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PREDICTING THE DEVELOPMENT OF DECLINE IN CONSTRUCTION COMPANIES

BY

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Submitted in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy in Civil Engineering
in the Graduate College of the
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Approved _____
Advisor

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A. Koksal

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CHAPTER I

INTRODUCTION

Business failures, organizational decline, and turnaround cases have interested researchers particularly in the organizational management sciences at the beginning of the 1980's. Organizational theorists' recipes for the "best" organization lost their validity in the oil crisis of the mid 1970's. Peters (1991) acknowledges that in the early 1980's he had defined how organizations achieved excellence but realized that he had been mistaken by the end of 1980's discovering that the "excellent" organizations had become the most troubled ones. Not only Peters (1991) but also others (e.g., Platt 1985, Frederikslust 1978, Argenti 1976, Miller 1977 and 1992, Nelson 1981) tried to understand the phenomenon of failure and the ways to protect organizations against this calamitous event.

Interestingly, although libraries and stores contain countless volumes presenting prescriptions for achieving success, very little attention is focused on avoiding failure. Failure is a topic that like death, people prefer to ignore. Not only researchers but also practitioners are reluctant to study or participate in a study of the phenomenon of failure. It is such a sensitive topic that sharing information or joining forces to fight failure seems almost akin to intruding into the personal lives of the participants.

Business failure is remarkably similar to death. The most obvious similarity is that when a company fails, its operations cease. However, unlike a corpse, a failed

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company may be revived. Also, like death, reasons for failure may not be obvious all the time. In some cases, companies make one overwhelming disastrous decision that leads to rapid demise. In other cases, failure may come from accumulated internal problems or external effects or both. No matter which one may be the reason, business failure information provides guidance to entrepreneurs contemplating starting a business. It gives a clear indication of the risk factors in the industry. It also provides experience for the professionals who are involved in managing risks. There are a number of individuals who ultimately become successful business owners who had failed in business before.

There are many definitions of failure. In general, from the financial point of view, failure is the inability of a firm to pay its obligations when these fall due. It mostly appears in a critical situation as a consequence of a sharp decline in sales, caused by a recession, the loss of an important customer, shortage of raw materials, deficiencies of management, etc. Failure is the outcome of a complex process and rarely depends upon a single factor. Organization theorists from one school to another define the fate of the firm with different paradigms. Organizational ecologists favor environmental determinism and claim that the fate of a firm is determined by environmental selection forces. On the other hand, the strategic management school which is grounded in the strategic choice model emphasizes the importance of managerial decisions and actions in affecting the fate of firms. Others reconcile these views by acknowledging the importance of the interaction between the environment and managerial decisions. In general, it is possible to summarize the phenomenon of failure as a function of two factors: environment dependent factors and strategic leadership dependent factors. The

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development of a theoretical framework that incorporates data based on organizational and managerial foundations rather than financial ratios is still open to researchers.

In construction, failure studies have focused on explaining failure at the project level rather than explaining failure at the company level. Several attempts have been made to adopt the financial ratios that were generated in management science. However, misleading financial information is sometimes generated by managers and accountants to hide the trend of the organization from the fatal end. Even though financial reports are the physical evidence, the early causes of failure more likely depend on the organizational structure and environmental factors that affect an organization's fate.

Many studies are reported in the construction management literature that aim to increase productivity, performance, and competitiveness of construction companies, either at the project level or at the company level; only few researchers study business failures. Yet, the statistics about business failures in the construction industry are striking. According to Dun and Bradstreet's 1997 data, the total value of failure liability in the construction industry was $2,021,220,115, which constituted 5% of the total value of failure liabilities in the U.S. in that year. Furthermore, the failure rate per 10,000 firms was 88 for all industries whereas it was 116 for the construction industry in 1997. The same pattern of higher numbers of business failures in the construction industry is observed consistently in the previous years as well (Dun and Bradstreet 1989-1993). Given the severity of the implications in terms of liabilities created by failures and the shear numbers of business failures in the construction industry, it is believed that at least

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as much research into business failures is justified in the construction industry as research into success recipes.

1.1 Objectives and Scope

The main goal of this research is to develop a model that company managers can use to evaluate the condition of their company to see whether the company is healthy, whether decline is developing, or whether decline has reached an advanced stage. The early detection of decline is expected to trigger corrective measures to prevent further decline and eventual failure. In order to accomplish the main goal, the following objectives are to be accomplished:

- Setting the theoretical foundations of the "decline" phenomenon in construction companies.
- Determining the early causes of construction company decline.
- Developing a prediction model that can establish the condition of a construction company vis-à-vis decline.

1.2 Significance of the Research

This research argues that the early causes of decline of construction companies lie in the environmental conditions and the organizational, human capital and strategic characteristics of a company. By the time the company is in financial crisis, it is often too late to start a turnaround: the company files for Chapter 11 bankruptcy. This research gives guidance to executives of construction companies about characteristics that are

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conducive to decline and eventually failure. It also provides a tool for the use of construction executives other than financial ratios that allows them to monitor the condition of their organization.

The data used to determine the non-financial causes of decline of a construction organization are collected by means of questionnaire surveys. The questionnaires used in the surveys are supported by studies provided in the construction management and organizational management literature. Being informed about the causes of construction company decline will enable company executives to identify the possible problems in their organizations.

In this research it is argued that construction company decline goes through four phases. These are decline development, decline recognition, decline response, and decline outcome. It is also argued that the downturn of an organization starts with primary symptoms, which include the deterioration of strategic and operational performance. The downturn of a company usually becomes official with the occurrence of a financial crisis in the company. It is therefore argued throughout this research study that the earlier the downturn is recognized, the higher the probability to turn the company around.

The model presented in this research provides the early causes of organizational decline and allows one to evaluate one's company based on the presence or absence of these causes. Although the analytical model has complex statistical foundations, the use

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of the model by professionals is rather straightforward and the outcome of the model is easy to interpret. The model presented provides a unique perspective of the decline phenomenon of construction companies.

1.3 Organization of the Dissertation

This research is presented in eight chapters. An introduction to the topic, the objectives and scope of the research as well as the significance of this research are presented in Chapter 1.

Chapter 2 examines business failure from the legal perspective with an emphasis on the reorganization of companies under the protection of bankruptcy courts. This chapter also covers a literature review of business failure in the context of organization science. Definitions of business failure and the models generated to predict business failure in general are followed by an expose of the prediction models that are generated for the construction industry in particular.

Organizational decline phenomena are examined from the perspective of organization theory in Chapter 3. This chapter describes organizational decline from the point of view of systems theory, population ecology, lifecycle principles, and organizational behavior theories.

There are certain characteristics of the construction industry that differ from other manufacturing and service industries. These industry specific characteristics affect the

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structure of organizations as well as the generic strategic competition between organizations. Since this research analyzes company decline within the context of the construction industry, an industry analysis is essential for the development of the research. Chapter 4 explains the similarities and differences as well as the structure of a construction company extensively. In Chapter 4, construction organizations are discussed in two sections, namely general contractors and specialty contractors.

Chapter 5 is a synthesis of Chapter 3 that explains the organizational decline from different perspectives and Chapter 4 that analyzes the construction industry. It proposes a model that explains construction company decline patterns. The proposed model has four phases of decline, namely, decline development, decline recognition, decline response, and the outcome. The chapter also explains the causes of a construction company decline under three components, which are environmental, operational, and strategic factors. The hypotheses of the research are also proposed in this chapter.

Chapter 6 describes the methodology utilized in this study to test the hypotheses set in Chapter 5 and to empirically assess the theory previously presented. The chapter starts with a description of scale development and its uses. It also describes how the theoretical considerations treated in the previous chapter are used in the scale development process. This section is followed by a section that defines the population used in the study. The characteristics of the population are very important in testing the hypotheses as well as developing the scales of decline patterns. The limitations of the population are also discussed in this section. In the third section, issues concerning data

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collection methods to measure construction company performance are discussed. Factor analysis is used to determine the scale variables of this research and in the last section Multinomial Logistic Regression is used for construction company rating analysis.

Chapter 7 contains the findings of the analysis. The first section describes the findings of a survey on construction company "causes of decline". This section is followed by the findings of another survey aimed to profile the company structure of bankrupt and non-bankrupt construction companies. The Mann-Whitney test is used for hypothesis testing and the organizational, human capital, and strategic posture differences between the bankrupt and non-bankrupt companies are interpreted. Factor analysis is conducted to determine the underlying factors, which are later used in developing the multinomial logistic regression model. The model can be used by construction executives to rate their company's condition.

Chapter 8 provides the conclusions of this research and discusses the accomplishment of the objectives that were set at the beginning of this research. Recommendations are also provided for future studies in this area.

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CHAPTER II

LITERATURE REVIEW OF BUSINESS FAILURE

2.1 Introduction

The theory of organization was accepted as a science after Adam Smith's famous work "The Wealth of Nations" was published in 1776. Since then researchers in this area tried to find out solutions to improve the quality of an organization in many ways. However, organizational theorists' recipes for the "best" organization lost their validity in the oil crisis of the mid 1970's. The organizations, which were assumed to achieve excellence in the early 1980's, became the most troubled ones by the end of the1980's.

Business failures, organizational decline, and turnaround cases have interested researchers particularly in the organizational management sciences at the beginning of the 1980's. This chapter covers a literature review of business failure in the context of organization science. Definitions of business failure and the models generated to predict business failure will be followed by the prediction models that are generated for the construction industry in particular.

In the next section, business failure will be examined from the legal perspective. The emphasis will be on the reorganization of companies under the protection of bankruptcy courts. The reorganization of companies is also a part of the decline process, which is part of the model built in this research. A company's petition for bankruptcy under Chapter 11 gives the signal that the company is in financial trouble but still wants

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to continue its business activities while willing to take actions to fix the troubled situation that they are in.

2.2 Business Failure from the Legal Point of View- United States Bankruptcy Acts

Under the federal statute, bankruptcy is a legal procedure for dealing with debt problems of individuals and businesses. This legal procedure is defined by title 11 of the United States (Bankruptcy Code /Administrative Office of the U.S. Courts, 1998). In other words, bankruptcy is a release of the debtor from his/her financial liabilities for a certain period of time under the protection of U.S. Bankruptcy courts or to start a fresh beginning.

Since 1898, U.S. Congress passed several acts regulating bankruptcy for individuals and businesses. Title 11 of the bankruptcy code consists of eight chapters. Chapters 1, 3, and 5 govern the provisions, procedures and parties involved under this title whereas the remaining chapters describe the operations for each type of filing (Russell and Casey, 1992).

Chapter 7, entitled Liquidation involves liquidating the assets of an insolvent company by a court appointed trustee in order to make a fair distribution among creditors. "No-asset cases" are the situations when a business that filed bankruptcy has no entity to liquidate. In this case, after the court approval, the debtor is released from all personal liabilities and can start a new business without the liability of the previous

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business. Chapter 9, entitled Adjustment of Debts of a Municipality, provides reorganization for cities, towns, counties, taxing districts, municipal utilities and school districts. Chapter 12, entitled Adjustment of Debts of a Family Farmer with Regular Annual Income provides debt relief to family farmers with regular income. Chapter 13, entitled Adjustment of Debts of an Individual with Regular Income gives the individuals opportunity of relief of debt. Although, Chapters 7 and 13 have some similarities, Chapter 13 additionally provides some opportunity on property issues to the debtor and gives an option to the debtor to propose a repayment plan.

Chapter 11, entitled Reorganization was first described in 1938 with the Chandler Act which opened a new area in bankruptcy proceedings. Chapter 11 is a voluntary proceeding that is initiated by corporations, sole proprietorships, or partnerships to reorganize their businesses. When a business falls into distress and starts loosing the ability to pay its debts but still wishes to continue operating, a bankruptcy petition is filed under Chapter 11 by the debtor (Fig. 2.1). A preliminary plan for financial relief is usually a part of the petition. After the filing, an automatic stay action is taken by the court. Automatic stay provides protection to the debtor and restricts creditors to pursue their claims during the negotiations that take place under Chapter 11. One of the advantages of Chapter 11 is that when the assets of the bankrupt company are under the custody of the court the debtor has freedom from prior pending court proceedings. Furthermore the debtor can borrow new funds that could cover the unsecured creditors. Although the interest rate will be high, new funds can provide financial relief for a while.

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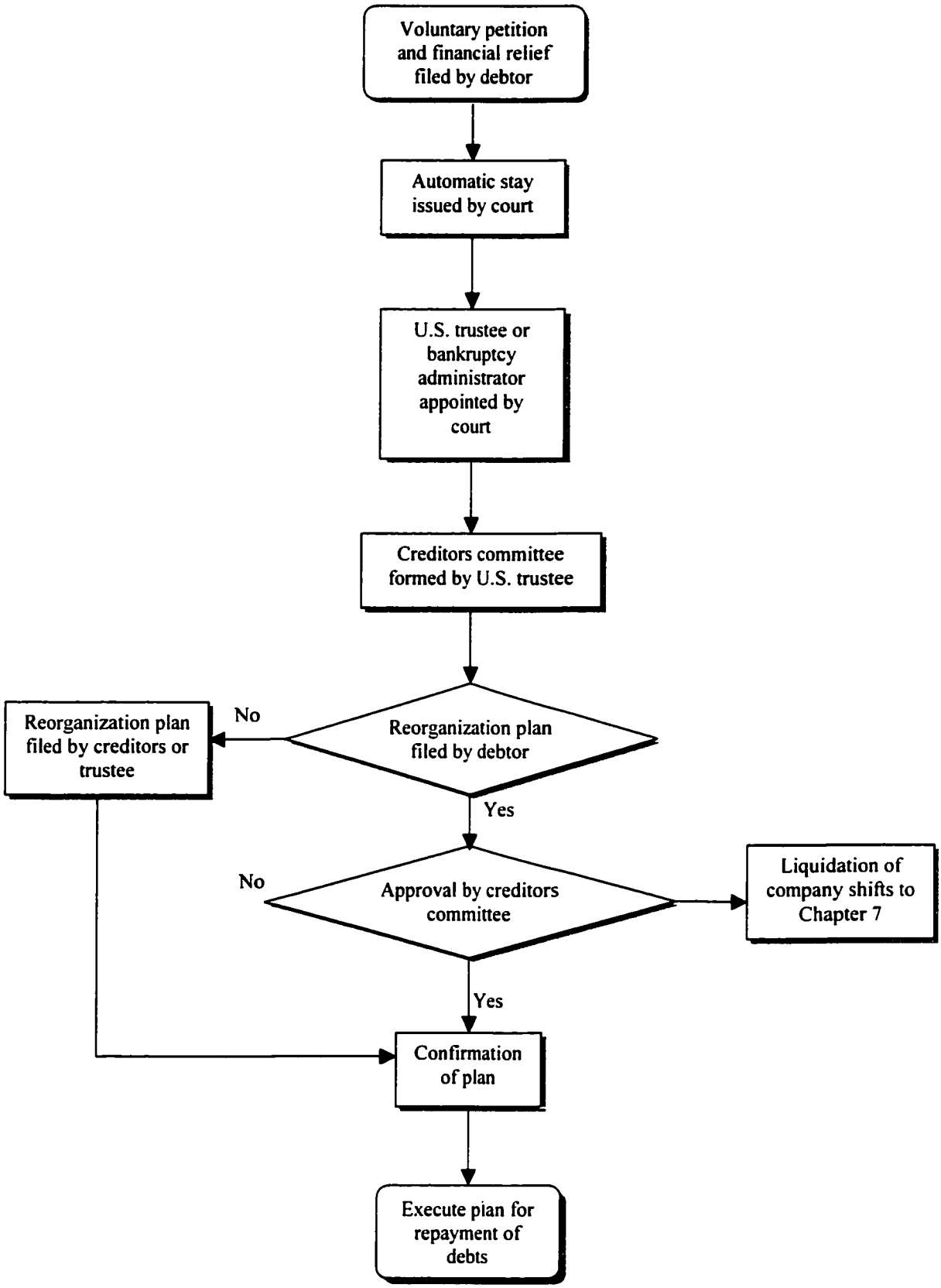

Fig 2.1. Flow Diagram for Chapter 11-Business Reorganization Procedure

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After the automatic stay, the court appoints a United States (U.S.) trustee or bankruptcy administrator. A U.S. trustee is an officer of the Justice Department who is responsible for supervising the administration of bankruptcy cases, estates, and monitoring plans and disclosure statements. The U.S. trustee or administrator is responsible for managing the corporate property. He/she usually allows the old management to operate the company and continue monitoring operations, reorganization plans, reimbursements to creditors, and arranges meetings between the management and the creditors committee. The U.S. trustee also appoints a committee that includes the seven largest unsecured creditors. In order to speed up the procedures and decrease the expenses, the debtor has 120 days to file a reorganization plan. If the debtor fails to file the reorganization plan, the creditors or trustee may file a plan. During the review sessions the plan may be modified in order to be more feasible and compliant with the code. The absolute priority doctrine applies for the reimbursement of claims. According to this doctrine, the creditors should be compensated according to their seniority. However, misuse of knowledge, influence, or any other fraudulent action may change this hierarchy that is called equitable subordination. The creditor committee goes over the reorganization plan. According to the code, at least two thirds in amount or one-half in number should be accepted by the creditors. If the plan does not receive the majority vote, the company starts liquidating its assets in (Chapter 7) order to compensate the creditors. If the plan receives the majority vote of acceptance required by the code, the reorganization plan is confirmed and can now be described as a contractual agreement between the debtor and creditors. In some cases, post confirmation plans are required to modify the current plan.

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It is important to mention the judiciary procedure for the bankruptcy process as well. The bankruptcy code created the U.S. Bankruptcy Court where there is a U.S. district. The President, with the advice and consent of the Senate, appoints the bankruptcy judges. All bankruptcy judges are appointed for 14 years. The appeals of bankruptcy cases are handled by district courts. An important role which is handled by the United States Trustee, is providing aids to bankruptcy judges for the administrative functions. Although the U.S trustees are a branch of the bankruptcy courts, they are supervised and appointed by the attorney general.

2.3 Definition of Business Failure

Last decade has been the scene of tremendous innovations, almost unbearable competition, and an economic wealth that has reached the highest levels ever in United States and many other countries. Despite this incredible development in the business world, conditions make life much harder for companies not only to keep up with their competitors but also to survive. According to the Administrative Office of the United States Courts, Bankruptcy Division statistics, the number of bankruptcy filings for each chapter increases despite the positive economic trends and industry regulations (Table 2.1).

There are many definitions of failure. According to Frederikslust (1978), failure is the inability of a firm to pay its obligations when these fall due. It mostly appears in a critical situation as a consequence of a sharp decline in sales, caused by a recession, the loss of an important customer, shortage of raw materials, deficiencies of management,

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Table 2.1. The Number of Bankruptcy Filings

Year	Total Business Failings	Chapter 7	Chapter 11	Chapter 12	Chapter 13
1990	749,956	521,358	20,067	1,320	207,211
1991	918,956	638,504	23,508	1,480	255,464
1992	977,434	684,866	23,312	1,625	267,631
1993	897,204	621,071	20,111	1,355	254,667
1994	837,764	571,971	15,920	931	248,942
1995	883,421	598,250	12,638	883	271,650
1996	1,111,917	761,652	12,554	1,096	336,615
1997	1,367,329	958,045	11,221	966	397,097
1998	1,436,929	1,026,134	8,765	879	401,151
1999	1,354,346	959,291	8,982	811	385,262

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etc. Platt (1985) characterizes failure in many forms. According to his approach, economic failure occurs when the opportunity value is too high compared to earnings even if the company may seem to have profit; this step is followed by a negative cash flow. Platt (1985) defines the other failure as financial failure. Technical insolvency is the first step of financial failure. This situation occurs when a company cannot meet its current obligations although the value of its assets exceeds its liabilities. Although this condition may be temporary, companies may prefer to solve their insolvency by filing bankruptcy under Chapter 11. The final step of financial failure is the liquidation of the company's assets under bankruptcy provisions. Altman (1993) defines failure from the point of view of economic criteria. A company is considered to have failed if the realized rate of return on invested capital, with allowances for risk considerations, is significantly and continually lower than prevailing rates on similar investments. Another criterion is insufficient revenues to cover costs and situations where the average return on investment is below the firm's cost of capital. Baden-Fuller defines failure (Storey, 1994) as a function of future events:

$$\pi < rC - C'$$

Where:

π = Present value of anticipated profit in the coming period

C = Residual value of the plant if scrapped now

r = Rate of interest

C'= Present value of anticipated capital gain in scrap value from deferring the closure

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On the other hand, Storey (1994) attaches a pejorative connotation to the term failure, implying either that the business should never have been started in the first place, or that the person was not competent to do so, or that the business left behind significant unpaid debt. Watson and Everett (1993) attribute business failure to four different situations: discontinuance for any reason, creditor loss, sale to prevent further losses, and failing to make go of it.

Failure is the outcome of a complex process and rarely depends upon a single factor. Organization theorists from one school to another define the fate of the firm with different paradigms. Organizational ecologists (Hannan and Freeman, 1977; Hannan and Freeman, 1984) favor environmental determinism and claim that the fate of a firm is determined by environmental selection forces. On the other hand, the strategic management school which is grounded in the strategic choice model (Child, 1972) emphasizes the importance of managerial decisions and actions in affecting the fate of firms. Hrebiniak and Joyce (1985) reconcile these views by acknowledging the importance of the interaction between the environment and managerial decisions. In general, it is possible to summarize the phenomenon of failure as a function of two factors: environment dependent factors and strategic leadership dependent factors.

2.4 Prediction Models of Business Failure

Traditional ratio analysis first started to detect the credit worthiness of a particular company before quantitative measures were generated to measure a company's performance. Although many researchers attempted to develop prediction models, in this

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research, only the models that have had a major impact on the state-of-the-art are discussed.

Beaver's Model: Beaver (1966) generated the first model that is called Recursive Partitioning Analysis (RPA) to predict business failures. His definition of business failure is the inability to pay financial obligations when they fall due. He took his data sample between 1954 and 1964. He classified the data according to industry and asset size. He conducted his analysis by pairing failed companies with non-failed ones in order to control each variable. The following six variables were used to conduct the analysis:

- Cash flow to total debt ratio
- Net income to total assets ratio
- Current plus long-term liabilities to total assets ratio
- Working capital to total assets ratio
- Current ratio
- No credit interval

His first approach is the comparison of the mean values of each variable between failed and non-failed firms. He found that deterioration of the means is substantial towards bankruptcy in the failed group, whereas the means are constant in the non-failed group. According to his findings, the best criterion to predict failure is the cash flow to total debt ratio. He emphasized the importance of financial ratios in his model. His

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predictions are more significant for non-failed firms than failed ones. However, this model draws the first general framework for this type of study.

Altman Models: Altman (1993) generated his first model in 1968 and called it the Z-Score Model. The study period was 20 years starting from 1946 through 1965. The sample size was 66, which consists of 33 failed, and 33 non-failed companies. In this model, like Beaver's study, the companies were categorized based on their asset size and industry type. The mean asset size of the bankrupt companies was $6.4 million, whereas this number was higher ($9.6 million) for the non-bankrupt companies. Both sample groups had the same asset size ranging between $1-$25 million. A list of 22 variables were categorized under five main groups that are liquidity, profitability, leverage, solvency, and activity. From the list of 22 variables the best five were selected to predict bankruptcy. The following equation is used to evaluate the Z-score of companies.

$$Z = 0.012X_1 + 0.014X_2 + 0.033X_3 + 0.006X_4 + 0.999\ X_5$$

Where;

X_1 = Working Capital / Total Assets

X_2 = Retained Earnings / Total Assets

X_3 = Earnings Before Interest and Total Taxes / Total Assets

X_4 = Market Value Equity / Book Value of Total Liabilities

X_5 = Sales / Total Assets

Z = Overall Index

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The main logic of the Z-score is the comparison of the mean values of variables for bankrupt and non-bankrupt companies. It is hoped that the comparison of a particular case with a similar sample will warn company executives about their company's trend with respect to bankruptcy. Altman found that, according to the above function, the greater the bankruptcy potential, the lower the discriminate score. He also concluded that the Z-score model is an accurate forecasting model to predict failure for up to two years. The accuracy diminishes greatly as the lead-time increases.

In 1977 Altman generated another model to predict bankruptcy that was called the Zeta Model (Altman, 1993). The main purpose of this model was to increase the company size ($100 million average) of failed and non-failed companies to compare the implications of the Z-score for larger companies. In this model seven variables were used. These are return on assets, stability of earnings, debt service, cumulative profitability, liquidity, capitalization, and size. It is concluded that the Zeta model is accurate enough to predict bankruptcy up to five years compared to the Z-score. It is also suggested that this model is still valid today and used by financial institutions for credit validations.

Edmister's Model: Edmister's purpose was to develop financial ratios for small businesses (Edmister, 1972; Altman, 1993). In his model he defined the firms according to borrowers and guarantee recipients from the Small Business Administration (SBA). In this model, it is assumed that loss borrowers are failed companies whereas non-loss

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borrowers are non-failed companies. He developed the following zero-one regression model with seven variables;

$$Z = 0.951 - 0.523X_1 - 0.293X_2 - 0.482X_3 + 0.277X_4 - 0.452X_5 - 0.352X_6 - 0.924X_7$$

With,

$R^2 = 0.74$, $F = 14.02$ and $N = 84$

Where,

$Z =$ The zero-one dependent variable. It equals one for non-failure and zero for failure.

$X_1 =$ The ratio of annual funds flow to current liabilities. It equals one if the ratio is less than 0.05.

$X_2 =$ The ratio of equity to sales. It equals one if the ratio is less than 0.07.

$X_3 =$ The ratio of net working capital to sales divided by corresponding RMA (Robert Morris Association) average ratio. It equals one if the ratio is less than –0.02.

$X_4 =$ The ratio of current liabilities to equity divided by corresponding RMA average ratio. It equals one if the ratio is less than 0.48.

$X_5 =$ The ratio of inventory to sales divided by corresponding RMA industry ratio. It equals one if the ratio has shown an upward trend.

$X_6 =$ The quick ratio divided by the trend in RMA quick ratio. It equals one if the ratio is downward.

$X_7 =$ The quick ratio divided by RMA quick ratio. It equals one if the ratio has

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shown an upward trend.

In this model Edmister shows that three consecutive years of financial statements are required for accurate prediction. SBA uses this model in deciding whether to award loans to firms.

Prediction Models for the Construction Industry: Researchers who were interested in business failures in the construction industry, were also interested in financial ratio models and their application in the construction industry.

Abidali and Harris' Model: Abidali and Harris' (1995) approach involves testing the applicability of Z-score in the construction industry. Financial data were collected for 11 failed and 20 non-failed UK construction companies between the period 1978 and 1986. A total of 24 financial ratios were generated to evaluate the financial structure such as profitability, working capital, financial leverage, liquidity, and trend measurement. A seven variable linear function was developed:

$$Z = 14.6 + 82V_6 - 14.5V_{17} + 2.5V_{23} - 1.2V_{24} + 3.55V_{25} - 3.55V_{26} - 3V_{30}$$

Where;

V_6 = Ratio of earnings after tax and interest charge to net capital employed. This ratio is for profitability measurement.

V_{17}= Ratio of current assets to net assets. This ratio is for financial leverage measurement.

V_{23}= Ratio of turnover to net assets. This ratio is for productivity measurement and

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market situation in the failed companies.

V_{24}= Ratio of short-term loans to earnings before tax and interest charge. This ratio is for a company's liquidity measurement.

V_{25}= Ratio of tax trend. This is another profitability measurement.

V_{26}= Ratio of earnings after tax trend. This is another profitability measurement.

V_{30}= Ratio of short-term loan trend. This ratio is for the liquidity over years.

At the end of a discriminant analysis, Abidali and Harris (1995) conclude that the higher the Z-score of a company, the higher its possibility of failure. However, Abidali and Harris (1995) also point to the inadequacy of financial ratios if used as the only tool to predict failure. Therefore, they generated another model called A-score. A questionnaire was designed to identify the managerial deficiencies in failing companies. Thirteen managerial deficiencies were detected from the survey that was administered to 90 construction companies with a response of 28. The results of this survey were weighted with the Z-scores of the seven failed and non-failed companies. It was concluded that a higher A-score value should indicate the vulnerability of that company. Although the intercorrelation between the Z-score and A-score was fairly low, the attempt to combine managerial and financial structure to predict failure highlights the importance of this model.

Russell and Zhai's Model: Russell and Zhai (1996) try to develop a model by using stochastic dynamics. Their definition of a contractor failure is the termination of a contractor's operations which can affect the owner as well. Stochastic dynamics is the

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study of financial variables that indicates distress over time. They can be measured by increment and percentage change of each financial variable in a particular time period. According to their model, the comparison of the drift parameter (μ= mean) and volatility (σ= standard deviation) would define the financial dynamics of an individual contractor. The model is developed by using the *Random Coefficient Method.* This is a data reduction procedure in a group of interpretative variables (coefficients) in order to define stochastic dynamics in the observed time period. This model is accurate for three years. In order to develop the model, 49 failed and 71 non-failed companies' financial data were collected from five insurance companies that provide contractors' surety bonds. Net worth, gross profit, net working capital are the three variables selected to measure the stochastic dynamics of an individual company. The conclusions of this model show that the non-failed companies' drift parameter (μ) is slightly positive compared to failed ones. Also the drift parameter becomes more negative prior to failure. The volatility change (σ) for the non-failed companies is smaller compared to failed companies. Like the drift parameter, volatility increases prior to failure. Finally, it is observed that the percentage change for the non-failed companies is a normal distribution. This model is important because it is an attempt to predict future position by using current ratios.

Kangari's Model: This is a macroeconomic model that consists of external factors which influence construction companies. In his model, Kangari (1988) defines five external factors that might affect contractors. These are:

- Interest rates (Federal intermediate credit bank loan rate)
- Construction activity rate (F. W. Dodge construction contract valuation index)

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- Residential construction activity (Conventional fixed long-term mortgage rate)
- Inflation (Department of Commerce's construction cost index)
- New business activity (The number of yearly business starts)

The following equation was generated after performing a multiple regression analysis.

(Change in failure index) = 2.1 (Change in new business index) + 1.8 (Change in interest rate) – 3.9 (Change in construction activity rate) + 44.8

At the end of this study, Kangari (1988) concludes that the contract value index has the highest effect on failure and new business activity and loan rate change have almost similar effects on failure. This model is important because it emphasizes the importance of the macroeconomic environment on business failures in the construction industry.

2.5 Summary

Chapter 11 is a voluntary application for corporations that fall into distress, and start loosing the ability to pay their liabilities, but are still willing to continue operating. One of the advantages of Chapter 11 is the protection against creditors by the bankruptcy courts. Business failure can be defined as the inability of a firm to pay its obligations when these fall due. Failure is the outcome of a complex process and rarely depends upon a single factor. Traditional ratio analyses were the first models developed to predict

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business failure. Beaver (1966) generated the first model called "Recursive Partitioning Analysis". This was followed by Altman's (1993) famous Z-score model that he developed in the 1960's, which was used as a basis in subsequent research in this area. Edmister (1972) tried to adapt Altman's model to small businesses with some adjustments. There were also similar research studies conducted in the construction industry. Abidali and Harris' (1995) approach involves testing the applicability of the Z-score model in the construction industry by developing a seven variable linear function. At the end of a discriminant analysis, they concluded that the higher the Z-score of a company, the higher the possibility of failure. Russell and Zhai (1996) used stochastic dynamics in their model and approached business failure in the construction industry from a different perspective. The model shows that the drift parameter (μ=mean) of variables becomes negative prior to failure, also the volatility (σ = standard deviation) for the non-failed companies is smaller compared to failed companies. Finally, Kangari's (1988) macroeconomic model involves the study of external factors that influence construction companies. He defines five external factors and concludes that the contract value, new business activity, and loan rates have similar effects over the failure of contractors. This model emphasizes the importance of environmental factors.

This chapter starts by looking into business failure phenomena from the legal perspective. This is the first step of acknowledging the crisis. All the prediction models on business failure, including the ones for the construction industry, focus only on financial aspects of companies. It is concluded that prediction generated by financial ratios have an accuracy ranging from three to five years. It is believed that a financial

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crisis is the consequence of failure and therefore can be used to predict failure, but cannot be the sole factor that predicts business failure.

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CHAPTER III

BUSINESS FAILURE IN THE CONTEXT OF ORGANIZATIONAL THEORY

3.1 Introduction

Organizational decline is a time-related process that shows different symptoms at different stages. The best way to investigate decline patterns may be through case based studies, which give a broad idea of the flow of the pattern. It is difficult to obtain information about organizations that have already completed the decline process. There is also a common unwillingness to share information from such organizations that are still at the beginning or mid stages of decline. Another issue is how an organization can be labeled as declining before considerable progress towards failure takes place.

Because this research tries to develop a model to predict construction company failure, the theory that underlines the model must be clearly spelled out. Therefore, in this chapter, organizational decline phenomena will be examined from the perspective of organization science theory. The following sections will describe organizational decline from different perspectives such as systems theory, population ecology, lifecycle, and organizational behavior theories. Finally, possible decline patterns of organizations that are discussed by other researchers are also discussed.

3.2 Decline in Organizations

Researchers focused on decline in organizations in the late 1970's and early 1980's as an important organizational condition and since then they have tried to define

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organizational decline by using different approaches of organization theory. However, most of the definitions failed to identify the early stages of decline and by the time definitions match the characteristics of an organization, irreversible damage occurs in the core of the structure. It is obvious that the number and depth of studies in decline is far less than that of the "success" and "expansion" theories. This can be explained by several reasons, such as, the difficulty in finding empirical data. Leaders and managers of successful organizations welcome the participation in success research studies while those in charge of organizations suffering from declining performance or liquidation usually have little time and no interest in sharing the information with researchers. It is difficult to detect the early stages of decline. It is common that managers have difficulty in differentiating between normal conservation and consolidation activities and the decline of an organization. Managers and researchers have undeniable cultural biases towards young and giant companies' success stories (e.g. Microsoft, America Online). The common ground in social science research is that managers are generally rewarded based on their ability to provide organizational growth. Finally, contrary to theoretical approaches (e.g., life-cycle theory, population ecology) not all matured organizations decline or die.

In addition to the difficulties encountered in empirical research on decline, the organizational decline literature does not have a common definition of decline. That is not due only to approaching the subject from a different perspective but also to the nature of the decline phenomenon that does not allow the formulation of a clear-cut definition. Whetten's (1987) example describes the situation; suppose a football team's win/loose

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ratio is dropping drastically over the years but the ticket sales increase at the same time. Giving this information, is it possible to state that the owner company of the team is declining? One of the approaches to the study of organizational decline is the mirror image of the study of growth (McKinley, 1993). However, there is not enough evidence that organizations develop asymmetric characteristics. Another approach is the "success breeds failure" (Whetton, 1987; McKinley, 1993; Rosenblatt et al., 1993) concept where success brings blindness and underestimation of isolated difficulties, which may give a hint of the possible future. Despite the difficulty on the definition of decline, there is a consensus on the consequences of decline. Decline produces conflict, secrecy, rigidity, centralization, formalization of the organization and decrease in morale, participation, commitment, leader influence, innovativeness and long term planning (Whetten, 1987).

The study of organizational decline is important because of the enormous social and economic consequences on individuals and organizations. Although different approaches have their own pros and cons, it is important to review each of them and look at their definition of decline in order to find a common ground. However, it should also be noted that organization theory contains various perspectives; it is difficult to draw a fine line between these different perspectives considering that one takes its facts or arguments from the other or proves its own argument based on another.

3.2.1 Systems Theory Perspective of Decline: The systems theory began to dominate organization theory in 1966-67, when two of the most influential modern works in organization theory appeared: Robert Katz and Daniel Kahn's *The Social Psychology*

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of Organizations (1966), which articulated the concept of organizations as open systems and James D. Thompson's coherent statement of rational systems / contingency perspective of organizations in *Organizations in Action* (1967). Systems theory views an organization as a complex set of dynamically intertwined and interconnected elements, including its inputs, processes, outputs, feedback loops, and the environment in which it operates and with which it continuously interacts. Norbert Wiener's, Cause-and- Effect relationship (logical positivist) model shown in Figure 3.1 gives a clear definition of an organization according to the systems theory approach.

According to systems theory, a system –organization- is a composition of units including their environment and their interactions for a specific goal. Therefore, systems theorists study these interconnections by using organizational decision processes and information and control systems. Hence, there is continuous interaction among organizational (internal) and environmental (external) dynamics; systems theorists try to observe these constantly changing processes in organizations. Since the cause-and-effect relationship is a dynamic process, the system tends to find balance between its units and the external environment. These changing processes represent shifting states of dynamic-equilibrium and are crucial for survival. The major difference between classical organizational and systems theory is that the first tries to find "the one best way" and the second tries to identify an "optimal solution" by using a cause-effect relationship. Systems theories are often called management sciences or administrative sciences. Statistical probability methods, quasi-experimental research techniques and computer

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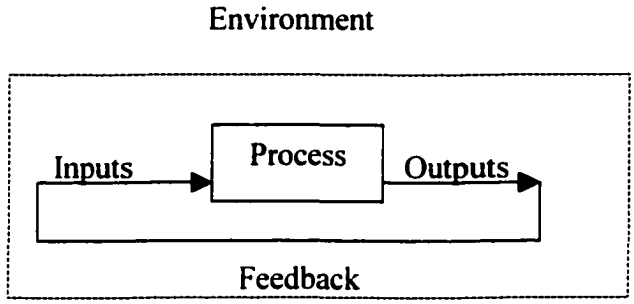

Figure 3.1 Norbert Wiener's Model of Organization as an Adaptive System

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models (e.g. PERT, CPM, linear programming, gaming, Monte Carlo methods and simulation) are the basic tools used by system theorists.

In their research, Katz and Kahn (1996) tried to connect the two major concepts of social systems and management systems by describing the organizations as open systems- "as organizations are open systems they must continuously adapt to changing environmental factors, and managers must recognize that all organizational decisions and actions in turn influence their environment". In addition to that Thompson (1967) pointed out that under the assumption of rationality, organizations attempt to anticipate and adapt to environmental changes from which the core technology cannot be protected. When changes in the environment are large, rapid or hard to predict, the organization must be capable of rapid change if it is to survive. Failure to find the appropriate change leads to the organization's slide toward dissolution. An organization's inability to adapt has been linked to various indicators, which have then been used to define decline.

3.2.2 Population Ecology Perspective of Decline: Organizational ecology, adaptation, environmental selection, niche theory, liabilities of newness and smallness are concepts that are used to explain and validate the population ecology perspective from different points of view while each theory takes its validation from the other. Populations consist of species – organizations –with the same knowledge, skills, and similar interests that compose ecologies or environments (McKelvey, 1988 and Clegg, 1990). Organizational ecologists seek to discover why there are so many kinds and sizes of organizations. Population ecology seeks to understand how social conditions affect the

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rates at which new organizations and new organizational forms arise, the rates at which new organizations change forms, and the rates at which organizations die out (Hannan and Freeman, 1989). The population ecology perspective explains these questions by using the niche theory.

The niche of a population is defined as a group of organizations, which share the same resources and interests in that particular environment (Hannan and Freeman, 1977). However, it should also be noted that niches do not have infinite capacity. They are bounded by their available resources and organizations that have a higher competitive ability will survive while others will die out.

According to population ecology theory, organizations are affected by environmental changes. There are two types of environmental change that might occur and affect the survivability of organizations (Hannan and Freeman, 1977; Whetten, 1987; McKelvey, 1993). First is the decrease in the resources of a niche. Second is the context change in the niche. Therefore, based on these assumptions, the organizations that can adapt to the new conditions of the niche will be able to survive.

Organizational ecology focuses on the reasons for organizational diversity, formation, survival, and death. This approach is concerned with competition, selection, and survival of the fittest in populations of organizations. Taking its basis from Darwinian theories, population ecology assumes that the selection process operates among organizations based on whether organizations are classified as "specialists" or

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"generalists". The specialist and generalist organizational forms can be explained in two ways. According to Hannan and Freeman's (1977) niche theory, organizations that operate in niches that cover a wide environmental range can be described as generalist organizations. However, the organizations that have a narrow environmental range, are categorized as specialist organizations (Fig.3.2). The other way to explain "specialist versus generalist" is the level of diversification of an organization. The more diversified an organization is, the more generalist it becomes. According to the population ecology perspective, diversification increases the chances of survival.

According to Aldrich et al. (1984), population ecology or the natural selection theory has four components. The first component called taxonomy focuses on organizational differences based on their activities and classifies them accordingly. Second, classification procedures allow identifying the organizational population and its relationships to other populations. Third, evolutionary inquiry describes why and which attributes of organizations makes the population remain different. Fourth, population ecology explains the niches and environments of organizational forms under the frame of their populations' environmental conditions including their rise and fall. In their research, Aldrich et al. (1984) identify three processes that differentiate organizational forms. First, ecological processes include scarce resources and negative selection such that members of a population that have ineffective attributes fail and leave a homogeneous group of members having a narrower set of survival-enhancing attributes. Second, generational processes assure that technologies, competencies, and attributes enhancing survival will be retained by surviving members even when their employees

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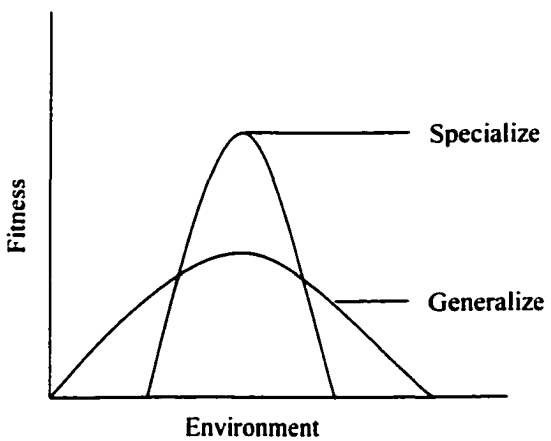

Figure 3.2 Specialist Versus Generalist Form

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change and that diffusion across members within a population will take place. Finally, isolated processes assure that technologies, competencies, and attributes of the members of one population are not easily shared with the members of other populations; otherwise population differences would slowly disappear.

This generalization process in a way describes the learning curves of organizations, which lead us to *Liability of Adolescence* and *Liability of Newness* concepts in the population ecology perspective. According to the Liability of Newness perspective, newly founded organizations have a high chance of failure based on lack of learning curves because of new roles and tasks, capital and creativity constrains, and environmental support (Bruderl and Schusssler, 1990). However, liability of adolescence suggests that it is hard to evaluate newly established organizations because of the differences in the initial stock of resources and the ambition of its founders. Liability of adolescence states that the risk of failure rises when the new organization establishes its structure and the adolescence period starts.

Hannan (1986) originally proposed that competition increases and the founding rate of organizations decreases as the population becomes dense. Arguments on the population density theory are controversial. Peterson and Koput's (1991) findings on density-related death rates suggest that death rates are caused by unobserved heterogeneity in the population. Delacroix and Rao (1994) noted that density dependent death rates are weaker than founding rates because of vicarious learning and the development of an infrastructure as well as track records. Baum and Oliver (1992)

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reported that at a rational density the number of formal relations between the members of a population and key actors in the population's environment diminished death rates and increased founding rates. In a more recent study, Baum and Powell (1995) suggested that if an institutional ecology of organizations is to be cultivated, then ecologists need to use non-density alternatives to incorporate the effect of sociopolitical legitimacy.

One of the central issues in the ecological perspective is an organization's adaptation to its environment. Some population ecologists suggest that organizations are embedded in interfirm networks that shape an individual firm's performance as well as the performance of the population as a whole by determining how resources are allocated and what range of action is feasible by organizations (Uzzi, 1997). According to Greenhalgh's (1983) definition, decline occurs when an organization fails to maintain the ability to adapt its response to a stable environment, or when it fails either to broaden or increase its domination of a niche which has diminishing capacity. Greenhalgh's (1983) definition of decline carries all the characteristics of population ecology as described above. It describes interorganizational relationships, degree of fit to an environment, and density of an environment. It is a common fact that environments are usually in a state of flux. The critical issue might be to find the magnitude and speed that an organization needs to adjust or change.

3.2.3 Lifecycle Perspective of Decline: Lifecycle theory including the product, organization, and industry follows the hypothetical stages of growth, maturity, decline, and death. According to lifecycle theory each stage of an organization shows different

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kinds of strength and vulnerability. Product market demand, competitive structure, intensity, government intervention and other factors change over the course of time. These factors define the characteristics of the industry (e.g., mature, declining, etc.) and therefore, organizations must adapt their strategies accordingly (Valentin, 1994).

Adizes (1989, 1999) suggests that there is an inverse relationship between flexibility and controllability in the nature of an organization's aging. Young organizations have a high level of flexibility and a low level of controllability whereas mature organizations have the opposite (Fig.3.3). According to his theory, during the growth-aging process, an organization reaches a point called "prime" where flexibility and controllability come to balance. When an organization reaches its prime stage, its functional systems and its structure work properly. The organization establishes its institutionalized vision and creativity. It becomes more result-oriented, i.e., it makes plans and follows them. Performance and profitability increase. Also, the organization starts producing new organizations.

Adizes (1989) divides the life cycle of an organization into nine stages and two periods as growth and aging (Fig.3.4). The first stage in the development of an organization is called *Courtship*. At this stage the organization is not yet born but it exists only as an idea. When the risk is taken for the "idea", the organization is born and is in the *Infancy* stage. The focus shifts from ideas and possibilities to the production of results. A company in *Infancy* has few policies, systems, procedures, or budgets. The

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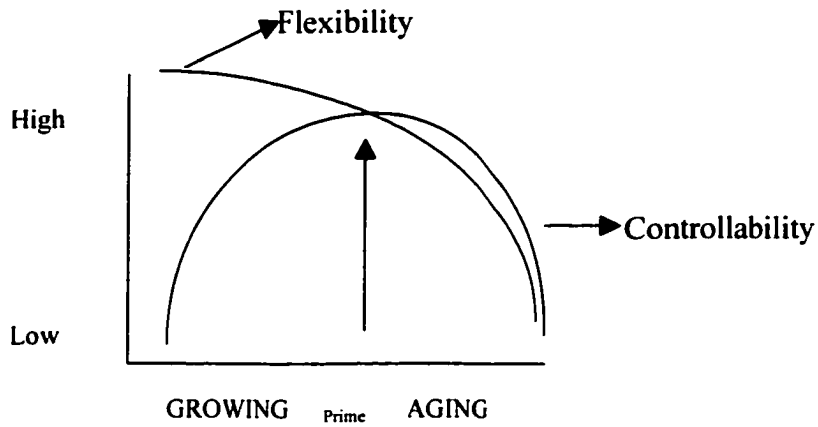

Figure 3.3 Flexibility Versus Controllability

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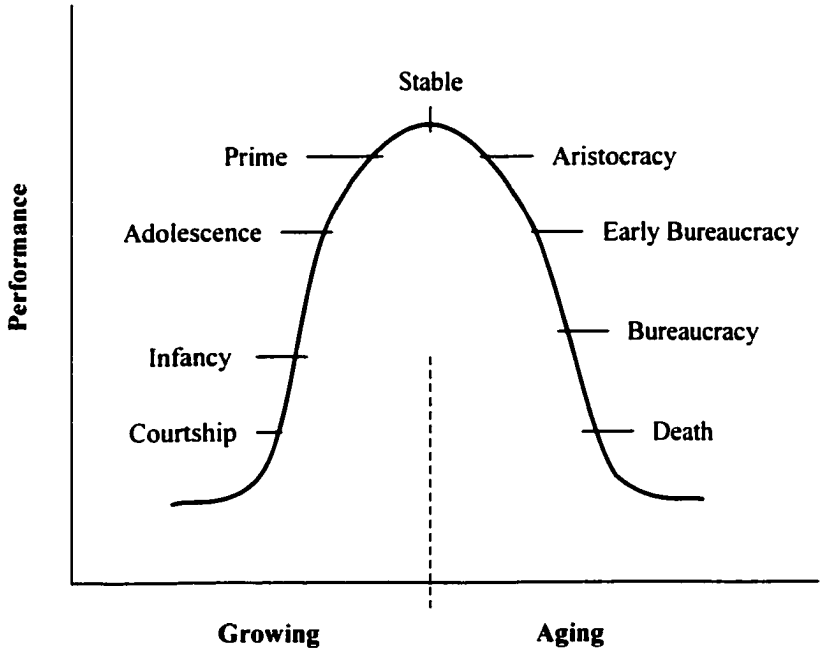

Figure 3.4 Lifecycle of an Organization

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organization is action-oriented and opportunity-driven. Inconsistent performance is its vulnerability to sudden, unexpected crises. *Adolescence* is the subsequent stage where an organization establishes its policies and creates its own system as well as administration.

The *prime* stage is the optimum point on the lifecycle curve. That is when an organization achieves its balance of self-control and flexibility. Although, the prime stage seems to be an organization's maximum point to reach, lifecycle theory defines it as a process not a destination. Hypothetically, the ideal situation for an organization would be to try to stay in the prime stage.

The *stable* phase is the first of the aging stages of the organizational lifecycle. The company is still strong but it is starting to lose its flexibility. This stage is the end of growth and the beginning of decline. The organization is hesitant to take risks, suspicious to change and innovate. Major focus is on the current achievements rather than future visions. This is the beginning of deterioration.

Aristocracy is the highly administrative stage of an organization. The focus is on more administrative policies than strategies and actions. The climate of an aristocratic organization is relatively stale and the major concern is *how* you did things, not *what* you did. *Early bureaucracy* is the stage where aristocracy reaches its maximum. Tension starts within the organization.

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In the *bureaucratic* stage, a company does not generate sufficient resources of its own. The organization disassociates from its environment and mostly loses its control. Bureaucratic organizations may survive a protracted coma when they are able to operate in isolation from the external environment. Therefore, the real death may take years. *Death* occurs when the least commitment disappears and all other artificial support systems are consumed.

Whetten's (1987) research in lifecycle has four stages. The first stage called *entrepreneurial* is the formation of a niche, the start of creativity and innovations. The second stage involves *collectivity* where cohesion takes place and commitment starts building up. The third stage is *formalization and control,* the beginning to institutionalization and stability. The fourth stage involves *elaboration and structure* and can be defined as the beginning of expansion and decentralization. This classification contains only the birth and growth stages.

The lifecycle theory defines the organization rather as a living entity. However, it must be noted that with this theory the effect of the external environment is undermined. Furthermore, the lifecycle theory may be misleading because of the fact that decline might start before or after the stable stage. Overexpansion might hide the indication of decline whereas strategic cutbacks or stagnation periods might be assumed as signs of decline by the managers of organizations. The common argument in the lifecycle theory is whether the movement at each stage is linear or recursive (Whetten, 1987). Linear

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movement describes the organization moving only in one direction. However, mergers, acquisitions, and other sudden crises may push the organization to previous stages.

3.2.4 Organizational Behavior Perspective of Decline: Organizational behavior studies began in the 1920's by social scientists and psychologists quite different than today's perspective on the behavioral side of organizations. In 1927 Elton Mayo's team at the Hawthorne plant of the Western Electric Company, Douglas McGregor's Theory X and Theory Y definitions in his "The Human Side of Enterprise" speech are the milestones of the organizational behavior approach. Starting from the1960's, the human side of organizations got the attention of organizational scientists and they started to research how organizations could affect people and how people could affect organizations.

The organizational behavior perspective draws on a body of research and theory built around the following assumptions (Shefritz and Ott, 1996):

- Organizations exist to serve human needs (rather than the reverse).
- Organizations and people need each other.
- When the fit between the individual and organization is poor, one or both will suffer. Individuals will be exploited, or will seek to exploit organizations, or both.
- A good fit between individual and organization benefits both. Human beings find meaningful and satisfying work, and organizations get the human talent and energy they need.

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Researchers who studied organizational decline also try to define the decline process from the organizational behavior perspective. According to Cameron et al. (1987) organizational decline can be analyzed at individual level, group level, and organizational level. D'Aveni (1989) defines decline as the decreasing of the numbers of prestigious top managers who add to the human capital of a firm. Another approach in this perspective is failure to recognize and respond to organizational deteriorations and external trends that threaten the organization's survivability (Newmann and Newmann, 1994; Cummings, 1988). The consequences of organizational decline increases conflict, secrecy, scapegoating, self-protective behavior, rigidity, and decrease in morale, innovativeness, participation, and long-term planning.

Cummings (1988) argues that there are three conditions of decline and discusses managers' responses to each condition.

Temporal Comparative Condition: The manager realizes that the resources are not available compared to past performances. Individual reaction is anxiety about personnel skills, ignorance with respect to relevant knowledge. The manager's first attempt is to deny the situation and then put the blame on him or herself for the organization's failure. Constructive confrontation with the other members of the organization follows at the final stage in order to improve the organization's performance.

Interorganizational Comparative Condition: The manager uses other organizations' performance to evaluate his/her organization's performance. Frustration over the unjust

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distribution of market resources and unfair practices by competitive organizations is the common reaction in the interorganizational comparative condition. External sources are considered to be the causes of decline. Under these circumstances, the manager's fierce competition strategy sometimes reaches destructive levels. Zero-bargaining attitude brings rigidity to the entire organization.

Aspirational Comparative Condition: This is the comparison of an organization's current performance to the manager's expected standards. Reactions vary based on the level of decline. The outcomes also vary in this condition. The manager may lower the goals or an unsatisfied manager may leave the organization.

The "threat rigidity response" perspective has also an important place in the organizational behavior approach. Threat rigidity responses are cognitive reactions under any kind of threat to an organization's survivability. The typical response to threat is tendency to centralize decision-making, to narrow fields of attention (backing up from diversification), and to pursue a rather inflexible strategy (Uzzi, 1997). Although threat rigidity is a reaction to decline, this effect may also increase the speed of decline for the organization.

There are also other studies that prove that the reason of decline is related to the CEO, the structure of the board, or managerial mistakes (D'Aveni, 1989; Barker and Mone, 1998; Neumann and Neumann, 1994; Cameron et al., 1987; Sutton and Callahan, 1987; Daily, 1995). Neumann and Neumann (1994) argued that extreme conservatism as

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well as purely reactive orientation can cause decline, especially long-tenured executives' commitment to old times and reactions to strategic renewals. Argenti (1976) also criticizes the one-man show of CEO's. Daily (1995) mentions the advantage of outside board members because of their objectivity and ability to present a new perspective to the organization.

The organizational behavior perspective is also interested in the actions that are taken in the later stages of decline. The common approach at the later stages is to change the CEO of the organization. It is believed that fresh blood will change the faith of the organization. There are many examples in real life that a new CEO turned around a company from the fatal end as well as failures. Although the idea of changing the CEO has its merits, it also brings new types of problems to the organization. Lack of trust, scariness of being easily laid off are some of the major reactions to the new CEO and his/her policies and strategies. These circumstances will disable the new CEO even if he/she has the ability to rescue the organization from the unfortunate end.

3.3 Patterns of Organizational Decline

Starting from the 1980's, a thorough literature survey shows that a handful of researchers study the organizational decline phenomenon. As it is mentioned in the previous sections, there is still no consensus on the definition of decline. However, based on limited empirical study and case based observations, it is possible to determine the possible causes and consequences of decline. The possible decline patterns in organizations are discussed below.

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Wetzel and Jonsson's model (1987) is based on three aspects, namely progressions of organizational problems, level of environmental support, and organizational strategy (Fig 3.5).

Blinded Stage: Lack of environmental support or slack resources are sometimes hard to recognize at the beginning. Although organizations are sensitive to quantitative changes, organizations at this stage are unable to recognize the changes. Qualitative changes are more difficult to recognize and insufficient internal evaluation makes it even harder if these qualitative changes are developing internally. At this stage the importance of leadership is stressed. According to the model leaders' personal expectations, tolerance level and ambiguity will reflect on the organization's character. Some will not hesitate to take risk under uncertainty whereas others will do anything to avoid it. At this stage it is suggested that unless the key decision makers anticipate the changes, they will be unaware of the beginning of decline.

Inaction Stage: At this stage the deterioration starts becoming obvious. Two common reactions divert the organization to the third stage. First is the denial or misinterpretation of available information. The failure to misinterpret the information takes its bases from previous successes and the longevity of the organization. Second, the key decision makers sometimes assume the threats as temporary conditions. "Wait and see" might seem rational to do long term planning. Developing decision-making coalitions and problem solving techniques, clarifying the differences between the actual performance and the expected performance may revert the organization to the inaction stage.

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BLINDED	INACTION	FAULTY ACTION	CRISIS	DISSOLUTION
Failure to anticipate decline	Failure to take action	Faulty decisions	Faulty decision unforgiving environment	Rapid or slow demise based on environment
Beginning of decline	Decline noticeable	Decline noticeable	Start of erosion	Irreversible decline bankruptcy proceeding

Figure 3.5 A Model of Stages of Decline

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Faulty Action: At this stage organizational failure may not be immediate, but it becomes obvious that correct actions are not being taken. Increase in tension, decrease in morale push some of the valuable staff to leave the company; therefore the competent employee will still have a chance to find a better job opportunity. This is the stage where the quality of leadership is questioned because of the high level of stress. Several factors lead the organization to the third stage. Quick and uncalculated decisions under stress, short-term answers to problems, high centralization are some of the factors. Ironically, it is argued that this stage may be the best stage for a major reorientation. The major actions at this stage are change of leadership, product diversification and acquisition, divestment of failing units or products, and personnel lay-offs. Authority, openness, realistic goals are the factors to be successful at this stage.

Crisis Stage: At this stage negative external reactions appear to the organization's unsuccessful reorientation attempts. Major cutbacks from customers and suppliers occur. Chaos turns into anger, finding capital becomes a problem. Revolutionary changes in the structure, personnel, and ideology are essential to recover from the fourth stage. Outside consultants or board members may be helpful to find new markets or niches as well as to scale down unpromising activities.

Dissolution Stage: This is an irreversible stage. The organization is in serious trouble through capital depletion, loss of markets, reputation, and human resource. Bankruptcy proceedings are essential at least to stop completely being out of business.

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An alternate to Weitzel and Jonsson's (1987) five-stage decline model is King's (1996) phase model of organizational decline. First of all, King (1996) defines failure as the consequence of internal factors that are rooted in faulty acquisitions and managers' poor use of information. The phase model suggests that phases do not necessarily follow the same order in every company. The phases can occur in various orders in different companies and this is the basic difference between King's (1996) phase model and Weitzel and Jonsson's five-stage model. The organizational decline phases are described as follows.

The Impulsive Syndrome: This phase is also called the 'running blind' phase. This is common for companies experiencing high growth-rates. These firms are characterized as overly complex and diversified, which causes a serious lack of information and control in the company. In order to overcome the impulsive syndrome, it is suggested that middle management should be improved by redefining its authority or by appointing replacements. Middle management is usually responsible for creating a connection between the executives and the technical staff or production centers.

The Stagnant Bureaucracy: This phase can be described as overconfidence in the current strategy that was the recipe for past successes. This kind of confidence usually causes the loss of opportunities or the creation of possible threats. Rigid operating procedures, resistance to change and inability to adapt to changing market conditions are the downsides of this phase. Revising the company mission and improing management's

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attitude towards the external environment are the actions that can help overcome this phase.

The Headless Firm: Leadership weakness is a major problem if the firm is large, complex, and highly diversified. Reluctant strategies and conflicting decisions are the major problems that threaten the survivability of companies. It is a common problem that the CEO or the top management team avoids dealing with details and only focuses on the generic picture for the decision-making process. This situation results in marginal strategic programs that are not suitable for the company's current position.

Swimming Upstream- The Aftermath: This is the turnaround effort for the company. The top management of the company realizes the problems and believes that if they don't take action they will never recover. Changing the top management team, generating new strategies with almost squandered resources are the last hopes for a turnaround.

3.4 Summary

According to systems theory, organizations are composed of two dynamics, which are called the external and the internal environments of organizations. The theory also suggests that there is a cause and effect relationship between these two environments. Survivability of organizations depends on the dynamic equilibrium between these two environments. Organizational failure occurs when managers fail to recognize the changes in the external environment and when the organization is unable to adapt to these changes because of its rigid structures.

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Population ecology seeks to understand how social conditions affect the rates at which new organizations and new organizational forms arise, the rates at which new organizations change forms, and the rates at which organizations die out. Survivability of an organization is affected by resources, which are not infinite, and change in the social context of the environment (their niche) in which the organization functions. Therefore, an organization that can adjust to the social changes and is able to take a share of the limited resources will be able to survive. Population ecology also covers the issues of *liabilities of adolescence* and *liabilities of newness.* The general idea is that newly founded organizations have a higher probability of failure because of a lack of learning curves on the structure and human resources. Lack of resources is also a threat to survivability when an organization starts its adolescence period.

The lifecycle approach theoretically assumes that organizations are born, they grow and finally they die. The ideal condition is to keep an organization at its *prime* stage, which is the optimum point on the lifecycle curve. This stage is the balance of self-control and flexibility. The down side of the lifecycle theory is that it undermines the environment and assumes that the movement in each stage is linear whereas certain events such as a sudden crisis can cause setbacks.

Researchers who studied organizational decline also try to define the decline process from the organizational behavior perspective. Recognizing and responding to decline is up to the managers in organizations. According to Cummings (1988) a manager's response to decline can be temporal (deny or blame the others),

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interorganizational (rigid and zero-bargaining attitude which can be destructive), and aspirational (lowering the goals to current performance). There are also several other studies that show that decline is related to the CEO, the structure of the board, or managerial mistakes. Extreme conservatism, commitment to old times, and resistance to strategic renewals are the other reasons that cause organizational decline from the behavioral management perspective.

Based on a limited empirical study and case based observation, Weitzel and Jonsson (1987) propose a decline pattern model that is composed of five stages. These are blinded stage (the beginning of decline), inaction stage (decline becomes noticeable-failure to take action), faulty action (taking wrong actions), crisis (taking unforgiving actions), and dissolution (irreversible decline, bankruptcy proceeding). King (1996) on the other hand suggests a model that is composed of phases such as the impulsive syndrome (running blind), the stagnant bureaucracy (overconfidence with the current strategy), the headless firm (leadership weakness), and the aftermath (turnaround effort). According to King's (1996) model, failure is the consequence of internal factors that are rooted in faulty acquisitions and managers' poor use of information.

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CHAPTER IV

AN INDUSTRY ANALYSIS: THE CONSTRUCTION INDUSTRY

4.1 Introduction

The second chapter examines the term business failure from a legal standpoint and from the point of view of the organizational science literature. This is followed in the third chapter by the theory of decline also examined from different perspectives. Since this research aims to investigate business failure in the construction industry, the industry itself needs to be analyzed before building a model.

There are certain characteristics of the construction industry that differ from other manufacturing and service industries. These industry-specific characteristics affect the structure of organizations as well as the generic strategic competition between organizations. In this chapter, construction organizations are discussed in two sections, namely general contractors and specialty contractors. In the construction industry, 70% of the companies are in special trades, whereas only 30% function as general contractors. On the other hand, although the majority of organizations are functioning as specialty contractors, structurally they have the same functioning units as general contractors. The difference lays in the strategic composition of the industry.

4.2 Structure of the Construction Industry

The United States Census Bureau defines the construction sector as the establishments primarily engaged in the construction of buildings and other structures,

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heavy construction (except buildings), additions, alterations, reconstruction, installation, and maintenance and repairs. According to the 1997 US Census, the dollar value of construction business done including building, heavy and special trades was $858,581,056,000, which accounts for almost 8% of the GDP. According to the same data, the number of establishments had reached 656,448 and the total number of employees was 5,664,853. In general it can be said that the construction industry is a major industry that significantly contributes to the nation's economy and that creates great employment opportunities.

"Construction industry" and "construction market" are the terms often used to describe the nature of the construction environment. The *construction industry* is an environment where different market segments such as building construction, civil works or industrial facilities interact with each other (Figure 4.1). While in some instances, those market segments make use of the same pool of resources and regulations, in some other instances they are forced to use specialized resources and special regulations. The *construction industry*, also defines the environment where producers (contractors), consumers (construction owners), suppliers (material and equipment manufacturers), designers, subcontractors (special trades), and governmental agencies (laws and regulations) interact with each other to undertake specific projects (Figure 4.2).

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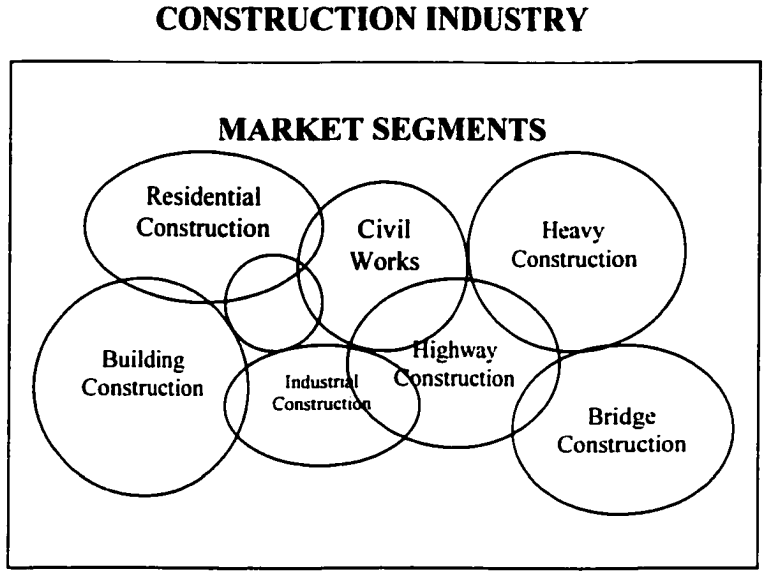

Figure 4.1 Construction Industry – Market Relationship

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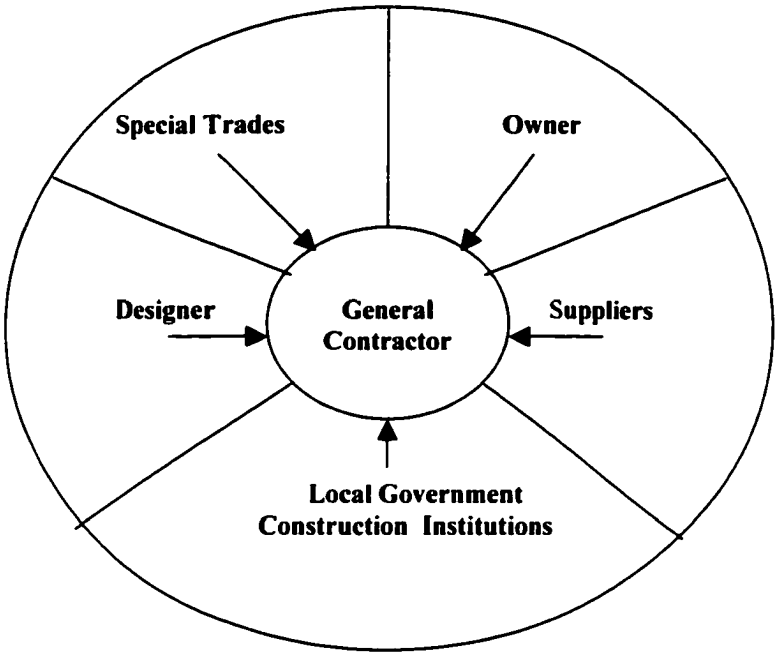

Figure 4.2 The Construction Industry

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There are several characteristics that distinguish the construction industry from other industries. These are the physical nature of the product, the structure of the industry, and the determinants of demand and price determination.

The physical nature of the construction product is usually large, heavy, fixed in a location and expensive. The output is a unique and custom-built in a specific geographical environment, whereas in manufacturing industries the end product is produced in large amounts and can be transported to different locations.

The structure of the construction industry is fragmented. A fragmented industry can be described as an industry where no firm or small group of firms has a significant market share that can strongly influence the industry outcome (Porter, 1980). Fragmented industries are populated by a large number of small and medium size companies most of which are privately held. In the construction industry there is evidence of a large number of smaller companies where size is measured in terms of number of employees. Indeed, 77% of the companies in the industry are small to medium size companies (0 to 99 employees per establishment) whereas only 27% constitute large size firms (100 or more employees per establishment) (U.S. Census, 1990-1995) . Figure 4.3 shows the employment size distribution in the construction industry.

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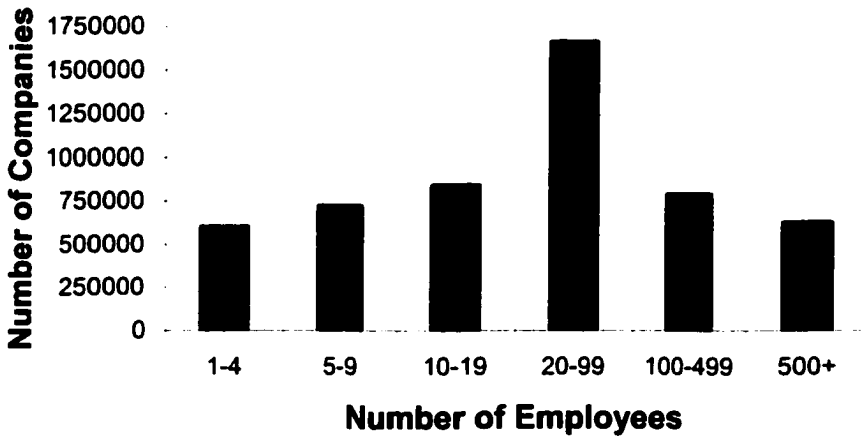

Figure 4.3 The Employment Size Distribution in the Construction Industry

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A high level of specialization is another characteristic of fragmented industries. In the construction industry specialization can be described as a high level of expertise in the production. The large number of small and specialized trade firms in existence in the construction industry can be explained by the need for this type of expert knowledge (e.g., electrical, mechanical, etc.) throughout the production. Figure 4.4 shows the distribution of establishment types based on the Standard Industry Classification (SIC) in the construction industry (U.S. Census, 1990-1995). According to SIC, format 1500 covers general building contractors that are residential, operative and nonresidential building construction; format 1600 covers heavy construction contractors except building, which includes heavy construction and highway and street construction contractors; and format 1700 covers special trade contractors such as plumbing, heating, air conditioning, electrical work, masonry, concrete, roofing, etc.

According to Porter (1980), industries become fragmented because of low entry barriers, the absence of economies of scale or experience curves, erratic sales fluctuations, no advantage of size in dealing with buyers or suppliers, diverse market needs, high product differentiation and finally the nature of exit barriers.

Entry Barriers: Low capital investment relative to manufacturing industry enables construction companies to enter the market easily. Licensing provides a minor hurdle as well as insurance and bonding to guarantee financial responsibilities. Still the apprenticeship nature of construction is another reason for low entry barriers.

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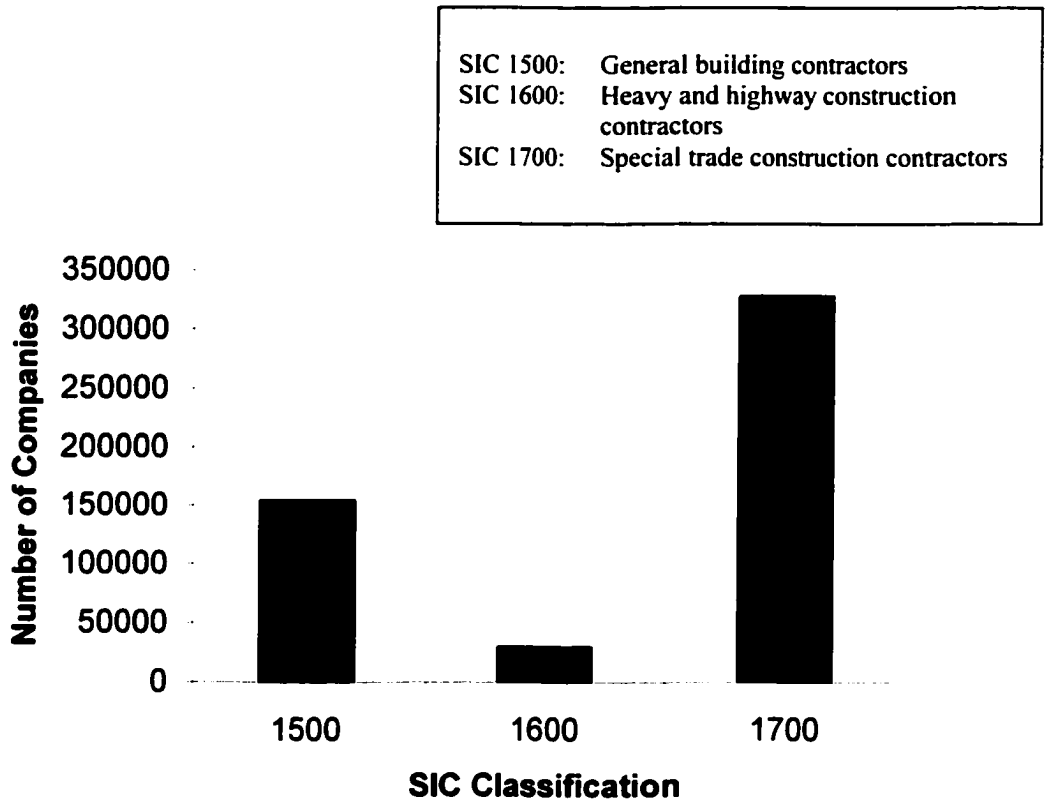

Figure 4.4 The Distribution of Establishment Types Based on Standard Industry Classification (SIC)

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Economies of scale and learning curves: The physical nature of the construction product eliminates economies of scale. Furthermore, each product has its unique specifications, which eliminates the opportunity to repeat it. Since repetitive production is minimal in the construction industry it can be argued that there is a lack of experience curve in developing the product.

Sales fluctuations: The construction industry is subject to sharp fluctuations for a variety of reasons. First of all demand in the construction industry follows a cyclic character. Residential construction is a good example in that certain geographical areas may reach a point where there won't be any demand for housing until the demographics of that area change. Secondly, the general state of the economy also creates fluctuations in the construction industry. Change in interest rates, shocks to the economy, surplus on manufacturing capacity, government policies on fiscal matters are the reasons that affect the supply and demand interaction. The changes in the general state of the economy do not only affect the demand side of the construction industry, but they also affect the supply side (i.e., the contractors) because construction companies are very dependent on credit from banks.

- The nature of the construction process is such that company size does not offer any advantage dealing with buyers. Since the product itself is geographically dispersed and unique, buyers and sellers cannot create significant power over each other.
- Porter (1980) defines the diverse market needs as the buyers' fragmented tastes. Buyers' tastes can differ by the variety of product or by the value of

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product. In the construction industry, diverse market needs range from new construction to renovation works, residential to non-residential building production, building to heavy construction.

- High product differentiation is also related to diverse market needs. Porter's (1980) definition for product differentiation is the firm's creating something that is accepted industry-wide as being unique. Approaches to differentiation can be based on design or brand image, which moves the company away from its low-cost position. It is hard to talk about brand image in the construction industry, but the products that reflect the image of their owner such as office buildings, entertainment buildings and high-end housing are examples that characterize product differentiation in the industry.
- Companies stay in the industry as a business even though their earnings may be low or even negative because of economic, strategic and emotional reasons. These conditions define the level of exit barriers in an industry. Economic reasons can be listed as low liquidation values or high costs of transfer or conversion of companies because of high specialization on the particular business or location. Economic reasons also include labor agreements and resettlement costs. Strategic barriers include the interrelationship between the business units and other companies in terms of image, marketing ability, access to financial markets, and shared facilities. Emotional barriers are the management's unwillingness to make an economically justified exit decision because of loyalty to employees, and fear for one's own career and pride. Low investment and fixed capital (through

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subcontracting and just in-time production) lower down the exit barriers in the construction industry. The low level of exit barriers in the construction industry can be explained by the type of ownership of construction companies. Publicly held companies usually have trouble with changes in their major product line because of their responsibilities to their shareholders; there is always the threat of a drop in their stock values if they change their strategy drastically. These conditions usually increase the exit barriers even if the company has low profit margins. However, the majority of the firms in the construction industry are medium and small size firms that are mostly held by private owners. Therefore, strategically speaking, exit barriers in the construction industry are also relatively lower than the exit barriers in the manufacturing industry.

Low entry and exit barriers and high fluctuations in the market increase volatility. The birth and death rates of the construction companies based on the establishment size can be seen in Figure 4.5 (U.S. Census, 1990-1995). The reasons for births and failures and the distribution based on company size are discussed in the following sections. Table 4.1 highlights the characteristics of the construction industry and makes a comparison with an example from the manufacturing industry (The automobile industry is partially global and a maturing industry).

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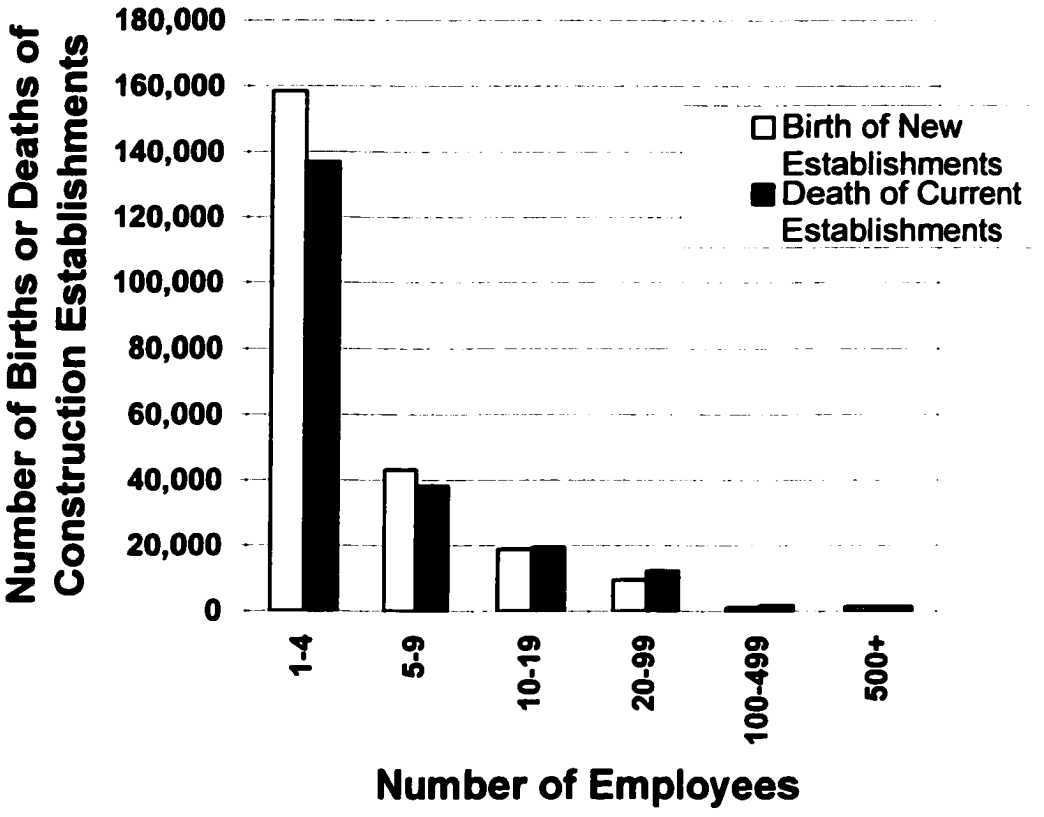

Figure 4.5 Number of Births and Deaths Based on Employment Size in the Construction Industry (US Census Construction Industry Dynamic Data 1990-1995)

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Table 4.1 Reasons that Cause an Industry to be Fragmented: The Construction vs. the Automotive Industry (Page 1 of 2)

Fragmented Industry Characteristics	Construction Industry	Automotive Industry
Low entry barriers	Low because: • Low capital investment • No major problem on licensing • Still carry an apprenticeship nature	High because: • High capital investment • Requirements to meet certain standards, strict government regulations • Highly skilled labor
Economies of scale production	Not existing because: • The end product is unique, heavy, and expensive.	Existing because: • The product lines for each brand are produced in thousands.
Erratic sales fluctuations	Existing because: • High volatility on demand and supply. • General state of the economy affects the overall demand and supply.	Not existing because: • An equilibrium exists on demand and supply. • High interest rate may affect demand rate.
Advantage of size when dealing with buyers or suppliers	Not Existing because: • Since the production is custom made, neither buyer (client) nor supplier (contractor) can create a significant power over each other.	Existing because: • Since the production is repetitive, buyer has a cost advantage in large size amounts. Also large suppliers gain competitive advantage in their industry.

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Table 4.1 (Page 2 of 2)

Fragmented Industry Characteristics	Construction Industry	Automotive Industry
Diverse market needs	Existing because: • New construction to renovation. • Residential to non-residential. • Building to heavy construction are examples of diverse market needs.	Existing because: • Automobile to sport utility trucks. • Vans to busses
Product differentiation	Existing because: • There is a demand for high-end quality production in order to reflect the image of the owner.	Existing because: • Automobile industry products vary based on the users' taste and affordability (e.g., Ford Taurus to BMW)
Exit barriers	Low because: • Private owning provides an advantage to make a decision for exit.	High because: • Most of them are publicly owned. • Initial investment is very large. • The guarantee issue of the product forces the firms to stay in industry.

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4.3 Construction Organizations

Robbins (1983) defines the organization as:

> The planned coordination of the collective activities of two or more people who functioning on a relatively continuous basis and through division of labor and hierarchy of authority, seek to achieve a common goal or set of goals.

Hunt (1972) defines an organization as:

> An identifiable social entity pursuing multiple objectives through the coordinated activities and relations among members and objects. Such a social system is open-ended and dependent on other individuals and sub-systems in the larger entity- society.

The common terms in both definitions are *goals*, *people* to materialize the goals, in some form of *structure* and in a relatively *long period of time*. There are five basic parts that compose the structure of an organization (Mintzberg, 1979). The *strategic apex*, which is the executive management deals with the long-term strategic planning and policy making. The *middle line* is composed of middle managers that provide the integration between operational staff and executive managers. The *operating core* is the technical core of the structure that is responsible for production. The *technostructure* is the people who support middle managers in analyzing, changing and controlling the organization. The *support staff* on the other hand is involved directly in the main operational processes of the company.

Male and Stocks (1991) define a company as a "black-box" that transforms inputs –money, labor, material, and equipment- into outputs that are sold to customers either for

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direct consumption (e.g., a house delivered to a client) or as a product to produce a flow of production (e.g., construction materials delivered to a contractor who is going to use them in building houses). A company is a complex system of decisions, processes, procedures, rules, technologies, and people that are in constant interaction with each other while having feedback form its environment (Male and Stocks, 1991). There are three basic components of organizations that need to be considered while analyzing their structure (Robbins, 1983). The first component is complexity, which covers horizontal differentiation –subdivisions of organizations based on tasks-, vertical differentiation – number of levels in the organizational hierarchy-, and spatial dispersion –separation of power centers-. The second component is formalization, which includes the expressed and impressed norms of organizations. Finally, the third component is centralization, which describes where the power is located in the organization.

The large firm is a phenomenon of the last couple of decades. In the past, the typical firm was small and owner controlled. The owner carried the risk supported by his own wealth and he/she was accountable only to himself/herself. The theory of the firm assumes that the owner, except for the price of the product, makes all decisions. Market forces will price the product where demand meets its supply. The efficiency of the production will determine the rate of return on the investment; the main aim is profit maximization. This approach is the perfect condition in traditional capitalism that encourages the owner to minimize the costs of risk taking while maximizing the efficiency of decision-making (Cannon and Hillebrandt, 1989).

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4.3.1 **Core Companies in Construction: The General Contractor:** As it is mentioned in the previous section, the construction industry is composed of a large number of small family-owned businesses as well as fewer large corporations. Each size carries different characteristics. Large size companies represent only 27% of the companies in the industry but produce the major portion of the output (U.S. Census, 1990-1995). A general contractor can be an independent company that is active only in construction and related areas or it can be a subsidiary of a major corporation that has a wide range of production activities. Medium to large companies are composed of three structural components. These are the technical level, organizational level, and institutional level (Male and Stocks, 1989) (Fig 4.6). The *institutional level* represents the executive management team of a company. They are responsible for making strategic decisions under uncertainty. The time span in which they function is long term. Purchasing, estimating, scheduling, and contracting are the *organizational level* departments of a construction company. They are mostly concerned with the coordination aspects of a company. Their decision-making time horizon is both short and long term. They provide data to the institutional level to help their decision-making process and their production activities. The *technical level* consists of the construction sites where the output takes place. They are characterized as the task-oriented centers of the company. Their decision-making time span is limited by the duration of each project.

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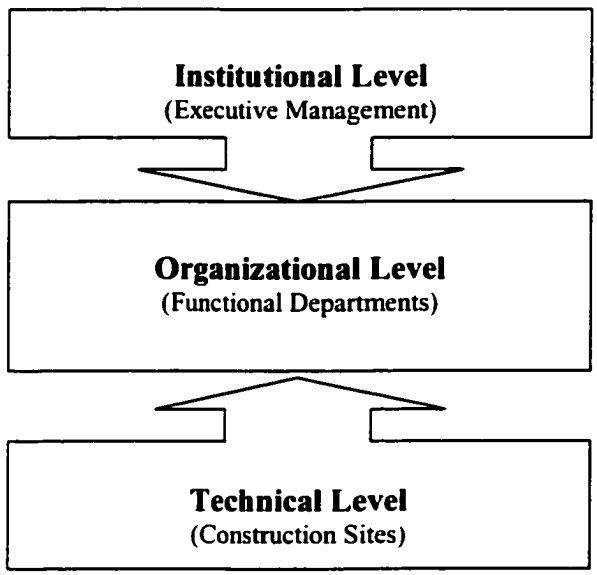

Figure 4.6 The Structure of a Medium to Large Size Construction Company

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The difference between the small and medium-to-large size company in the construction industry can be explained by their relative objectives. Large size companies' -especially the subsidiaries of a large corporation- main objective is profit maximization and usually quality comes next. However, small size companies aim for an acceptable rate of return and a comfortable work environment (Hillebrandt and Cannon, 1990). The difference of objectives creates different structure and strategy development. The following aspects of a construction company define the differences of each type.

Growth: Short-term finance is provided by cash flow, which is generated by several projects that the firm undertakes and from financial institutions. On the other hand long-term financing is usually generated by investments other than the contracting business. Small firms usually have continuous problems with raising enough capital to invest in the long run. Raising capital can also open the door to diluting the ownership of the company, which owners usually try to avoid in order to protect their power base in the company. Therefore, the growth prospect is expected to be slower for small size construction companies.

Structure: Simple structure is common in small businesses because of direct supervision over projects, low level of formalization and organizational complexity. In a simple structure, authority is usually centralized on one person where the structure tends to be highly organic. However, the matrix structure, which is common in large businesses has a high level of formalization. Vertical and horizontal communication is

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complex. The organizational structure is integrated with its functional units and production centers (project sites) vertically and horizontally.

Diversification Strategy: Diversification is the process by which firms extend their business operations outside the ones in which they are currently engaged (Hillebrandt and Cannon, 1990). Diversification can be in the same industry that the company functions or can be in a totally different industry. Inside the industry, diversification can occur in the input to the firm's main production (e.g., materials used in the production – backward integration) or it can be the extension to of a new product line within the industry (e.g., a construction company's output can be partially in general building construction as well as in highway construction- forward integration). Raising enough capital is one of the requirements for a successful diversification strategy, which is a constant problem for small size company's.

Centralization: This is generally the distribution of decision in a construction company. Centralization decreases when the company expands and grows. On the other hand, the construction process is geographically dispersed and therefore decentralization seems inevitable.

Innovation: In the construction industry, innovation takes place on the organizational level rather than the production level as in manufacturing and other service industries. Lansley's (1994) research in the construction industry shows that new

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approaches in the deliberation of the product, non-traditional contracting methods, and new forms of financing are the areas where innovation mostly takes place.

Contracting: Simple economic propositions do not apply in the construction industry. First of all, the price is set before the product itself. Second, risk and uncertainty are extremely high in the demand of workload projection and of costs (Flanagan and Norman, 1989). And finally, starting from the bidding process to contract negotiations, the general contractor tries to define its liability under extreme uncertainty. Flanagan and Norman's (1989) research also shows that in eight out of eleven contractual agreements the contractor carries the major risk of the project. It is a common fact that not only negotiating but also contracting needs special professional skills. Since complex contractual agreements such as design-build, guaranteed maximum price, and construction management need a more structured organization where the necessary input can be provided by the coordination of divisions that are focused on certain elements of production (e.g., estimating, scheduling, contracting departments), small size companies try to avoid those kinds of contractual arrangements in order to decrease their risk.

Formalization: It is generally explained as the written and unwritten norms and regulations used in a company. Generally large companies, which employ many workers, are more specific on regulations such as employment policies, perks, job descriptions, and documentation norms.

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Management Team: Small size firms, especially family companies are controlled by a large number of family members where top management may loose the opportunity of having good managers because of the unforeseeable prospects of promotion. In contrast, in larger companies, promotion is based on the merits of performance, management skills and the level of professionalism in the job, which gives an opportunity for everyone to become a decision-maker for the company. Not only the promotion aspects but also the composition of the top management team is different for each size company. The small company top management team usually comes from the same background and culture. However, large companies' boards are composed of executives who have a wide range of experience either inside or outside the industry and have different management styles, which enriches the quality of the organization (Daily, 1995).

Organizational Communication: The more the structure and functional divisions are complex the more the organizational communication lines become formal. Also, the bigger the organization becomes, the more the bureaucracy, which is established in a more formal manner. Nevertheless, regardless of the size of the organization, the construction industry has a more informal nature compared to other service industries. The aspects of a construction company are described based on company size in Table 4.2.

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Table 4.2 The Characteristics of a Construction Company

Aspects of Construction Company	The Presence of Aspects According To Size of Construction Company	
	Small Size Construction Company	Medium-to-Large Size Construction Company
Company goal	Mainly quality oriented	Mainly profit oriented
Growth	Slower	Faster
Structure	Simple structure allows flexibility and supervision.	Functional and matrix structures are the common types.
Diversification strategy	Financially unable to generate such strategy.	Companies diversify in order to reduce the risk factor and/or to generate continuous cash flow.
Centralization	Highly centralized	Decentralization is inevitable in order to operate in different geographical locations.
Innovation	They are less open to innovation.	They are open to innovations on the organizational and procurement methods. Technical innovations are rather observed in heavy construction.
Contracting	Traditional methods such as cost plus fee or lump sum.	Traditional and non-traditional methods such as design-build, GMP.
Formalization	Highly informal on written policies and norms.	Highly formal on policies, norms, and regulations.
Management team	Usually family members of the same background.	Professionals of different backgrounds and experience.
Organizational communication	Informal	Formal

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4.3.2 **Periphery Companies in Construction: Specialty Contractors:**

Organizational science theory describes the periphery firms as those that provide core firms a pool of specialized skills and expertise that may be uneconomical for core organizations to develop on their own because of the uneven demand for a product or unique know-how design requirements that would be costly for in-house production (Uzzi, 1997).

Demand in the construction industry develops because of changes in people's needs. Fluctuation in demand forces construction companies to be more flexible in their organization. Bresnen and Fowler's (1994) research describes the flexible organization with three components: the core, the periphery and the external workforce. The peripheral and external workforce consists of part-timers, home workers, temps, self-employed workers, and subcontractors. Other than changing the type of demand, it is a common fact that any simple project consists of hundreds of different types of work items let alone a complex, high-end, multimillion dollar project. Specialization is unavoidable in the construction industry. According to the U.S. Census Construction Industry Dynamic Data, 70% of the companies in the construction industry in the 1990-1995 period consisted of specialty contractors active in special trades such as plumbing, heating, air conditioning, electrical work, finishing, etc., while only 30% consist of general contractors including building contractors (residential and non-residential) and heavy contractors (heavy, highway and street construction).

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In the construction industry, the need for subcontracting can be justified by the following conditions (Hillebrandt and Cannon, 1990):

- The construction of projects takes a finite period of time.
- Especially the large construction company desires to be able to handle big projects in geographically different locations other than its head office.
- Several different skills are required in order to complete a project.
- One contractor cannot supply the diversity of skills.
- The demand for any particular type of work fluctuates over time.

A general contractor's decision for subcontracting can be done in two ways: labor only subcontracting and supply and fix subcontracting (Figure 4.7).

Labor only subcontracting is an arrangement where the general contractor gets into a contractual agreement with an individual or a group of people to provide manpower for a project (Hillebrandt and Cannon, 1990). The contractual agreement is drawn for the maximum duration of the particular project. In labor only subcontracting, the general contractor provides the material and the necessary equipment while the labor only subcontractor brings hand tools only. The members in the self-employed labor force increased by the mid 60's when the unions lost their power and employers kept wages at the margin rather than average. Self employed laborers can create continuous income by working in different projects at a higher wage rate. Starting from the 70's, the skill shortage in the construction industry and the fragmented product mix encouraged the

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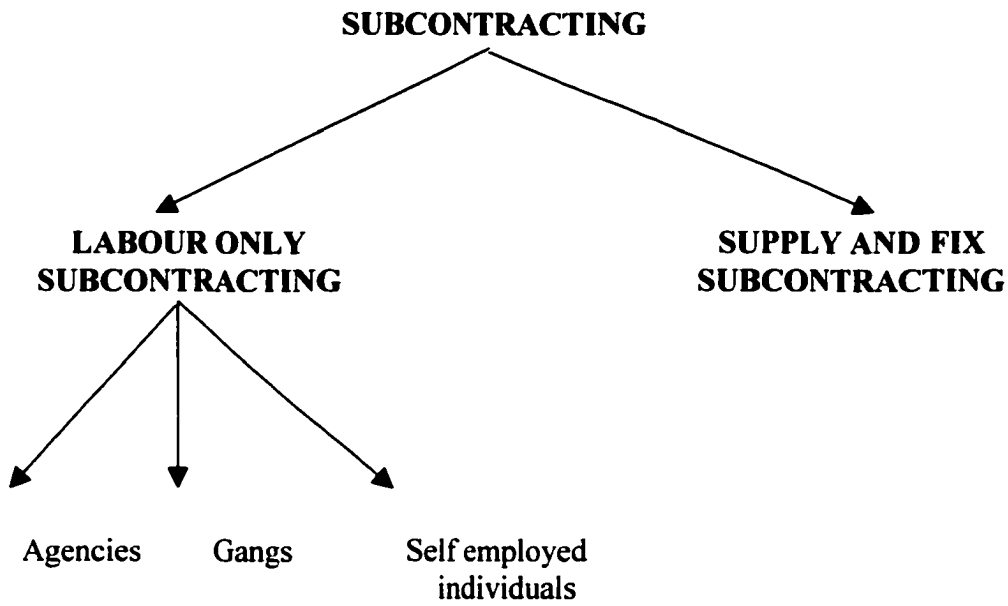

Figure 4.7 Types of Subcontracting

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growth of self-employment (Winch, 1998). There are some advantages of labor only subcontracting in the construction industry:

- The productivity of labor only subcontracting seems to be higher than for full-time labor. The labor only subcontractor is normally paid by lump sum for the work that is defined in the project. This condition provides workers with an incentive to finish the work faster in order to move to other jobs (Winch, 1998).
- The labor only subcontractor's direct cost to the construction company may seem to be higher on a hourly rate, but the total of the amount that is paid to full-time workers (hourly rate, bonuses, benefits, insurance) is usually higher. However, the management costs for supervision can be higher in some cases (Hillebrandt and Cannon, 1990).
- The construction company has to pay full time wages to their employees even when there is no project at the time as well as for bad weather days where construction has to be stopped.
- Labor only contracting provides some tax benefits to the employees on certain expenses such as cars, telephone, etc.

One of the main disadvantages of labor only subcontracting is the quality of production (Bresnen and Fowler, 1994). Lump sum pay per work encourages the worker to finish the job before it is supposed to, which may negatively affect the quality of production. Therefore, quality control management is a major problem in labor only subcontracting.

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The other category in the subcontracting phenomenon is supply and fix subcontracting, in today's terms "special trades" subcontracting. A supply and fix subcontractor provides the material, labor, and necessary equipment for the job. It may however, hire labor only subcontractors to provide its manpower. There are several advantages of using specialty contractors.

- Specialty contractors have more skills and know-how than the general contractor can provide in the production process.
- General contractors can obtain the services of specialty contractors by letting them compete through a bidding system.
- Special trade contractors allow general contractors to keep their working capital low.
- The "pay-when-paid" tradition transfers the risk from the general contractor to the special trade contractor.
- Special trade contractors have the freedom of choosing the jobs that they want to be involved in.

Supply and fix subcontracting also has disadvantages. The quality of production is again an issue that has to be addressed by the general contractor. The hierarchal structure can create authority conflicts in the management of the construction site. The safety of an operation and liabilities on safety issues are potential problem areas. The contractual agreements between special trade contractors and the general contractor are complex in that the interpretation of the scope of the job, the start and completion dates, payment conditions, insurance conditions, bonds, penalties, and manpower (union or non-

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union) may end up in disagreements. General contractors usually retain a certain amount of the value of the work, which decreases the risk of the general contractor but adds to the financial burden of the specialty contractors. A big project usually contains 50% of the value or more in special trades that creates a sensitive coordination in order to keep the production flow.

Today special trades in the construction industry are becoming more structured (through associations) and regulated (by federal and government acts) as well as powered (70 percent of companies in the construction industry are active in special trades). For example, most government projects have requirements for a certain percentage of work that must be carried out by minorities (MBA, WMBA, etc). It is also important to emphasize that special trade contractors and general contractors are construction companies that share the same organizational structure.

4.3.3 **Strategic Management and Competitive Advantage in the Construction Industry:** Strategy is a plan of action, which covers the mission, values, and policies of an organization and will position the business to maximize its capabilities compared to its competitors (Aldrich and Fiol, 1994; Seth and Thomas, 1994; Henderson, 1991). Companies define their strategies in three stages. First of all, they have to state their *mission*, which describes the company's long-term ambition. Mission is usually expressed in qualitative terms. The company theoretically will never reach this ultimate end (Ramsay, 1990). In the second stage, the company's *objective* needs to be defined. Objectives are end-oriented and they will be shaped by the executive power of the

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company in the direction of the mission set in the first stage (Male, 1991). Objectives are explicit statements, which facilitate comparison of actual versus projected performance through quantifiable values. They define the relationship between the business and its environment and have a time horizon, which is usually limited to five years. According to Ramsay (1990), strategic management continues with analyzing strengths, weaknesses, opportunities and threats (SWOT). Identifying the strategic options, deciding on the plan, implementing the plan and finally evaluating the progress are the final stages of strategic management. Deciding on the plan and implementing it is firm specific, but SWOT analysis is quite generic and is explored further.

Strategy has four distinct components. The first component is the scope that defines the business in terms of its customers, the customers' needs, and the way to satisfy these needs. The second component is resource utilization i.e., the allocation of funds, fixed assets, and human resources properly. The third component is competitive advantage to identify where the business is superior compared to other businesses in the industry. And finally the fourth component is synergy that allows the various parts of the organization create something that is greater than their total sum.

Porter (1980) describes industry competition by five major forces (Figure 4.8). These are the threat of new entrants, the bargaining power of buyers, the threat of substitute products or services, the bargaining power of suppliers, and the rivalry among existing firms. Although Porter's approach is well accepted in the management science literature, its applicability to the construction industry needs some adjustments. First of

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all some of the driving forces are not applicable to the construction industry and some of the driving forces are different than those in the manufacturing industries. The construction industry, by its very nature, has low entry barriers. This issue was discussed in detail in Section 4.2 that analyzed the structure of the construction industry.

The bargaining power of buyers: According to Porter (1980), the bargaining power of buyers has an important impact in competition if:

- The volume of sale is large.
- The cost of the product purchased constitutes a large portion of the buyer's purchases.
- The products are standard or undifferentiated.
- The buyer's switching costs (from one seller to another) are low.
- The profit margins are low.

The buyer in Porter's (1980) approach can be interpreted to mean the owner in the construction industry. Simple economic propositions on price determination do not apply in the construction industry. Perfect market conditions are absent. Risk and uncertainty are endemic both in the projection of workload (demand) and of costs (supply) (Flanagan and Norman, 1989). Although the projects in the construction industry are price guided, pricing the project is not usually as simple as in manufacturing

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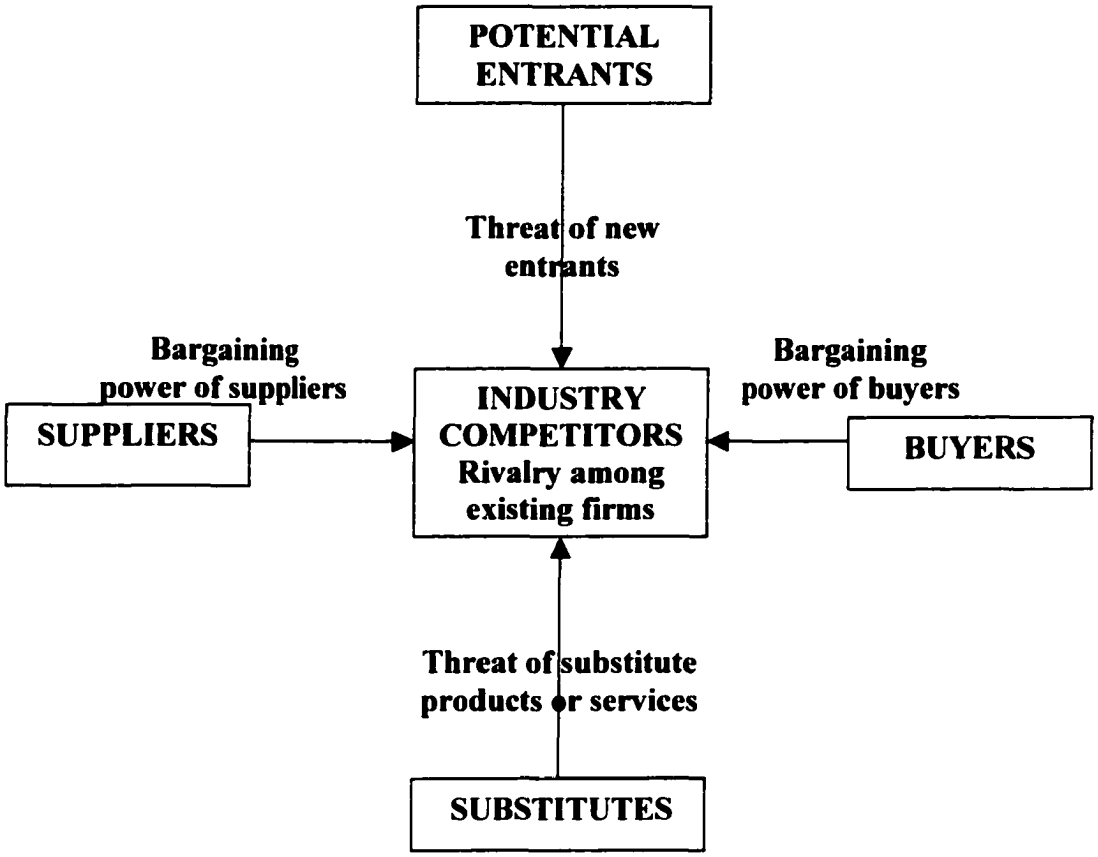

Figure 4.8 Forces Driving Industry Competition (Source: Porter 1980)

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industries. Competitive and negotiated procurement systems are the tools to price and award the projects in the construction industry. The type of procurement system also draws the framework of main contractual agreement between the client (buyer) and the contractor (seller). In general the objective of bidding in the construction business is to select from a group of bidders the one who can carry out the work for the least cost. There are also several other types of contractual arrangements in the construction industry such as design/build, lump sum on a fixed or fluctuating price, guaranteed maximum price with a fixed management fee, cost reimbursement, and construction management. Based on the type of the contractual arrangement, the owner can decide the type of pricing delivery as a closed bid or negotiated bid. Closed bids are usually open to all the contractors including the ones that are invited by the owner. The general trend is that the project is awarded to the lowest bidder given that the contractor qualifies the requirements of the contract. On the other hand in a negotiated bid, the client (buyer) starts negotiating with the contractor (seller) being chosen on a competitive bidding (Flanagan and Norman, 1989). In this type of bidding the client starts his/her negotiation with the information of the minimum and the maximum limits of the project. The contractor, on the other hand tries to negotiate in the limits of his/her acceptable risk. If the client's upper limit is not satisfied, the client may enter into a negotiation with another contractor. It is obvious that in both the closed and open bid conditions, the client (buyer) has extensive bargaining power over the contractor (seller). Today the procurement systems in the construction industry are becoming more complex. Architects, project consultants and construction managers advise clients (buyer) in

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technical and procedural methods, which causes the clients to become more powerful than before in the construction business.

Substitute products or services: Porter (1980) defines the substitute products as the industry's overall elasticity of demand. Substitutes limit the potential returns of an industry by placing a limit on the prices of products. The buyer's intent in identifying substitute products is to replace the product with another that can serve the same function. The reason for the tendency to seek substitute products may involve price concerns or expectancy of higher profits. In the construction industry, to identify a substitute product is rather difficult. The difficulty starts with the product itself because the "product" in construction is defined by the client and as such, cannot be substituted by another product. On the other hand, if the type of construction service is considered, the threat of substitution can be governed by the preference of the delivery system such as design/build, construction management, management contracting, and traditional contracting. Although it is rather difficult to define a substitute product in construction, as explained above, it is not impossible to view renovation work as a substitute product for new building.

Bargaining power of suppliers: Porter (1980) suggests that the bargaining power of suppliers is enhanced under certain conditions:

- Few supplying companies exist in the industry.
- Other products cannot substitute a supplier's product.
- The industry is not an important customer of the supplier group.

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- The supplier's product is an important input to the buyer's business.
- The supplier's product is differentiated.
- A forward integration threat exists towards the buyer.

In the construction industry, it is quite difficult to determine the power of suppliers. There are many firms that supply construction services, the substitution option is mostly available, the industry is certainly important for the suppliers, and in most cases the products are not differentiated. The cost trends in construction are usually impacted by the cost trends in major supply items such as steel, wood, cement, drywall, labor, etc. It can be argued that the bargaining power of suppliers is not as pronounced as in other industries such as electronics.

Rivalry among existing firms: Porter (1980) explains the intense rivalry among competitors by means of the following conditions that exist in the industry:

- Existence of numerous or similar size competitors
- Slow industry growth rate
- High fixed or storage costs
- Lack of differentiation
- Diverse competitors
- High strategic stakes
- High exit barriers

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Most of the characteristics of high rivalry among competitors are discussed in Sections 4.3.1 and 4.3.2. Based on these discussions, it can be argued that intense rivalry exists among similar size companies in the construction industry.

The forces that drive the competition in the construction industry are explained above. In order to identify the strategic options of a construction company, the strategy developers must analyze the company's strengths, weaknesses, threats, and opportunities (SWOT). A company's strengths and weaknesses constitute its profile that is internal to the company (Porter, 1980; Ramsey, 1990). Strengths and weaknesses include the structure, human resources, operating policies, marketing attributes, production lines, level of know-how and the state of the company's financial portfolio. On the other hand, opportunities and threats define the competitive environment, which are external to the company. Opportunities and threats cover the size of the market, growth opportunities, profitability, entry and exit barriers, general economic trends such as inflation and recession, government support, technological complexity, and social aspects such as demographic changes and unionization.

4.4 Summary

The construction industry has the characteristics of a fragmented industry. The fragmentation of the construction industry is related to the following issues. The majority of the companies in the industry are small and medium size companies while the relatively few large size contractors produce most of the output. Low capital investment needs and minor licensing requirements lower the entry barriers into the construction

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industry. The physical constraints and the uniqueness of the constructed facility eliminate economies of scale. Fluctuations in demand are substantial when especially special geographic areas are concerned. The bargaining power of owners is quite considerable in the construction industry. The projects are usually awarded to the lowest possible bidder. Project consultants and construction managers support owners in making the best decisions for their project. The threat of substitute products occurs mostly in the delivery systems rather than the physical product. Differentiation in the construction industry can be achieved on the quality of the product (e.g., using high end quality materials) or on the market in which the contractor is involved (e.g., building construction, heavy construction, highway construction). Exit barriers on the other hand are relatively low compared to manufacturing or service industries.

The structure of a construction company is composed of three levels. The institutional level that represents the executive management of the company, the organizational level that provides support to the institutional and technical levels, and finally the technical level that represents the production centers of construction companies. Company goals, growth prospects, organizational structure, diversification strategy, level of centralization of decision making, level of innovation, type of contracting, level of formalization, and level of communication are aspects that differentiate small to medium size companies from large size companies.

Periphery firms provide core firms with a pool of specialized skills and expertise that may be uneconomical for core organizations to develop on their own. Specialization

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is unavoidable in the construction industry. The need for special trade contractors comes from the project's finite period of time, the general contractor's desire to be active in geographically diverse locations, the requirement for diverse skills, and a protection of the general contractor against demand fluctuations over time. The different types of subcontracting are also discussed.

This chapter also discusses strategic management and competitive advantage in the construction industry. Porter's (1980) driving forces are analyzed in the context of competition in the construction industry. These are the threat of new entrants, the bargaining power of buyers, the threat of substitute products, the bargaining power of suppliers, and the rivalry among existing firms. It is also argued that a powerful strategic plan needs conducting a thorough industry analysis and a company specific analysis of strengths, weaknesses, threats, and opportunities (SWOT), identifying strategic options, deciding on the plan, implementing the plan and evaluating progress and control of the strategic plan.

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CHAPTER V

CONSTRUCTION COMPANY DECLINE MODEL

5.1 Introduction

So far in this research, business decline/failure is discussed in the context of organizational science theory. The decline phenomenon is explored form different perspectives. This is followed by an industry-specific analysis. It is argued that a model for business failures in the construction industry cannot be generated without a thorough industry analysis. This chapter is a synthesis of the four perspectives of decline (systems theory, population ecology, lifecycle, and organizational behavior) in the context of the construction industry and proposes a model that can explain construction company decline patterns.

The model builds its theory on non-financial aspects of decline. It is argued that financial crisis occurs at the decline recognition stage, which may also be described as the wake up call for top management. The proposed model covers environmental, strategic, organizational and human capital aspects of companies and argues that these aspects have joint impact on decline patterns.

This chapter will begin by an explanation of the three major factors that are the early causes of decline. This will be followed by a description of the four phases of decline, namely, decline development, decline recognition, decline response, and the outcome.

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5.2 Causes of Decline

5.2.1 **Environmental Factors:** Under what environmental conditions would organizations perform better? Some argue that dynamic environments will cause failure because of unavailable data and lack of permanent relationships (Fredrickson and Mitchell, 1984; Fredrickson, 1984; Fredricson and Iaquinto, 1989, Priem et al., 1995). Organizations prefer to act rationally and dislike uncertainty because uncertainty threatens rationality. Contrary arguments are made by other researchers; decision makers operating in dynamic environments will accelerate their cognitive processing by using more information, consider more alternatives, and seek a greater amount of advice that will lead the firm to a better performance (Eisenhardt, 1989; Miller and Friesen, 1983). Although one could argue that the causes of a company's downfall are not always foreseeable, the chief executive officer and the other decision-makers of a company should understand and develop contingency plans to compensate for the volatility of a company's environment, whether or not it is actually on the horizon. The external forces that affect a company's performance can be summarized as, the cyclic nature of business, including general industry conditions, innovations in project delivery systems, technological changes, shifting consumer preferences, and a declining market for products or suppliers; economics, including labor problems, natural disasters, and scarcity of strategic resources; and politics, including regulatory issues and other legislation relating to business in general or that is industry specific.

As it is explained in the fourth chapter, the construction industry is influenced by general macroeconomic trends. The construction industry is an important part of the

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national economy because it provides predominantly investment goods, it is large and it is composed of a large number of participants including contractors, owners, consultants, suppliers, etc. No construction company has significant market share and therefore no company can have a dominant influence on the market. On the other hand, while the large majority of construction companies are small and medium size companies, the major portion of the work is done by large companies.

The construction industry is a volatile industry that is characterized by market ups and downs. Construction investments follow a cyclic pattern that is heavily influenced by business conditions, interest rates and growth prospects. Platt and Platt (1994) suggest that the cyclic nature of the economy may provoke business failures. In times of recession, construction demand goes down and fuels fierce competition among contractors; this situation forces contractors to submit unrealistically low bids or to bid projects beyond their specialty or competence, which in turn causes many of them to go out of business.

It is therefore hypothesized that:

$H_{5.2.1}$ Environmental changes affect construction company decline.

$H_{5.2.1.1}$ Economic recession causes construction companies to decline

$H_{5.2.1.2}$ High interest rates cause construction companies to decline.

$H_{5.2.1.3}$ Poor industry growth prospects cause construction companies to decline.

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$H_{5.2.1.4}$ Decrease in construction demand causes construction companies to decline.

$H_{5.2.1.5}$ Supply shortages cause construction companies to decline.

$H_{5.2.1.6}$ Complex project delivery systems cause construction companies to decline.

$H_{5.2.1.7}$ Labor problems cause construction companies to decline.

$H_{5.2.1.8}$ Inability to adapt to technological changes causes construction companies to decline.

$H_{5.2.1.9}$ Natural disasters cause construction companies to decline.

$H_{5.2.1.10}$ Changes in regulations and new legislation cause construction companies to decline.

5.2.2 **Operational Factors:** Operational factors include organizational structure and human capital issues. Different organizations may display distinct patterns of human architecture yet at the same time share a number of characteristics. All organizations have goals, boundaries, levels of authority, communication systems, coordinating mechanisms, and distinctive procedures. A structure is more than boxes and lines arranged hierarchically on official organization chart. It is an outline of the desired pattern of activities, expectations, and exchanges among executives, managers, employees, and customers or clients. The shape of the formal structure very definitely enhances or constrains what an organization is able to accomplish (Bolman and Deal, 1991). Structure can also play an important role in an organization's performance. Non-

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routine tasks can be accomplished better with a decentralized structure whereas more routine tasks are done better with a more centralized structure (Leavitt, 1978).

Organizational structure defines the hierarchical authority in an organization. The hierarchical authority can be viewed at three levels, technical, managerial and institutional. The technical system is the part of an organization that directly processes the "materials" used by the organization. Construction sites constitute the technical level of construction companies where the outcome (constructed facility) takes place. The resources used by the technical system to do the organization's basic work are allocated by a broader organizational apparatus, the managerial level. While each depends on the other, the managerial level has a superior position to the technical level. Purchasing, estimating, scheduling, contracting and all other administrative departments compose the managerial level of construction companies. The institutional level on the other hand, articulates the relationship of the whole organization with the broader society. The institutional level represents the executive management team including the board of directors. The organizational structure of a construction company can be defined by the interaction of these three levels. Horizontal communication defines the information lines within the levels (e.g., estimating and purchasing at the managerial level, chief executive manager and vice presidents at the institutional level, etc.). On the other hand, vertical communication defines the information lines between levels (e.g., scheduling department and construction sites, vice presidents and project managers, etc.). The quality and the level of communication describe the level of formalization in an organization.

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The culture of an organization comprises the established way of thinking and doing things in the institution and includes the organization's rules, policies, and procedures. Culture includes not only the value system but also the traditions and assumptions, and the nature of the language used to communicate (Jacques and Clement, 1997). It is clear that culture has psychological as well as sociological effects on organizations. However, in this research this topic will be limited with an organization's reactions towards adversity. According to Staw et al. (1981), there are three characteristics of an organizational crisis. First, there is a major threat to system survival; second, there is little time to react; and third, the threat is unanticipated. Under adversity, an organization's information processes and control systems are affected. Theory suggests that organizations under crisis restrict the information processes by narrowing the field of attention, by simplifying the information codes, or by reducing the number of channels used. The other effect of a crisis occurs in the control systems of organizations where centralization is manifested by contraction in authority, reduction in number of decision participants, and decision-making at higher levels of the organization. Similarly, increased formalization and standardization of procedures can ensure coordination of organizational action when lower-level participants must carry out the decisions of others (Katz and Kahn, 1996). Formalization defines the tasks of the incumbents of different positions in the organization as well as the skills and the knowledge that are required to occupy these positions. It also contains who should report to whom and the level of authority that can be exercised in that position. A company's written procedures such as rules that a company adopts as policy are also covered under this definition. Double roles in the company create conflict between different departments and muddle the lines of

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responsibility and accountability for the reporting of potentially damaging events. These conflicts create monitoring problems as well. Such problems exist in construction projects where performance feedback is often difficult because of time pressures, conflicting interests, and arbitrary and unclear risk distribution in construction contracts.

It is therefore hypothesized that:

$H_{5.2.2.A}$ Organizational structure affects construction company decline.

$H_{5.2.2.1}$ Ineffective vertical communication causes construction companies to decline.

$H_{5.2.2.2}$ Ineffective horizontal communication causes construction companies to decline.

$H_{5.2.2.3}$ Decentralization causes construction companies to decline.

$H_{5.2.2.4}$ Formalization protects construction companies from decline.

$H_{5.2.2.5}$ Specialization protects construction companies from decline.

$H_{5.2.2.6}$ Standardization protects construction companies from decline.

$H_{5.2.2.7}$ High level of dependence on third parties causes construction companies to decline.

$H_{5.2.2.8}$ Advanced managerial practices protect construction companies from decline.

$H_{5.2.2.9}$ Advanced construction technologies protect construction companies from decline.

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The organizational structure develops in response to an organization's tasks and environment. Human resources constitute an additional dimension in this equation. Although attempts have been made to industrialize the construction process, the production of many engineering structures and in particular buildings is still essentially craft-based, small batch, out-of-doors processes which compared to most manufacturing processes, involve relatively little repetition, routine or mechanization from one product to the next. In this sense, the construction industry is essentially a human one, and the process of managing construction is highly vulnerable to the unpredictability of peoples' idiosyncrasies (Loosemore, 2000).

The human capital of organizations is defined by the general background of the management team such as members' education and years of work experience (Bruderl et al., 1992), their business knowledge (Bruderl et al., 1992; Keasey and Watson, 1987), their managerial experience (Keasey and Watson, 1987), their cognitive style (Neumann and Neumann, 1994), and the composition of the board members (Argenti, 1976; Daily, 1995; Keasey and Watson, 1987). The human capital of organizations can be explained by referring to *learning* theories. Cohen (1996) explains that organizational learning shapes organizational structure by acquiring information about the state of the world and by improving what the organization can do. In theory, psychologists are more focused on the individuals' learning whereas organizational theorists are rather focused on the organizational structure and context. In this respect, the environmental ecology and organizational adaptation paradigms have driven different perspectives. In the environmental ecology approach, it is suggested that there is a relationship between

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organizational survivability and the age of an individual organization. This relationship is explained by two basic properties of organizational learning (Hannan and Freeman, 1984). The first one is the accumulation of knowledge and skills as the organization ages, and the second one is the increasing reliability and consistency of organizational behavior over time. On the other hand, in the adaptationist approach, organizational learning does not only consist of gaining competence in certain activities, routines, technologies or goals but also involves a process which is characterized by a search for and an exploration of alternative routines, technologies and goals based on the realization that certain competencies can no longer meet the previously set targets (March, 1991).

Business knowledge can be expanded to mean in-depth industry knowledge, market savvy, and certain practical knowledge of how to find and attract clients, suppliers and distributors. Organizational learning allows a construction company to identify the profitable markets, to forge partnering alliances with suppliers and subcontractors, to take advantage of technological innovations, and to establish good relationships with financial institutions, surety companies and potential owners. Particularly smaller start-up construction companies are vulnerable in this respect since the people who start the company may have the technical know-how to complete a construction project but in all likelihood lack the business knowledge to ensure the survival of their company.

Managerial inexperience is described by Argenti (1976) as being caused by one-man rule, non-participating board, unbalanced top-team, lack of management depth, weak finance function, and combined chairman-chief executive. One-man rule is rather valid

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for small firms. In small firms, the chief executive dominates the firm and rather than acting as a leader, allows less discussion and may be quite closed to advice. In small firms, the chief executive may also double as the chief estimator and the project manager; a chief executive who is overly involved in the day-to-day operational activities may fail to formulate mid- and long-term strategies for the future growth of the company. A non-participating board is composed of passive board members and normally fails to direct and guide the firm in its short and long-term policies. Lack of management depth and weak finance functions are also characteristics of non-participating boards. Argenti (1976) observes that the 'unbalanced top team' phenomenon occurs in engineering companies where not only the chief executive is an engineer but so are most of the board members. He considers this situation a handicap in challenging subordinates. The composition of the board and its leadership structure form the two main components of the strategic leadership approach. The composition of the board may affect a director's ability to provide advice and counsel to the chief executive officer and to influence organizational performance (Daily, 1995). The existence of outsider directors on the board may generate a higher degree of objectivity and monitoring of organizational performance. According to Daily's (1995) research, successful reorganizations are characterized by a board which is 65% outsider dominated. The same research shows that failed firms have a majority of inside directors serving on their board.

It is therefore hypothesized that:

$H_{5.2.2.B}$ Human capital affects construction company decline.

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$H_{5.2.2.10}$ Managers' lack of education causes construction companies to decline.

$H_{5.2.2.11}$ Managers' lack of work experience causes construction companies to decline.

$H_{5.2.2.12}$ Managers' lack of business knowledge causes construction companies to decline.

$H_{5.2.2.13}$ Managers' lack of managerial experience causes construction companies to decline.

$H_{5.2.2.14}$ The unbalanced composition (internal vs. external members) of the board causes construction companies to decline.

5.2.3 **Strategic Factors:** Strategy, as described in the pervious section, is a plan of action, which covers the mission, values, and polices of an organization and will position the business to maximize its capabilities from its competitors (Aldrich and Fiol, 1994; Seth and Thomas, 1994; Henderson, 1991). Strategy has four distinct components. The first component is the scope that defines the business in terms of its customers, the customers' needs, and the way to satisfy these needs. The second component is resource utilization, i.e., the allocation of funds, fixed assets, and human resources properly. The third component is competitive advantage to identify where the business is superior compared to other businesses in the industry. And finally, the fourth component is synergy, which allows the various parts of the organization create something that is greater than their total sum. Strategic factors affecting construction company decline can be analyzed at four levels.

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Corporate level strategy deals with issues regarding the domains in which the firm will operate. Corporate level strategy may also involve choosing the industries and markets in which a firm will compete. Industry structure plays an important role at the corporate level strategy. Diversification can be considered to be a method that dilutes potential threats in any particular environment in which a business may be operating. *Business level strategy* generally refers to how a company can compete effectively in a business or industry. Market share and firm size play an important role in finding the right niche in the industry. *Network level strategy* involves attempts by organizations to influence the behavior of other organizations without loosing independence. Such attempts can take the form of contracting through joint ventures or inviting outside directors to acquire managerial expertise and information about the environment. A networking strategy cannot only be defined as retrieving information, but also as sharing the risk for survival. Finally, financial strategy defines the pattern of investments the firm makes. Such a pattern of investment could involve tight or loose controls of production, inventories, marketing expenses, purchases, etc.

It is therefore hypothesized that:

$H_{5.2.3.}$ Strategic posture affects construction company decline.

$H_{5.2.3.1}$ Inability to define the scope of company activities causes construction companies to decline.

$H_{5.2.3.2}$ Inefficient resource utilization causes construction companies to decline.

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$H_{5.2.3.3}$ Inability to exploit competitive advantage causes construction companies to decline.

$H_{5.2.3.4}$ Lack of synergy to activate competitive strategy causes construction companies to decline.

$H_{5.2.3.5}$ Inability to diversify the company's production market causes construction companies to decline.

$H_{5.2.3.6}$ Inability to diversify the company's production portfolio causes construction companies to decline.

$H_{5.2.3.7}$ Low level of self-performance causes construction companies to decline.

5.3 Phases of Decline

Levy (1986) defines organizational decline in terms of lack of awareness of environmental threats, internal weaknesses and lack of corrective actions in such conditions. According to Weitzel and Jonsson (1989), organizations enter the state of decline when they fail to anticipate, recognize, avoid, neutralize, or adapt to external or internal pressures that threaten the organization's long-term survival. Rozanski's (1994) view of decline is a condition in which a substantial and absolute decrease in an organization's resource base occurs over a specified period of time. It is obvious that the key word in the definition of decline is "a specified period of time". Decline has been found to occur at varying rates (Daily, 1994).

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Construction company failure occurs at the end of four phases, which are decline development, decline recognition, decline response, and decline outcome (Figure 5.1). In the context of the construction industry, it is postulated (Figure 5.2) that the development of decline is caused first by environmental, operational and strategic factors that later translate into a financial crisis. Once the company is in financial difficulty, decline and the danger of total failure become official: this is decline recognition. After decline is recognized by company executives, measures are put in place to achieve a turnaround. If a turnaround is possible, the company carries on with its activities but if a turnaround is not possible the company files bankruptcy.

The performance of a successful company is typically climbing or stable over time. There may be small ups and downs but the main duty of the administration is to avoid serious downturns that can lead to failure. It is therefore most desirable to detect a serious downturn as early as possible and to take action before a financial crisis occurs and forces the company to file bankruptcy (Figure 5.3).

5.3.1 Decline Development: *Decline development* begins with a healthy firm and a suitable strategy developed by the firm's top management team who has been successful in determining the firm's character as well as its environment. Barker's (1992) anticipation for a healthy firm is earning at least a risk-adjusted minimum rate of return. This is the condition of 'at least minimal fit' to its strategy and environment and its structure including control systems and managerial quality. The decline development phase begins with failing to recognize negative forces around the organization. Decline

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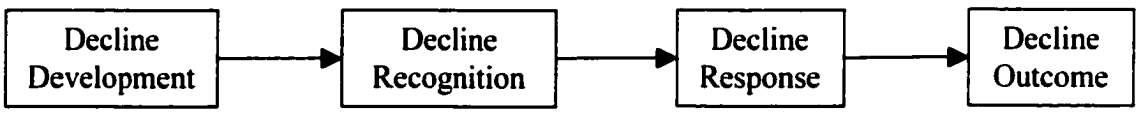

Figure 5.1 Phases of Decline

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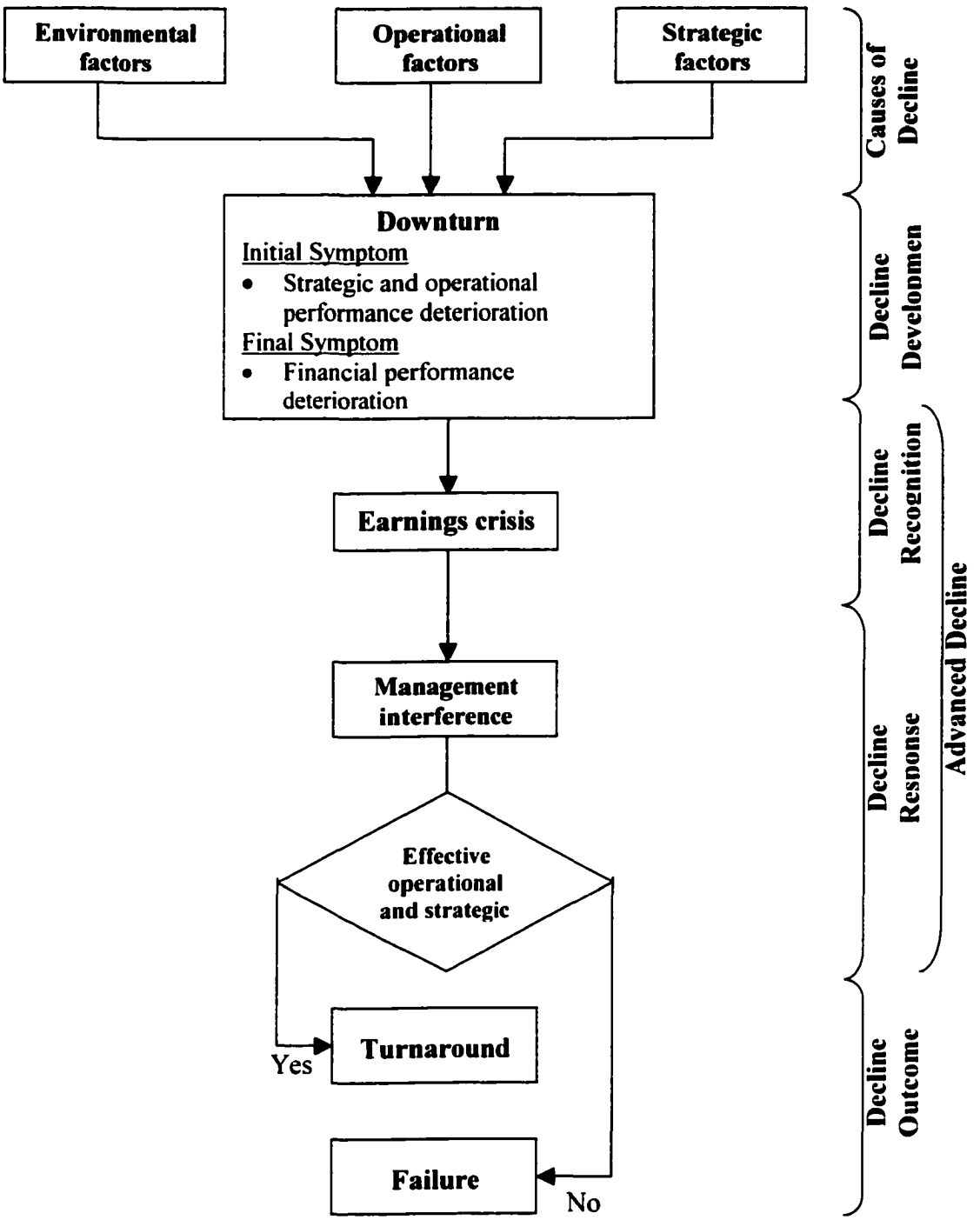

Figure 5.2 Construction Company Decline Model

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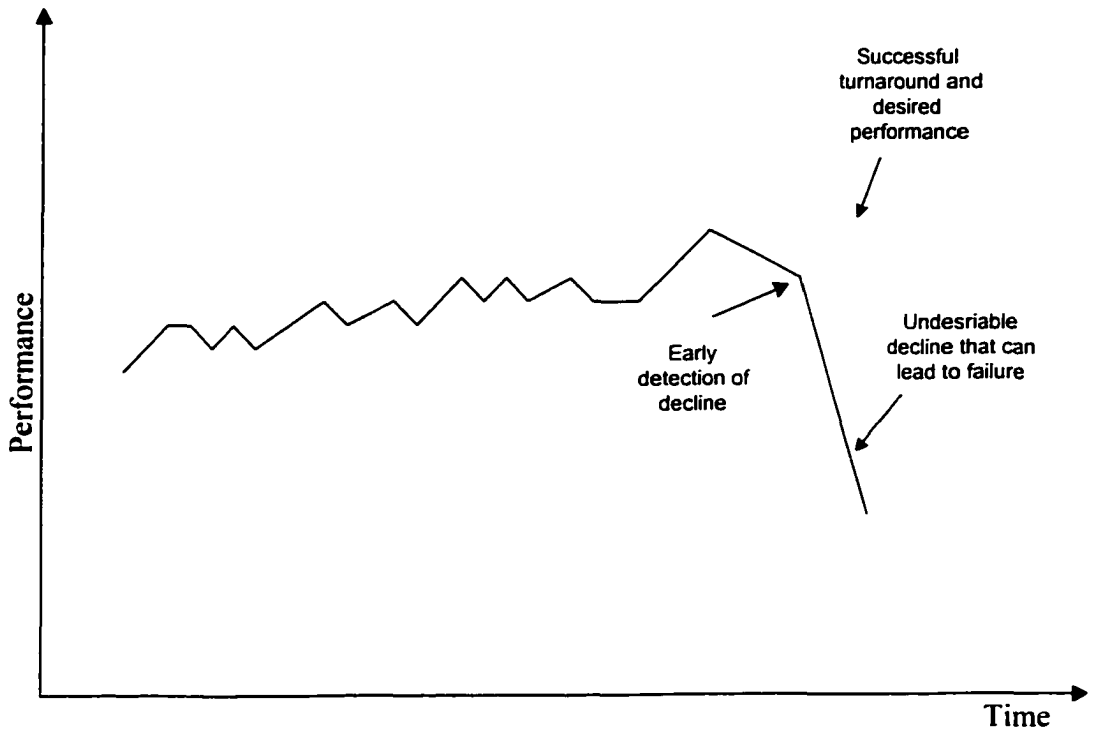

Figure 5.3 Early Detection of Decline

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development can also begin if the organization fails to respond to opportunities, which might affect the organization's present and future condition. Decline can begin in the early stages of an organization as well as during the time of its development. Some researchers tried to connect the concept of liability of newness to mortality of organizations (Caroll and Delacroix, 1982; Freeman et al., 1983; Stichcombe, 1965). The liability of newness assumes that a lack of social approval, stability, and sufficient resources typifies recent entrants into a population and that these shortcomings increase their risk of failure. Some empirical studies demonstrated that mortality rates tend to decrease where an organization's age increases (Stinchcombe, 1965; Bruderl and Schussler, 1990; Levinthal, 1991; Baum and Oliver, 1991; Bruderl, Preisendorfer, and Zeigler, 1992). These researchers explain the reason why failure occurs at younger ages in several ways. New organizations depend on new roles and tasks that have to be learned at some cost. Young organizations may have conflicts between capital constraints and creativity. The social hierarchy in young organizations is not well established. Finally, young organizations do not have a stable relationship with clients and other organizations with whom they need to interact for their production. The same literature also examines the relationship between failure and company size. The tendency of failure decreases with an increase in the size of organizations. Small organizations tend to have problems with raising capital, recruiting and training a workforce, and handling administrative costs. Furthermore, large organizations are expected to be less vulnerable to the risk of failure.

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$H_{5.3.1}$ Construction company failure is associated with the size of company; the smaller the company, the higher the probability of failure.

$H_{5.3.2}$ Construction company failure is associated with the age of company; the younger the company, the higher the probability of failure.

The management science literature defines the causes of decline in two ways. Industrial decline, which is called *k-type* decline occurs when a firm's industry (niche) shrinks in size or shift, reducing the number of firms the industry (niche) can support, which may cause many or all the firms in the industry to be adversely affected (Cameron et al, 1988). For example, the U.S. steel industry in the early 1980s was forced into a *k-type* decline because of shrinking demand and foreign imports. On the other hand, *r-type* decline occurs when a firm exists in a stable or growing industry but it performs below the average firm in the industry (Cameron et al, 1988). Firms may also suffer *r-type* decline because management has taken actions that have led to a deterioration of the firm's adaptation to an environment that has remained relatively stable. There are three major causes for organizations to enter the decline development phase. These are unfavorable environmental shift for the organization, inefficient structure, and poor strategies that decision makers generate for the organization (Figure 5.2).

The decline development phase is the phase when the downturn begins for the company. Symptoms of this stage can be observed at two levels; initial symptoms are operational and strategic and final symptoms are associated with the decline in financial performance (Figure 5.2).

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Organizations start loosing their resources when they enter the decline trend. They usually do not have enough resources when they attempt to turn the company around. Therefore, the timing of decline recognition is very important if one wants to maximize the chances of turning the company around. As it was mentioned earlier, companies may enter the decline development stage in various ways and the time they spend at this stage may vary from company to company. Part of the decline literature deals with stagnating organizations. Organizations set up programs and procedures to pursue stability and avoid uncertainty in their relationship with their environment. Over time, organizations stick to these programs no matter what and generate only small adjustments towards changes in the environment. At this point, stagnation starts for the organization because these programs become frozen in patterns of low performance and desensitize the organization towards its environment. The stagnating organization literature suggests that most of these organizations do not survive at the end. Many organizations consume most of their slack resources during this time, and when a crisis occurs the organization cannot support a reorientation for a turnaround.

5.3.2 Decline Recognition: The performance of an organization begins to deteriorate during the decline development phase. The decline recognition phase is an important point in the failure/turnaround process. Early recognition will increase the chances of survival of an organization. In the decline development phase, there is a time lag between the initial and final symptoms. Top management's late recognition of decline can be explained in many ways. First of all, since there is a time lag between the initial and final symptoms, the initial symptoms of deterioration are likely to be the most

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equivocal indicators of organizational decline. Secondly, in most cases top management does not attach much importance to primary signs as long as they do not affect the financial performance. Since the deterioration is not so visible, the top management team focuses its attention on other matters that are not crucial for the organization. The top management usually denies the decline development phase until a crisis (usually a financial crisis such as crisis on credit lines with financial institutions) occurs in the organization. Lagrange and Nelson (1987) define other early signals of organizational decline as excessive personnel, tolerance of incompetence, cumbersome administrative procedures, disproportionate staff power, replacement of substance with form, scarcity of clear goals and decision benchmarks, fear of embarrassment and conflict, loss of effective communication, and outdated organizational structure. Recognition of decline brings a need to respond to the decline process.

5.3.3 Decline Response: Rather than focus on the trend leading to bankruptcy, turnaround can begin much earlier in the business cycle. It is the ability to detect and spot the signs of trouble early in the cycle that leads to a more rapid and successful turnaround.

After a drastic financial crisis, not always but in many cases, managers file bankruptcy under Chapter 11 in order to establish some financial relief. As it is explained thoroughly in Chapter 2, Chapter 11 is a voluntary proceeding that is initiated by corporations, sole proprietorships, or partnerships to reorganize their businesses. When a business falls into distress and starts loosing the ability to pay its debts but still

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wishes to continue operating, a bankruptcy petition is filed under Chapter 11 by the debtor. One of the advantages of Chapter 11 is that when the assets of the bankrupt company are under the custody of the court, the debtor has freedom from prior pending court proceedings. Furthermore the debtor can borrow new funds that could cover the unsecured creditors. Although the interest rate will be high, new funds can provide financial relief for a while.

The concepts of strategic management in general, and strategic management in the construction industry are discussed elaborately in Section 4.3.3. Regardless of whether a company files Chapter 11 or not, the top management's response to strategic reorientation can be conducted by taking measures at the corporate level such as diversifying the product line, forging new alliances with other parties; and/or by taking measures at the business level such as increasing relative market share and firm sales, downsizing the production line, and liquidating some assets to generate cash flow (Barker, 1992). In the model proposed in Figure 5.2, response to decline occurs in the operational and strategic activities of companies.

During the decline response phase, the quality of human resources decreases because some of the valuable managers leave the company. These valuable managers leave because they believe that being part of a failed company in some sense put a stain on their successful resume. This kind of situation forces a company to undertake turnaround efforts with a relatively less competent management team. On the other hand, another scenario during this phase is blaming only one person, typically the "CEO", for

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all the problems and replace the CEO believing that a new CEO will bring fresh blood to the company. This approach has some merits. The theory suggests that a new manager will have the power to break the status quo and be able to observe the major dysfunctions in the organization's structure with an outsider view. However, the counter approach suggests that organizations may show resistance to a new CEO, "an outsider", and his or her new ideas. This approach argues that mistrust plays a major role on resistance. In the model presented in Figure 5.2 management interference starts with either the replacement of the CEO or partial replacement of the management team. In other words, response starts at the top of the organizational hierarchy.

Centralization of the decision-making process is inevitable in responding to decline in order to control the organization and create significant monitoring systems. Strategic changes that can be considered in responding to decline are grouped into five categories by Whetten (1987). Domain defense is oriented towards preserving the legitimacy of the existing domain of activities and buffering the organization from the hostile environmental conditions. Partnering or joint venturing can be described as defense efforts of organizations. Partnering or joint venturing does not only relieve the company financially but also decreases the risks and liabilities and even it can help rebuilding credibility vis-à-vis financial institutions. Domain offense focuses on expanding those activities that the organization does well. Domain criterion supplements current domain activities with new domains, primarily through diversification. Domain consolidation involves reducing the size of the domain occupied by the organization, but cutting back to the core products or services. Since the construction business has spread

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production centers that are spread out, downsizing can be accomplished by closing distant offices. Heavy operating expenses become particularly burdensome when construction companies need to shrink and expand in cycle with the job market and competitive conditions. It is a common practice for construction firms to try to level their heavy operating expenses by subcontracting throughout the project. Also the nature of construction business is such that a firm employs many temporary workers; as projects come to an end, lay-offs and cut backs on labor can be accomplished. Downsizing is the effort to decrease overhead expanses. Domain substitution involves replacing one set of activities with another. This can be accomplished through expanding market options such as from building construction to heavy construction and civil works.

5.4 Summary

The major causes of decline are unfavorable environmental shifts, inefficient organizational structure, and poor strategy. *Decline development* is the first phase in the decline process. At this stage a healthy firm begins by failing to recognize negative forces around the organization. Decline development can also begin if the organization fails to respond to opportunities, which might affect the organization's present and future condition. Initially, effects are seen on the strategic and operational performance of a company. Then a decline in the financial performance is observed. It is important to emphasize that initial and final symptoms do not occur concurrently. This stage can last a different period of time for different organizations. Some organizations can spend a long period of time in this phase; they are called "stagnating" organizations. These organizations become frozen at a low level of performance; some researchers call them

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"permanently failing" organizations. *Decline recognition* comes usually with a financial crisis. At this stage the top management team is forced to face the downturn. *Decline response* starts with management interference. This is an action-taking stage to regenerate strategy and reorganize the operations of the organization. Bankruptcy filing under Chapter 11 usually takes place at this stage also. It is important to note that the changes in strategy and operations have to be done at the same time in order to get out from the decline pattern and turn the company around. On the other hand, operational changes include changes in the structure and the human capital of the organization.

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CHAPTER VI

METHODOLOGY

6.1 Introduction

This chapter describes the methodology utilized in this study to test the hypotheses set in Chapter 5 and to empirically assess the theory previously presented. Two surveys are conducted in this study. The chapter starts by describing the characteristics of the populations used in the surveys (Section 6.2). The characteristics of the populations are very important in testing the hypotheses as well as developing the scales of decline patterns. The limitations of the populations are also discussed in this section. The development of the questionnaires for these two separate surveys is discussed in Section 6.3. Descriptive statistical analysis is conducted on the data collected in the first survey and Mann-Whitney, factor analysis and multinomial logistic regression analysis are conducted using the data of the second survey. In the following section (Section 6.4), scale development is explained including the theoretical considerations treated in the previous chapter. Section 6.5 describes the Mann-Whitney test, which is used for hypothesis testing using the data of the second survey. Factor analysis is used to determine the scale variables of this research; factor analysis and validation methods are discussed in Section 6.6. Finally, in Section 6.7, the multinomial logistic regression method is explained, which is used to determine the condition of a construction company to see whether it is healthy, whether decline is developing or whether decline has reached an advanced stage.

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6.2 Population Characteristics

The model described in Chapter 5 is analyzed within the context of the construction industry. The construction sector comprises establishments primarily engaged in the construction of buildings and other structures, heavy construction (except buildings), additions, alterations, reconstruction, installation, and maintenance and repair. Establishments engaged in demolition or wrecking of buildings and other structures, clearing of building sites, and sale of materials from demolished structures are also included. This sector also includes those establishments engaged in blasting, test drilling, land filling, leveling, earthmoving, excavating, land drainage, and other land preparation. The industries within this sector have been defined on the basis of their unique production processes. As with all industries, the production processes are distinguished by their use of specialized human resources and specialized physical capital. Construction activities are generally administered or managed at a relatively fixed place of business, but the actual construction work is performed at one or more different project sites.

The data for the analysis of the model was collected in two separate surveys. The first survey (causes of decline) was conducted in order to determine the opinions of construction executives concerning the significance of causes of decline that are described in Chapter 5. The survey was mailed to the top four hundred general contractors and top two hundred specialty contractors, which are published by Engineering News Record yearly (ENR, 2001; ENR, 2001). The respondents of the survey were either the presidents or the chief executive officers of these companies. Descriptive statistical analysis was conducted. The survey results are presented

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according to the level of importance of the factors that cause construction companies to decline. Further evaluation was also conducted to determine respondents' possible biases towards the survey. In order to do that, the demographic information of the respondents was used.

The model described in Chapter 5 attempts to define the decline patterns of construction companies. Decline development can have different durations for different companies. This is the phase where downturn takes place. The initial effects are seen on strategic and operational performance, which is followed by financial performance deterioration. In some cases, decline recognition is the phase when the company files bankruptcy. A statistical model that assesses a construction company's condition vis-à-vis decline was developed by using a second survey (company profile survey) administered to a different population than the population used in the first survey. The population in this survey was composed of construction companies that have filed bankruptcy under Chapter 11 and construction companies that have been functioning without bankruptcy protection. The companies that filed bankruptcy were retrieved from two online databases called Westlaw and LexisNexis. Westlaw is West Group's online research tool for the legal community. Introduced in 1975, Westlaw enables legal professionals to retrieve cases, statutes, and other documents from West's vast library of legal and business materials in a matter of seconds. At the root of the success of Westlaw is its content-cases and statutes, administrative materials, law reviews and treatises, attorney profiles, news and business information, and forms. With nearly 15,000 databases, more than 1 billion public records, more than 6,800 news and business

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publications from Dow Jones Interactive, and more than 700 law reviews, Westlaw is one of the most trustworthy and convenient online resources for legal professionals in the world. In order to retrieve information about bankrupt construction companies, the "Bankruptcy Database" (BKRDATA and BKRALL) was used. The second source, the LexisNexis Group also provides information to legal, corporate and government markets and publishes legal information via online, hardcopy and CD-ROM formats. The Lexis service is the first commercial, full text legal information including comprehensive company, country, financial, demographic, market research and industry reports.

As stated above the second survey also contains construction companies that are not under bankruptcy protection. These companies were randomly selected form the directory of the Associated General Contractors (AGC) of America for the year 2000. The Associated General Contractors is the nation's largest and oldest construction trade association represented by chapters all over the country.

6.3 Format of the Questionnaires

The collection of the data concerning the characteristics of construction companies in relation to three causes of decline, namely environmental factors, operational factors, and strategic factors was conducted by two questionnaire surveys. Survey 1 (Causes of Decline) and Survey 2 (Company Profile) have some similarities. The first survey is composed of three parts while the second has four parts. The first part in both surveys includes a cover letter, which emphasizes the intent of the study and also acknowledges the confidentiality of the information that is requested. The second part in

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both surveys collects demographic information about the companies such as the area of specialization, the age of the company, the size of the company based on the number of full-time employees and on annual dollar turnover. Also demographic information about the respondents is sought in this second part of the surveys; this information can be summarized as the respondent's position in the company, education, years of experience in the industry, and number of years spent with the current company. This demographic information allowed the analyst to assess the quality of the answers to the survey.

In the third part of Survey 1 (Causes of Decline), the causes of decline are presented to the respondents in no particular order. The respondents are asked to declare their opinion by rating the significance of these causes on a 1-5 scale where 1=not significant and 5=extremely significant. This section of Survey 1 begins by emphasizing that a respondent's opinion should be reflected regardless of his/her company's condition. However, in Survey 2, it is emphasized that a respondent's observations of the state of his/her organization need to be considered while answering the questions.

In the third part of Survey 2 (Company Profile), the questions are categorized under three groups.

- The first group of questions investigates the presence/absence of the ***operational causes*** of decline in the respondent's company. Since this survey is administered to bankrupt and non-bankrupt companies, the statistical significance of differences constitutes a test of the hypotheses set in Chapter 5, i.e., that decline is affected by ineffective vertical communication ($H_{5.2.2.1}$),

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ineffective horizontal communication ($H_{5.2.2.2}$), decentralization ($H_{5.2.2.3}$), absence of formalization ($H_{5.2.2.4}$), absence of specialization ($H_{5.2.2.5}$), absence of standardization ($H_{5.2.2.6}$), dependence on other organizations ($H_{5.2.2.7}$), inability to adapt to advances in managerial practices ($H_{5.2.2.8}$), and inability to adapt to advances in construction technologies ($H_{5.2.2.9}$). At the end of this group of questions, the respondent is asked to rate the condition of his/her company only in relation to organizational aspects.

- The second group of questions in the third part explores the presence/absence of ***human capital issues*** in the respondent's company including managers' level of education ($H_{5.2.2.10}$), managers' work experience ($H_{5.2.2.11}$), managers' business knowledge ($H_{5.2.2.12}$), managers' managerial experience ($H_{5.2.2.13}$), and representation of outside members in the company board ($H_{5.2.2.14}$). As in the previous part, at the end of this part, the respondent is asked to rate the condition of his/her company only in relation to human capital aspects.
- The third and final group of questions in the third part collects information about the condition relative to the ***strategic posture*** of the company. The questions are designed to extract information about defining the scope of the company ($H_{5.2.3.1}$), resource utilization ($H_{5.2.3.2}$), defining the company's competitive advantage ($H_{5.2.3.3}$), and synergy to activate competitive strategy ($H_{5.2.3.4}$). Rating of the strategic aspects of the company concludes the third part.

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The fourth part of Survey 2 (Company Profile) requires the respondent to rate the condition of the company in the light of all the questions in the third part. The overall ratings made at the end of each group of questions are used in the second part of the analysis, as it is discussed in the following sections.

Scale items occur in a variety of forms. One of the most common item formats is called a Likert scale. The Likert scale is commonly used to measure opinions, beliefs and attitudes especially in social sciences. When a Likert scale is used, the item is presented as a declarative sentence, followed by response options that indicate varying degrees of agreement with or endorsement of the statement. Typical Likert scales consist of 4 to 40 items. Respondents in the Survey 1 (Causes of Decline) were asked to state the significance of each potential cause of decline by using a 5-point scale where "not significant=1", "fairly significant=2", "significant=3", "very significant=4", and "extremely significant=5". Respondents in Survey 2 (Company Profile) were asked to rate each potential cause of decline relative to the existing condition in their company using a 5-point scale where "extremely weak=1", "weak=2", "fairly strong=3", "strong=4", and "extremely strong=5". It should be noted that negative worded items must have their scores reversed. It is often useful for these statements to be fairly strong when used in a Likert format. The moderation of opinion is expressed in the choice of response option. High validity and reliability are essentials of good scales. In this study, validity is accomplished by the comprehensiveness of item coverage.

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6.4 Scale Development

Measurement is a fundamental activity of science. We acquire knowledge about people, objects, events, and processes by observing them. Making sense of these observations frequently requires that we quantify them. A "major variable" can be measured by a set of different "variables" that define the "major variable". Scales are used to measure the effects of the individual variables. Although it is difficult to observe or quantify it directly, the major variable presumably takes on specific values under some specified set of conditions. The set of variables are intended to estimate the major variable's actual magnitude at the time and place of measurement for each person measured.

An example may reinforce the above definition. In this research it is suggested that "organizational structure affects construction company decline" ($H_{5.2.2.A}$). In order to measure the impact of the major variable "organizational structure" on "company decline", a set of organizational variables are defined that may affect company decline. The following variables define organizational structure:

Vertical communication

Horizontal communication

Decentralization

Formalization

Specialization

Standardization

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Dependence on third parties

Ability to adapt to advanced managerial practices

Ability to adapt to advanced construction technologies

These variables are presented to construction company professionals in order to investigate how extensively they exist in their respective companies. In other words, the combination of the responses associated with all the variables should give an indication of how strong the major variable "organizational structure" is in a company. The major variables and their respective variables are presented in Figure 6.1. In this research, it is argued that the construction company decline pattern can be measured by three major variables, namely organizational structure, human capital issues, and strategic posture. A set of variables that define the same major variable do not necessarily need to be independent from each other (e.g., formalization, standardization, and specialization have different definitions but in some way each concept supports the other).

Although there are many technical aspects involved in developing and validating a scale, one should not overlook the importance of being well grounded in the substantive theories related to the phenomenon to be measured. The boundaries of the phenomenon must be recognized so that the content of the scale does not inadvertently drift into unintended domains. The scales developed in this research rely on the theoretical considerations that are treated in Chapter 5. The intent is to develop scales for variables that can measure a firm's condition in terms of three major variables –organizational structure, human capital, and strategic posture.

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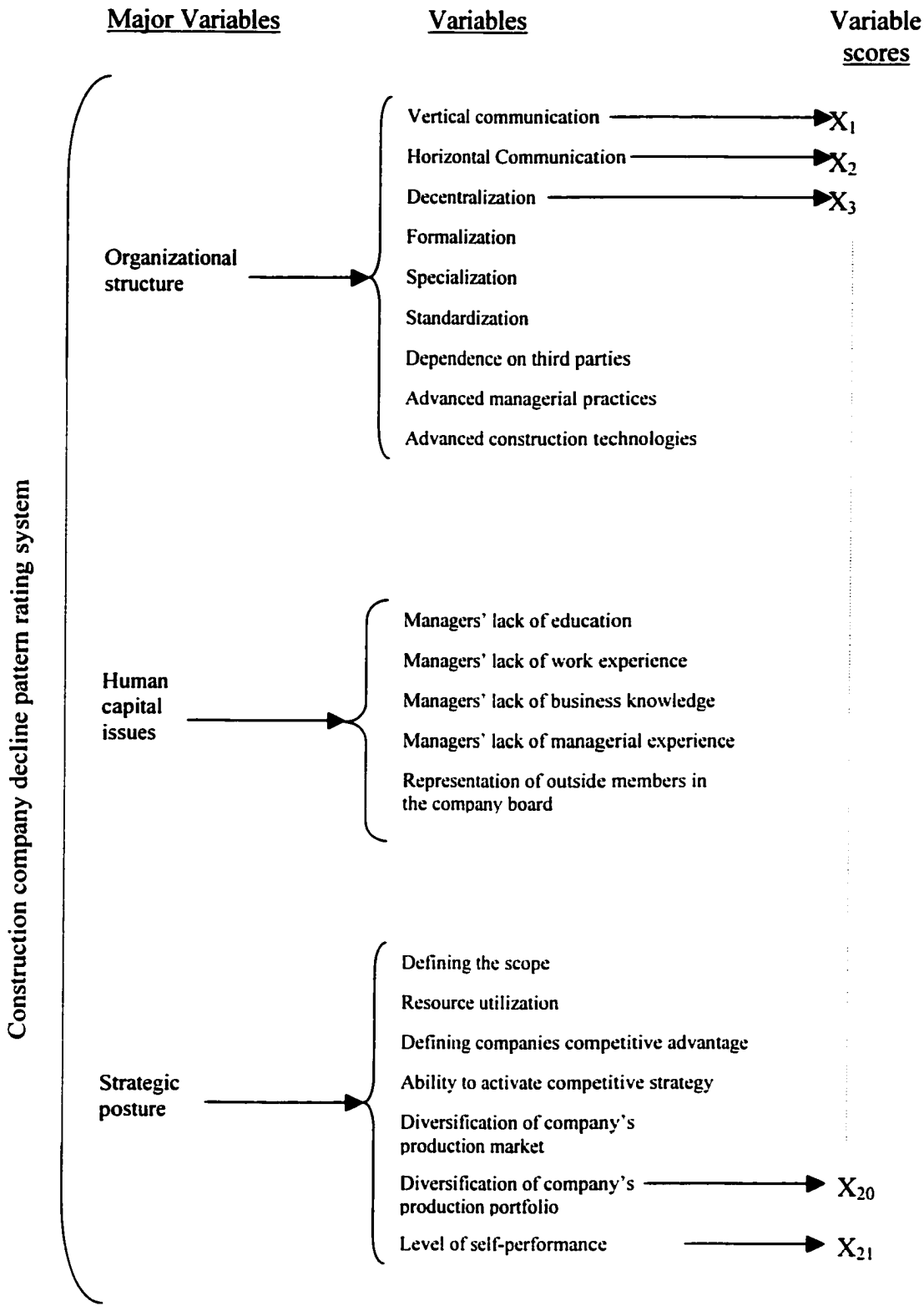

Figure 6.1 Path Diagram

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6.5 Hypothesis Testing

The Mann-Whitney test is used for testing the hypotheses set in Chapter 5 by using the data collected in Survey 2 (Company Profile). The Mann-Whitney test is a nonparametric alternative to the independent samples t-test. Like the t-test, Mann-Whitney tests the null hypothesis that two independent samples come from the same population. Rather than being based on parameters of a normal distribution like mean and variance, the Mann-Whitney statistic is based on ranks. The Mann-Whitney statistic, U, is obtained by counting the number of times an observation from the group with the smaller size precedes an observation from the larger group. The equation for the Mann-Whitney U statistics is:

$$U = N_1 N_2 + \frac{N_1(N_1+1)}{2} - T_1$$

Where,

N_1, N_2 = Sample sizes of the two groups.

T_1 = The sum of the ranks of the samples.

6.6 Factor Analysis

Factor analysis serves several related purposes. One if its primary function is to help an investigator determine how many latent variables underlies a set of items. A second purpose, which follows from the first, is to provide a means of explaining variation among relatively many original variables using relatively few newly created variables. This amounts to considering information so that variation can be accounted for by a smaller number of variables. A third purpose is to define the substantive content or

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meaning of the factors that account for the variation among a larger set of items. That is accomplished by identifying groups of items that co-vary with one another and appear to define meaningful underlying latent variables.

Factor analysis can be quite useful for developing scales where there are too many variables to consider. Principal component analysis is a good technique for studying dimensionality of a scale. The aim of the principal component analysis is to be able to estimate the correlation matrix and this can be done by finding the characteristic equation of the matrix. The challenges of this type of analysis are the determination of the number of factors that best represent the items and the interpretation of the factors. In this analysis, factors are extracted from the variables that are gathered in the third section of the survey. For the most part, in principal component analysis, the task of defining the factors are up to the factor analysis program (SPSS is used in this research).

6.7 Multinomial Logistic Regression

Logistic regression is useful for situations in which one wants to be able to predict the presence or absence of a characteristic or outcome based on values of a set of predictor variables. It is similar to a linear regression model but is suited to models where the dependent variable is dichotomous. Logistic regression coefficients can be used to estimate odds ratios for each of the independent variables in the model. Logistic regression is applicable to a broader range of research situations than discriminant analysis. Multinomial Logistic Regression is useful for situations in which one wants to be able to classify subjects based on values of a set of predictor variables. The

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Multinomial Logistic Regression procedure internally aggregates cases to form subpopulations with identical covariate patterns for the predictors, producing predictions, residuals, and goodness-of-fit tests based on these subpopulations. In this method, since all the predictors are categorical, the subpopulation approach can produce valid goodness of fit tests and informative residuals.

As it is stated in the pervious sections, the aim of this research is to develop a rating scale to measure the condition of a construction company relative to its performance and to detect the early stages of decline. In order to do that a rating system is to be developed. The first step involves defining an estimated condition rating for each company in the sample. The respondents' ratings of their company's condition that were obtained in the last part of Survey 2 (Company Profile) are used for this purpose. Using these ratings, classification groups are established that define the state in which a company is. The theory behind the phases that companies go through is explained in Chapter 5. It is important to note that growing and mature companies are included in the study to provide a classification group for companies that have not filed bankruptcy under Chapter 11. In this research, three states are defined: no-decline state, decline development state, and advanced decline state. The states are defined by establishing intervals explained in detail in Chapter 7.

This analysis is conducted by using SPSS, the Statistical Package for Social Sciences. One can obtain the following statistics using multinomial logistic regression:

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- Likelihood ratio test: Prints likelihood-ratio tests for the model partial effects. The test for the overall model is printed automatically.
- Parameter estimates: Prints estimates of the model effects, with a user-specified level of confidence.
- Cell probabilities: Prints a table of the observed and expected frequencies (with residual) and proportions by covariate pattern and response category.
- Classification table: Prints a table of the observed versus predicted responses.
- Goodness of fit chi-square statistics: Prints Pearson and likelihood-ratio chi-square statistics. Statistics are computed for the covariate patterns determined by all factors and covariates or by a user-defined subset of the factors and covariates.
- Define subpopulations: Allows the selection of a subset of the factors and covariates in order to define the covariate patterns used by cell probabilities and the goodness-of-fit tests.

The rating intervals that define the states are reset and the analysis is run again. The goodness of fit, chi-square, and the likelihood ratio tests are compared. The most significant output provides the prediction model that is sought in this research.

6.8 Summary

In this study, two separate surveys were conducted to collect data in order to test the model proposed in Chapter 5. The methodology chapter explains the procedures of the analyses conducted using these data. Figure 6.2 summarizes the methodology used in this study. As it can be seen from the figure, Survey 1 (Causes of Decline) is an opinion

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survey administered to general and specialty contracting companies listed as the largest in the U.S. by *Engineering News Record* in 2001. The survey aims to find out construction executives' opinions about the causes of construction company decline. Descriptive statistics are calculated and the causes are listed in order of significance in the following chapter.

Survey 2 (Company Profile) investigates the presence/absence of the causes proposed in Chapter 5. The populations of this survey consist of a set of bankrupt companies and a set of non-bankrupt companies. First the statistically significant differences between bankrupt and non-bankrupt companies are determined by administering the Mann-Whitney test. Factor analysis and multinomial logistic regression analysis are conducted to test the decline model proposed in Chapter 5.

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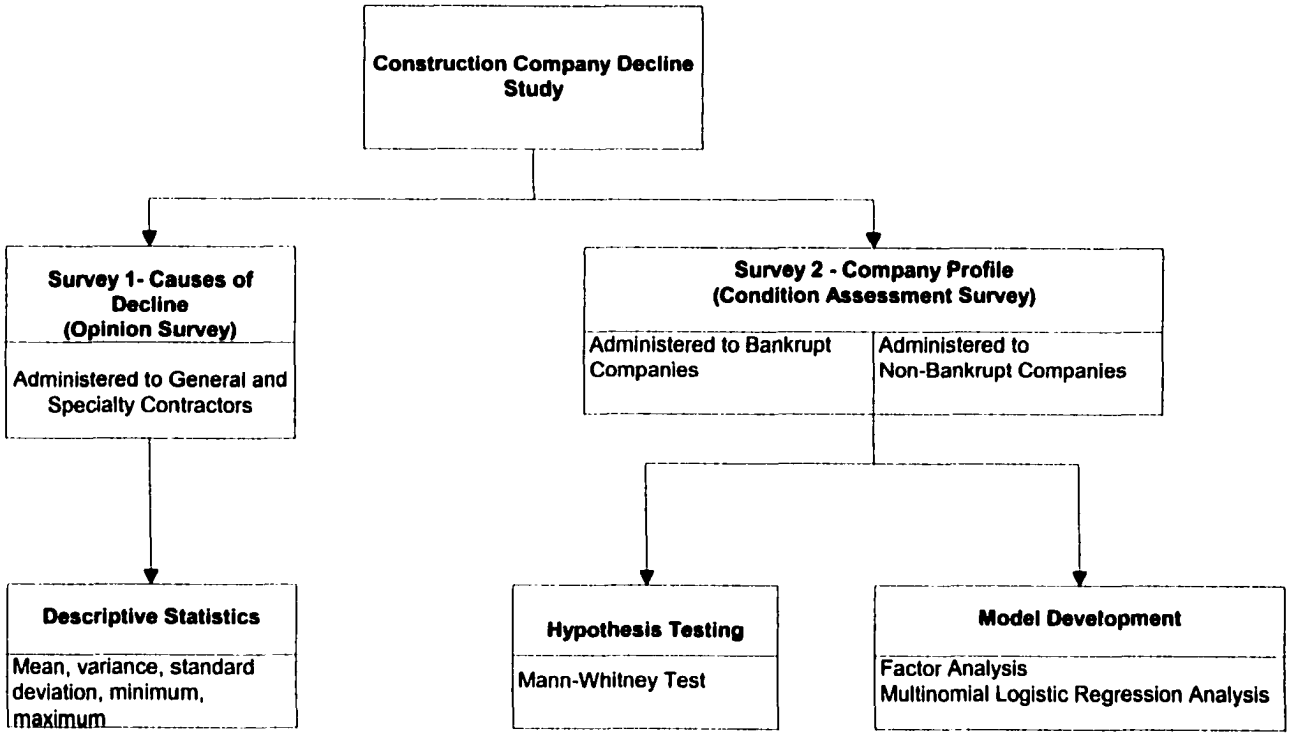

Figure 6.2 Research Methodology

CHAPTER VII

RESEARCH FINDINGS AND DISCUSSION

7.1 Introduction

In this chapter the analysis of the proposed model is discussed. There are two surveys conducted in this research. In Section 7.2 the findings of the Survey 1 (Causes of Decline) are discussed. This survey is administered to company executives. It seeks expert opinions about the causes of construction company decline. Executives are asked to express their opinions regardless of their companies' condition. Descriptive statistical analysis is conducted on the data and the causes of construction company decline are ranked according to their significance. This section is concluded with a discussion of the findings in relation to the respondents' demographic.

Section 7.3 discusses Survey 2 (Company Profile) that is conducted in this research. Survey 2 (Company Profile) is administered to randomly selected non-bankrupt construction companies and construction companies that filed bankruptcy in the last five years. This survey seeks information about the organizational structure, human capital, and strategic posture of the two different groups of companies. Section 7.3 starts by describing the characteristics of bankrupt and non-bankrupt companies and provides comparisons between them. Then the Mann-Whitney test is administered in Section 7.3.1. As explained in Chapter 6, the Mann-Whitney test determines the statistical significance of the differences between two independent populations.

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In section 7.3.2 factor analysis is used to reduce the 21 variables proposed in Survey 2 (Company Profile) into a more manageable number of factors. As described in Chapter 6, the prediction model developed in this study makes use of Multinomial Logistic Regression. Several runs are conducted in Section 7.3.3 using different sets of variables. The variables used in the Multinomial Logistic Regression analysis are determined in several ways. These variables are retrieved from: the outcome of factor analysis (3 factors), the variables that define the three factors in the factor analysis (11 variables), the variables that came out of the Mann-Whitney test (7 variables), the top 9 variables that were identified as the most important in Survey 1 (Causes of Decline), and finally all the variables obtained form Survey 1 and from the Mann-Whitney test. The results of each analysis are also discussed in this section. The outcome of each analysis is tested with hypothetical values and cases selected from the sample in Section 7.3.4.

7.2 Findings of Survey 1 (Causes of Decline)

While describing the model that explains construction company decline in Chapter 5, the causes of decline were categorized in three major groups. These are environmental factors, operational factors and strategic factors. It is also argued that if one can determine the real causes of construction company decline and understand the effects and development of these causes, then executives can watch for these phenomena and try to avoid them, hence avoiding decline.

Survey 1 (Causes of decline) aims to determine the significance of causes of construction company decline, which are listed in Chapter 5. Survey 1 (Causes of

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Decline) is administered (see Appendix A) to the top 400 general contractors and the top 200 specialty contractors listed by *Engineering News Record* in 2001. *Engineering News Record* annually publishes the industry's major actors such as general contractors, specialty contractors, and design firms in different categories (e.g., construction managers, building contractors, heavy contractors and etc.) as well as their overall annual turnover ranking. The questionnaires were mailed to the executive management, either the president or the chief executive officer (addressed in person). It is believed that the targeted population has enough experience in the industry to understand the phenomenon of organizational decline. It is also believed that since the companies in this population are ranked as the "largest" in the industry, the respondents will have a good understanding of the aspects investigated in the survey. A total of 588 questionnaires were mailed to construction companies and a total of 100 responses were received with a 17% rate of response.

As mentioned in Chapter 6, part of this survey contains demographic information about the respondents. The demographic information of the respondents provides the characteristics of the respondents in a systematic manner. They are also useful in determining possible biases towards certain questions in the survey. For example, the respondent is asked in the survey to rate the significance of the type of ownership on construction company decline. In order to determine a possible bias, type of ownership of respondents' companies is also asked in the demographic part of the survey. Type of ownership of the company is grouped in three categories: publicly owned, private, and family owned companies. The demographics of the company ownership of the

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respondents shows that 7 percent of the responding companies are publicly owned, 67 percent privately owned, and 26 percent family owned businesses. This information will be used in analyzing the answers of the respondents in the next section of the survey.

Another demographic question was the company's major activity line. The respondent companies' major activity lines are categorized according to the Standard Industry Classification (SIC). According to the SIC format, 1500 covers general building contractors that are residential, operative and nonresidential building construction. 1600 covers heavy construction contractors except building, and includes heavy construction and highway and street construction contractors. 1700 covers special trade contractors such as plumbing, heating, air conditioning, electrical work, masonry, concrete, roofing, etc. Based on this categorization, 45 percent of the companies' major activity area falls in general contractors (SIC 1500), 22 percent in the heavy construction (SIC 1600), and 33 per cent in special trades (SIC 1700).

The significance of young age in company decline is investigated in the survey. Therefore, the respondents' company age is sought in the demographics section of the survey. The findings show that 46 percent of the respondent companies are between 1 and 50 years old, 44 percent between 51 and 100 years old, and 10 percent more that 100 years old. The age of the youngest responding company in this sample is 4 and of the oldest company is 175, with a mean of 58.80 years.

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The respondents were also asked in the demographics part of the survey, whether their company is geographically dispersed. Since the production centers in the construction industry are the construction sites, it is to be expected that construction companies' activities be mostly geographically dispersed. In this survey, it is observed that 75 percent of the companies have offices in different geographical locations, while 25 percent are not large enough to have regional offices.

The size of a company is assumed to be one of the important parameters of organizational decline in the management science and construction management literature. In Chapter 4, the construction industry's fragmentation is explained by means of the size parameter. It is also argued that smaller companies are more likely to fail where size is measured in terms of number of employees (Chapter 4, Figure 4.3). In this survey, 10 percent of the responding companies have an employee size between 1 and 100, 53 percent between 101 and 499, and 37 percent more than 500 employees. It should also be noted that the target population of this survey is the largest 600 construction companies in the industry; therefore the average company size is expected to be higher than the average of the industry. The size of the company can be determined based on annual turnover as well. In fact, *Engineering News Record* uses this parameter to rank the companies in the industry. Based on this parameter, 28 percent of the companies have an annual turnover of up to $100 million, 62 percent between $101 and 500 million, and the remaining 10 percent more than $500 million.

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In this survey, the respondents' average level of involvement in the construction industry is 30.48 years. This gives a clear indication of the extensive "experience" of the respondents in the industry.

In the following section of this survey the respondents were asked to rate the significance of factors that may cause a construction company to decline, eventually leading to business failure. These factors are elaborated in detail in Chapter 5. The outcome of this survey can be seen in Table 7.1. In this table, the organizational decline factors are listed in descending order according to their level of significance perceived by the respondents. For example, the outcome of this survey shows that lack of managerial experience has the highest level of significance over construction company decline with a mean value of 4.23, on a scale of 1-5, when 1=Not significant and 5=Extremely significant.

- **Lack of Managerial Experience:** Do managers of successful firms pay more attention to the internal and external environment of an organization? Organizational behavior studies and human capital theory investigate the management side of the organization. Although they investigate the human side of the organizations by using many parameters, such as the age, education, occupational background, etc, of the participants, in this survey "managers' lack of experience" is found to have the most significant effect over company decline. Management ineffectiveness appears to be the biggest factor behind business failure. Ineffective management diminishes any opportunity that a business has of succeeding. Management's responsibility is to provide

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Table 7.1 Level of Significance of Causes of Decline

Rank	Variable Description	N	Mean*	Var.	Std Deviation	Min*.	Max*.
1	Lack of managerial experience	100	4.23	0.493	0.69	2	5
2	Lack of business knowledge	100	4.21	0.693	0.83	2	5
3	Overexpansion	98	4.03	0.973	0.97	1	5
4	Lack of work experience	99	4.02	0.836	0.91	2	5
5	Resistance to construction technology	100	3.78	1.022	1.01	1	5
6	Resistance to managerial practice	100	3.77	1.007	1.00	1	5
7	Ineffective vertical communication	100	3.75	0.816	0.90	2	5
8	Lack of competitive advantage	100	3.72	0.850	0.92	1	5
9	Inefficient resource utilization	100	3.68	0.765	0.87	1	5
10	Lack of synergy	97	3.57	0.998	1.00	1	5
11	Shortage of competent labor	98	3.52	1.056	1.03	1	5
12	Ineffective horizontal communication	100	3.48	1.080	1.04	1	5
13	Inability to adapt to complex delivery systems	98	3.43	0.866	0.93	1	5
14	Decrease in construction demand	99	3.42	1.410	1.19	1	5
15	Inability to define scope	98	3.41	0.945	0.97	1	5
16	Economic recession	100	3.40	1.111	1.05	1	5
17	Absence of standardization	98	3.39	0.879	0.94	1	5
18	Inability to adapt to technological changes	98	3.32	0.796	0.89	2	5
19	High interest rates	100	3.13	1.023	1.01	1	5
20	Poor industry growth	100	3.04	1.109	1.05	1	5
21	Supply shortages	100	2.94	1.269	1.13	1	5
22	Absence of formalization	98	2.85	1.079	1.04	1	5
23	High level of dependence on other organizations	100	2.84	1.509	1.25	1	5
24	Absence of specialization	98	2.74	1.058	1.03	1	5
25	Company's young age	99	2.74	1.277	1.13	1	5
26	Managers' lack of education	98	2.66	1.401	1.18	1	5
27	Insufficient profitability	99	2.65	1.619	1.27	1	5
28	Decentralization	100	2.58	1.640	1.28	1	5
29	Diversified production market	100	2.53	1.242	1.11	1	5
30	Federal and state regulations	98	2.50	1.510	1.23	1	5
31	Inability to self-perform	99	2.31	1.278	1.13	1	5
32	Natural disasters	98	2.15	1.430	1.20	1	5
33	Company's small size	99	1.94	1.139	1.07	1	4
34	Ownership by family	100	1.80	1.212	1.10	1	5
35	Inadequate diversification of production portfolio	98	1.74	1.017	1.01	1	5
36	Absence of outsiders in the company board	98	1.69	0.813	0.90	1	5

*Measured on a scale of 1-5 where 1=Not significant, 2=fairly significant, 3=significant, 4=very significant, 5=extremely significant.

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leadership, direction, and order for the company so that it is able to reach its goals. Failure to do so leads to the downfall of organizations. Pate (1999) defines the lack of experience as inability to identify mistakes together with inability to lead the organization through the necessary change to correct these mistakes. He also adds the management's lack of focus on operational issues such as internal control, the planning and budgeting process, and timely reporting leads to loss of control over the operations of the company.

In this research, management's reactions to decline are discussed in Chapter 2. A manager's denial to recognize the crisis is followed by self-blame, frustration and zero-bargaining attitude, which brings rigidity to the entire organization, and unreasonably high standards. These are some of the management conditions that cause permanent damage to the organization by the managers. Furthermore, especially in smaller firms, the chief executive dominates the firm and rather than acting as a leader, allows less discussion and may be quite closed to advice. In a construction company, the chief executive may also double as the chief estimator and the project manager; a chief executive who is overly involved in the day-to-day operational activities may fail to formulate mid- and long-term strategies for the future growth of the company.

- **Lack of Business Knowledge:** The outcome of this survey shows that "lack of business knowledge" follows "lack of managerial experience" as the second most significant factor that causes construction companies to decline (μ=4.23) (Table 7.1). "Lack of business knowledge" means lack of in-depth industry knowledge, market savvy, and a certain practical knowledge of how to find and attract clients, suppliers and

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distributors. Dun and Bradstreet's survey of small business owners shows that "owners believe the necessary expertise is acquired through a combination of formal and continual study, and on-the-job experience" (Dun and Bradstreet, 1989-1993). Organizational learning allows a construction company to identify the profitable markets, to forge partnering alliances with suppliers and subcontractors, to take advantage of technological innovations, and to establish good relationships with financial institutions, surety companies and potential owners. Particularly smaller start-up construction companies are vulnerable in this respect since the people who start the company may have the technical know-how to complete a construction project but in all likelihood lack the business knowledge to ensure the survival of their company.

- **Overexpansion:** "Overexpansion" is the third most significant factor that causes to decline (μ=4.03) (Table 7.1). "Overexpansion" can drive a company to higher risk-investments with larger financial debt hence increasing its chances of failure. For a construction contractor, overexpansion can either mean that the contractor is undertaking too many projects that the company cannot afford organizationally and financially or is employing too many employees and owns too many equipment that the company is unable to finance. Partnering with subcontractors or entering into joint ventures with other contractors may enrich a company's portfolio but can also jeopardize its survival since in such business ventures the company loses its absolute control over the schedule, quality and cost of the operations. Expansion into new markets such as projects in other states or other countries, and seeking different niches such as shifting from residential to civil construction without the right preparation may also carry unusually high risks.

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- **Lack of Work Experience:** "Lack of work experience" is the fourth-significant factor that causes construction companies to decline (μ=4.02) (Table 7.1). In the context of the construction industry, the failure of a firm may be considered to be dependent on the failure of one or more of its projects. Many theoretical and empirical research studies have been conducted to determine the critical success and failure factors in projects (e.g., Russell and Jaselskis, 1992; Bellasi and Tukel, 1996; Fleming and Koppelman, 1996). However, it is difficult to define the project's success or failure because the parties who are involved in the project may have different perceptions of the outcome. A project considered to be a success by the owner may be considered to be a failure by the contractor. On the other hand, the critical factors may vary according to the characteristics of the project. Bellasi and Tukel (1996) define the critical factors in four main groups: factors related to the project, the project manager and the team members, the organization, and the external environment. In the surveys Bellasi and Tukel (1996) conducted, they identified top management's support, availability of resources, the project managers' managerial skills, the team members' commitment and their technical background as the critical factors in project performance. They also note the importance of the size and value of the project, the uniqueness of the activities, the density of a project network, the project life cycle and the urgency of the project outcome. The importance of project size and duration is also supported by Russell and Jaselskis's (1992) research.

- **Other Causes:** The most significant four factors that cause construction company decline are discussed above as an outcome of this survey. However, it is

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important to note a couple of other factors also. In the organizational decline literature and construction management literature, several studies have been conducted on company failure based on the age and size parameters of companies. In their study, Bruderl and Schussler (1990) describe the *Liability of Adolescence* and *Liability of Newness* concepts (these concepts are elaborated in Chapter 2) and many other researchers built their empirical studies on this theory. In this survey the effect of a company's size over decline was investigated, because the theory suggests that small size organizations are more vulnerable and open to failure. However, the findings show that construction industry professionals do not attach enough significance to the size parameter of a construction company (μ=1.94) in the context of company decline and failure. The effect of a company's young age is also asked separately in the survey. The outcome shows that young age's significance over construction company decline (μ=2.74) was ranked 25th out of 36 factors. Furthermore, the overall ranking indicates that industry professionals attach more significance to human capital, organizational factors and strategic factors than environmental factors. In another words, it can be argued that internal factors are considered to have more importance than the external factors on construction company decline.

It was mentioned while discussing the demographic aspects of the survey that the demographic information is useful in determining possible biases in a survey. The differences between respondent groups are analyzed in Figures 7.1 to 7.13. In these figures, the rating of a causes of decline is placed on the y-axis and the distribution is analyzed based on the respondent's "type of ownership", "company type", "company

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age", "geographical dispersion", "employment size", and "annual turnover". In general, respondents in different groups agreed with each other as differences were below 15%. Figures 7.1 through 7.13 show the distribution of the decline factors according to demographic parameters where differences higher than 15% were observed. A straight line parallel to the horizontal axis shows the mean value. The respondents' answers to the questions will be discussed based on the parameters that are listed above.

The "company's young age" is analyzed in the context of the respondents' demographic parameters in Figure 7.1. According to companies that are 100 years old and older, the company's young age has less significance (μ=2.50) compared to the mean rating (μ=2.74). However, the companies between the 1 and 50 years old and 51 and 100 years old attached a similar importance to the company's young age (μ=2.77 and μ=2.76, respectively) implying that respondents associated with smaller companies, find smaller companies to be slightly more vulnerable to decline than larger companies. But in general, similar mean values for the three age groups indicate a parallel opinion about this variable. On the other hand, when company type is considered, general building contractors (SIC 1500) and heavy construction companies (SIC 1600) consider age to be significant (μ=2.93 and μ=3.05 respectively), whereas special trade companies (SIC 1700) consider it less significant (μ=2.27).

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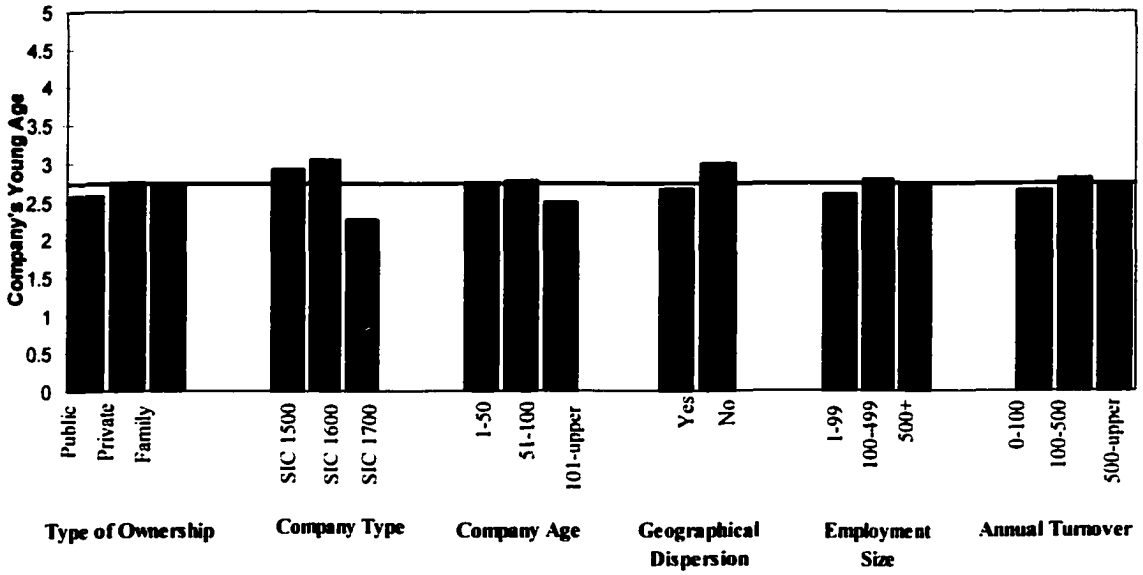

Figure 7.1 Significance of Company's Young Age on Company Decline According to Demographic Characteristics

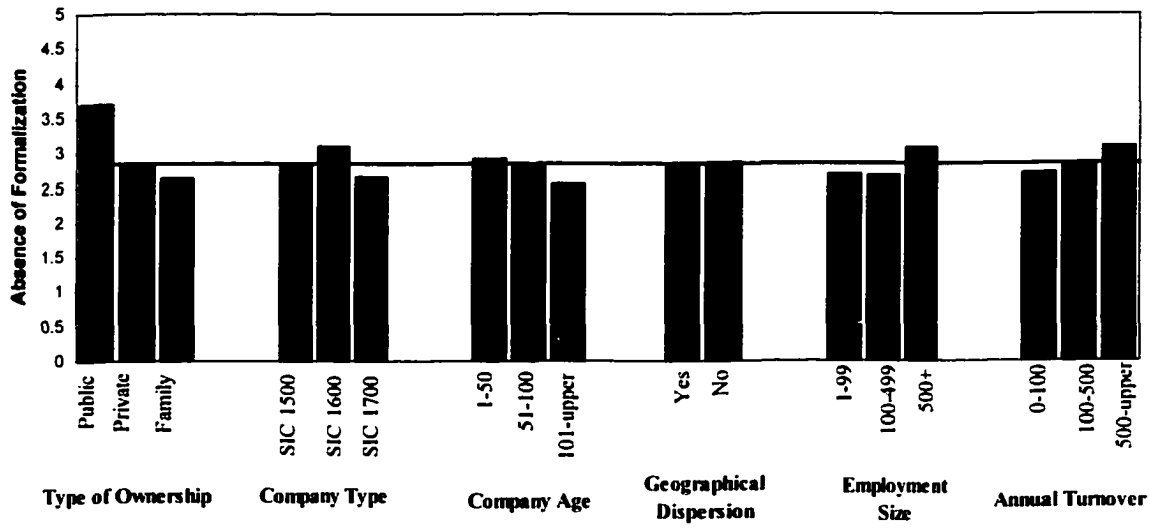

Figure 7.2 Significance of Absence of Formalization on Company Decline According to Demographic Characteristics

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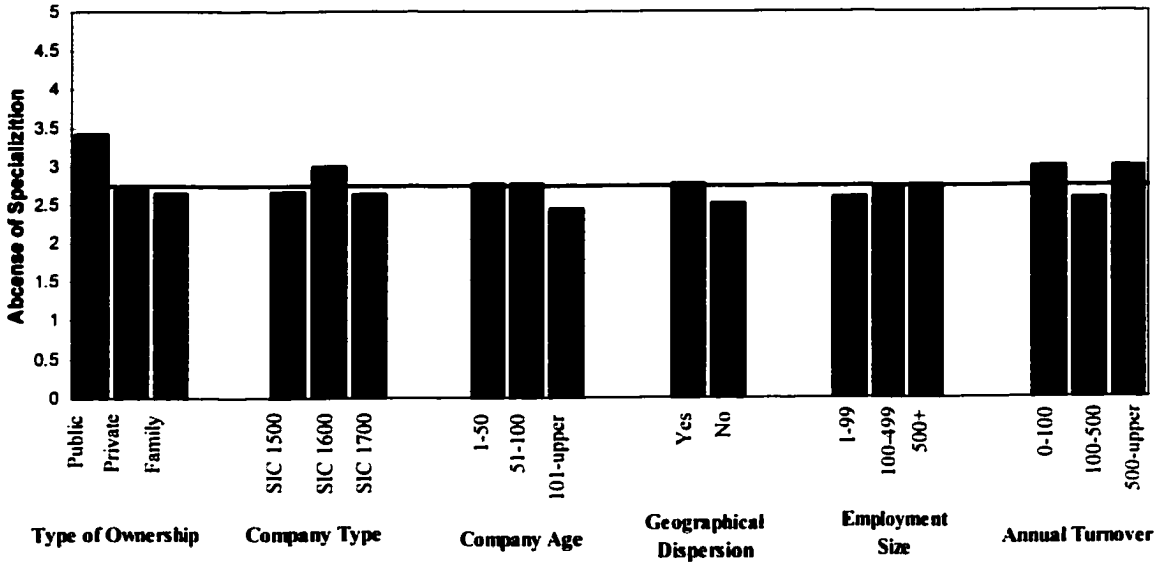

Figure 7.3 Significance of Absence of Specialization on Company Decline According to Demographic Characteristics

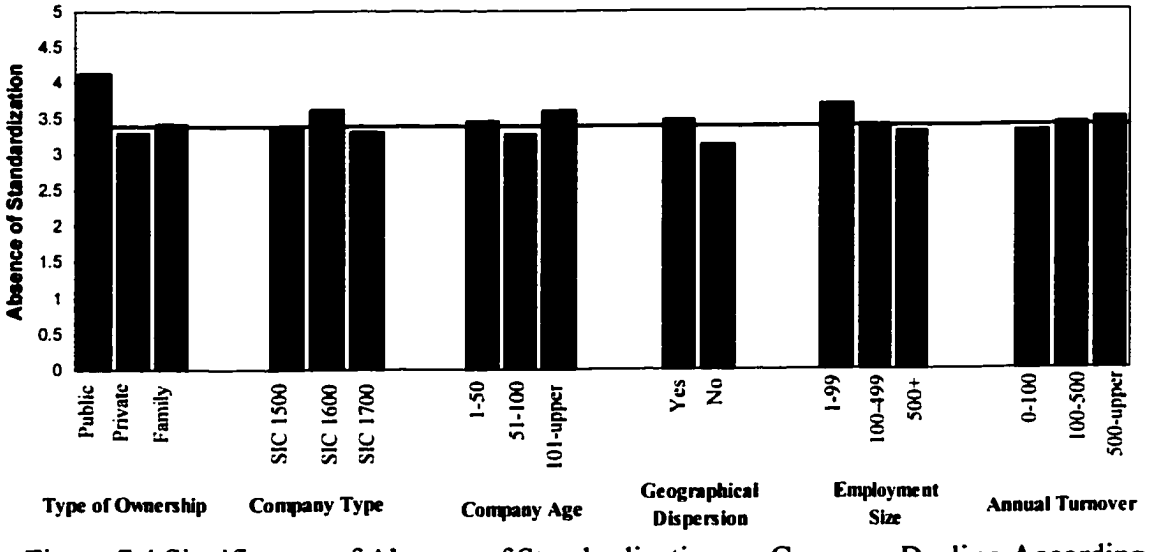

Figure 7.4 Significance of Absence of Standardization on Company Decline According to Demographic Characteristics

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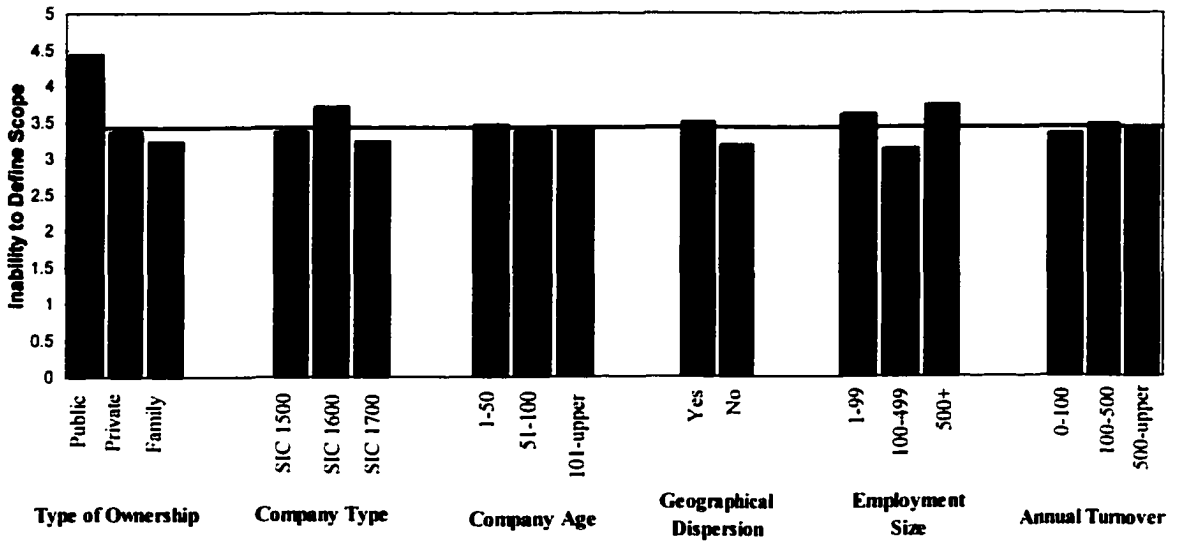

Figure 7.5 Significance of Company's Inability to Define Scope on Company Decline According to Demographic Characteristics

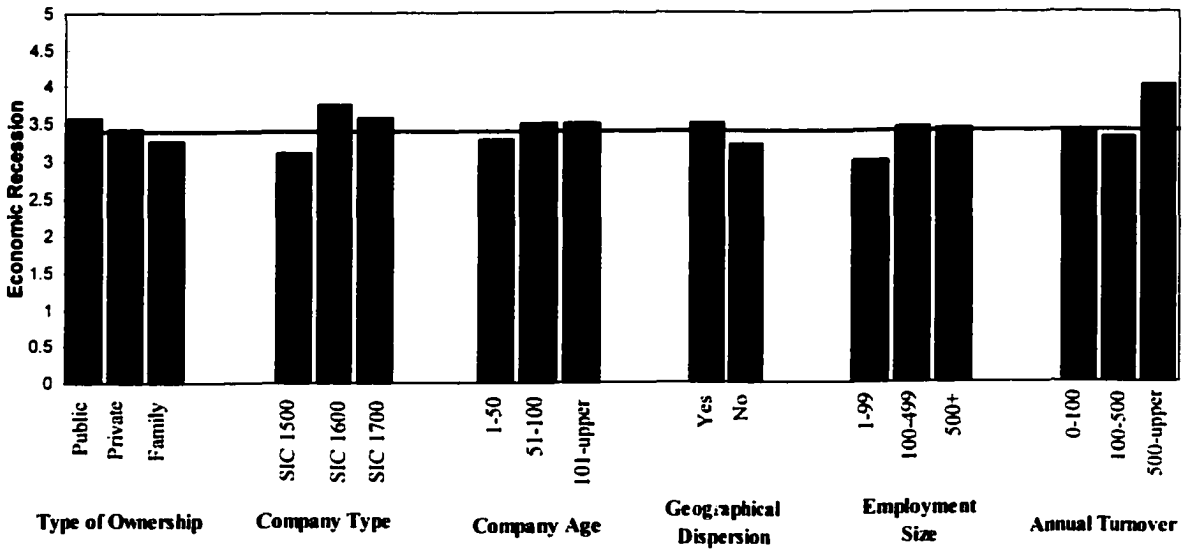

Figure 7.6 Significance of Economic Recession on Company Decline According to Demographic Characteristics

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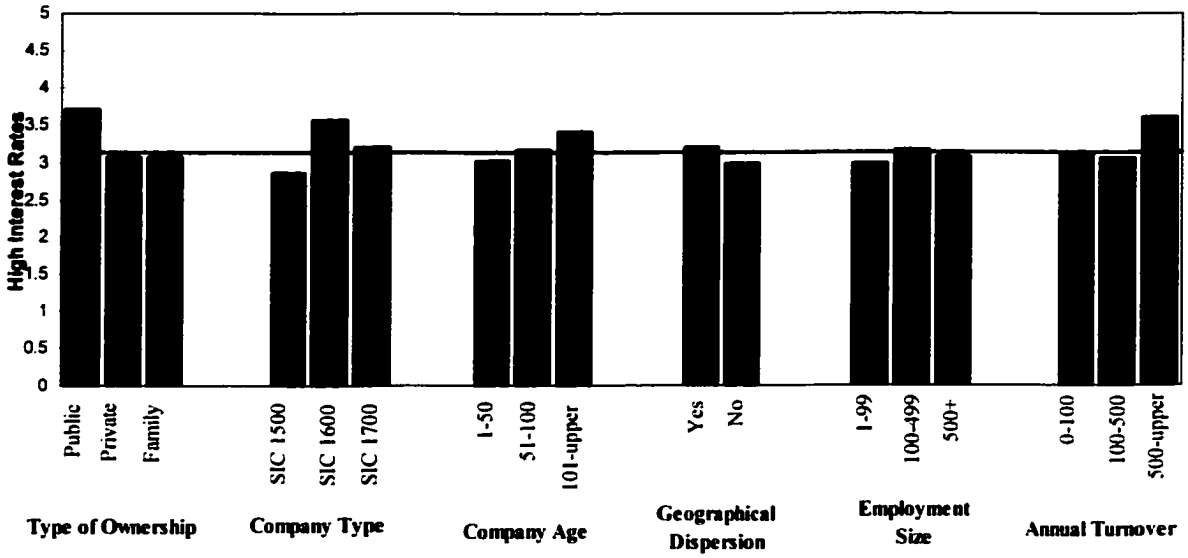

Figure 7.7 Significance of High Interest Rates on Company Decline According to Demographic Characteristics

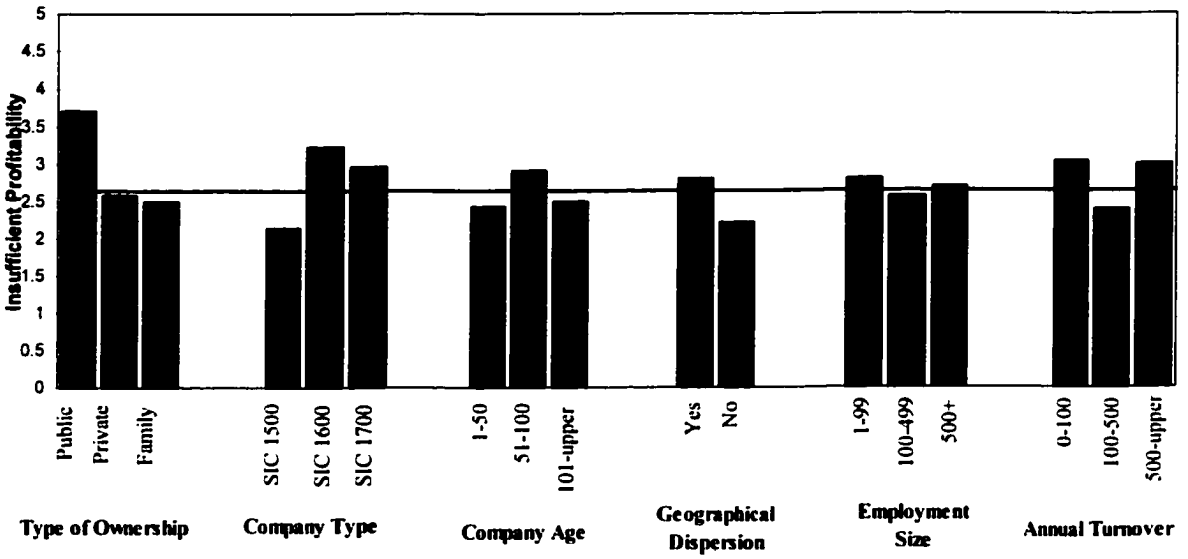

Figure 7.8 Significance of Insufficient Profitability on Company Decline According to Demographic Characteristics

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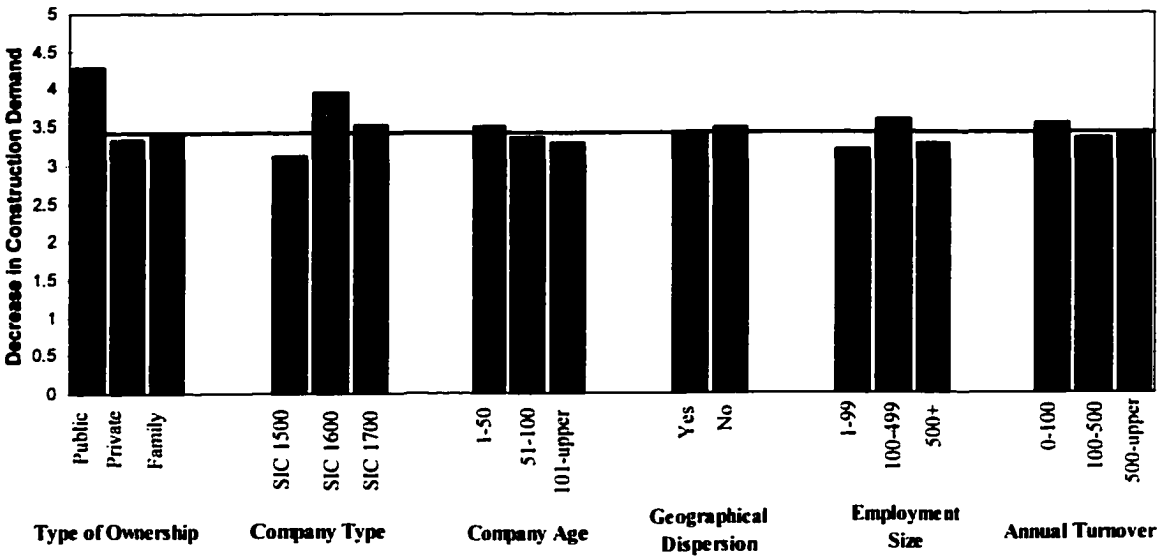

Figure 7.9 Significance of Decrease in Construction Demand on Company Decline According to Demographic Characteristics

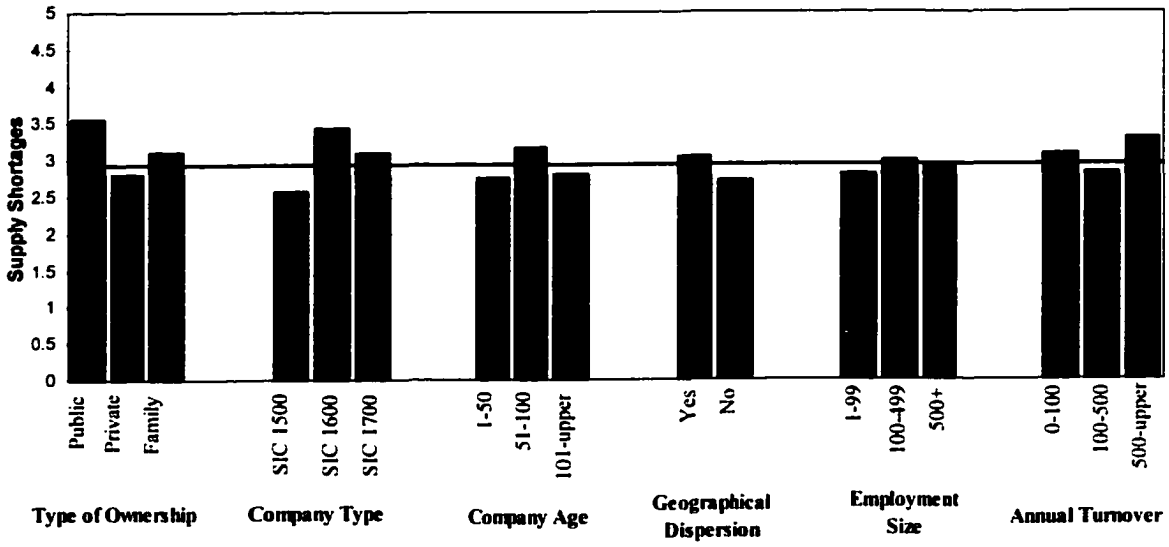

Figure 7.10 Significance of Supply Shortages on Company Decline According to Demographic Characteristics

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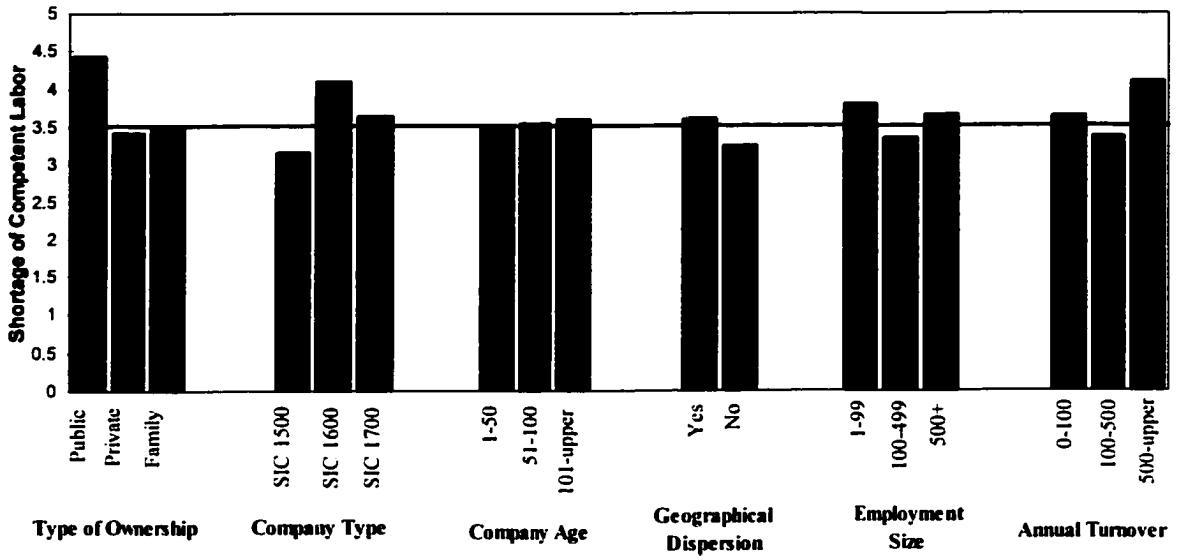

Figure 7.11 Significance of Shortage of Competent Labor on Company Decline According to Demographic Characteristics

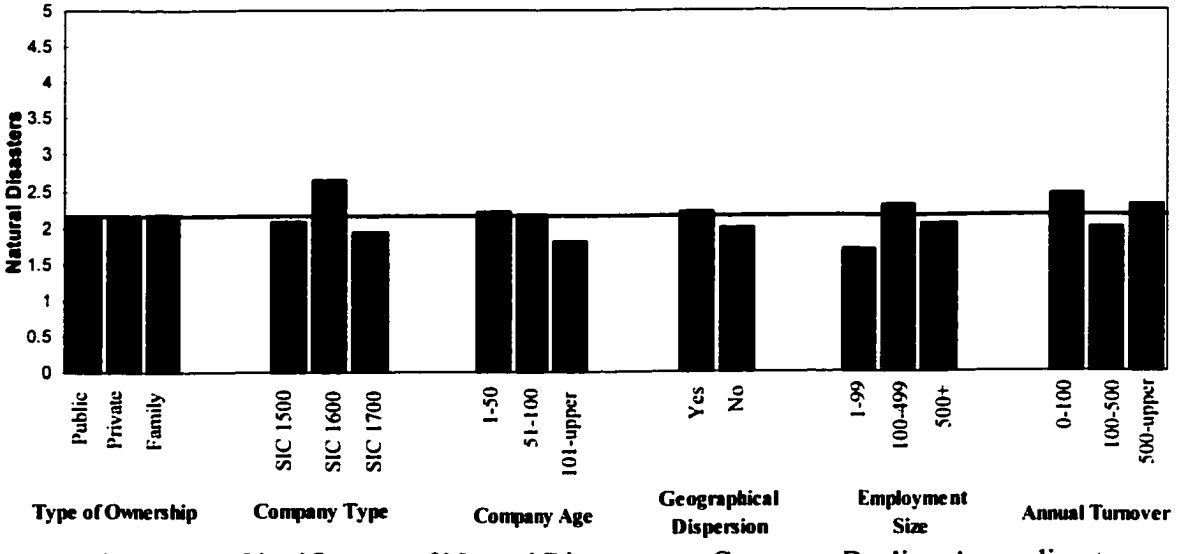

Figure 7.12 Significance of Natural Disasters on Company Decline According to Demographic Characteristics

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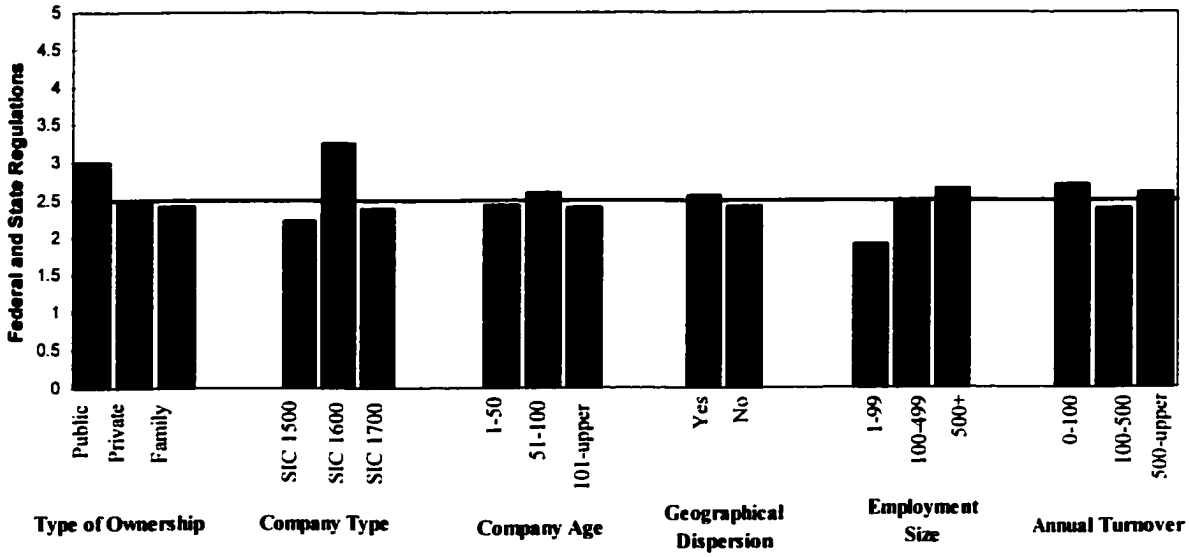

Figure 7.13 Significance of Federal and State Regulations on Company Decline According to Demographic Characteristics

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Figure 7.2, 7.3, and 7.4 indicate that absence of formalization, specialization, and standardization are more significant causes of decline in public companies. Formalization, specialization, and standardization are described in detail in Chapter 5. Briefly, formalization is described as the rules, procedures, instructions,, and communications of an organization (most of the time) in written format; specialization is described as the division of labor within the organization and/or distribution of official duties among a number of positions; standardization is the procedures that are governed by regulations. It is argued that public companies are in general larger than family owned or private companies and that larger companies that lack formalization, specialization, and standardization would be vulnerable to decline. Size related data (number of employees and annual turnover) in Figure 7.2, 7.3, and 7.4 tend to support this argument.

Figure 7.5 shows that the type of ownership, plays a role in the effects of "inability to define the scope of a company" on company decline. The outcome of the survey shows that publicly owned companies rate this cause of decline as very significant (μ=4.43) whereas family owned companies attach a lower significance (μ=3.23) to this variable.

The rest of the causes of decline presented in Figure 7.6 to 7.13 display environmental causes. The common feature of these findings is that decline is affected by "economic recession" (Figure 7.6), "high interest rates" (Figure 7.7), "insufficient profitability" (Figure 7.8), "decrease in construction demand" (Figure 7.9), "supply shortages" (Figure 7.10), "shortage of competent labor" (Figure 7.11), and "federal and

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state regulations" (Figure 7.13) more in publicly held companies than in family owned or private companies. This finding is sometimes tied to the size of the company (larger companies tend to be publicly owned) and sometimes to the type of work the companies undertake (general and heavy contractors tend to be larger and more of them are publicly owned than building contractors).

7.3 Findings of Survey 2 (Company Profile)

The model proposed in this study attempts to define the decline process in construction companies. The data to test the model are collected by conducting two parallel surveys using the same questionnaire. The populations of the surveys are composed of construction companies that filed bankruptcy and others that did not. The sources used to collect the data from are described in detail in Chapter 6. Survey 2 (Company Profile) (see Appendix B) was mailed to a total of 406 construction companies that filed bankruptcy in the last twenty years. 31 percent of the mail was returned as "undeliverable" by the Post Office. This means that those companies have either moved to another location with no forwarding address or converted to Chapter 7 –liquidation- and dissolved. Another attempt was made to check the address and current status of the companies that filed bankruptcy. Some of the states publish details about the companies in their states on their state websites as public information. The researcher checked one more time the status and address of the companies in the sample. It was found that the majority of the companies' current condition was "inactive", which means they no longer function as a business entity. The same survey was mailed to "active" bankrupt companies that filed bankruptcy in the last 5 years. A total of 135 surveys were mailed in

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this second round. The final number of "active" bankrupt companies that responded to the survey was 11 (8% of the 135 companies that went bankrupt in the last 5 years). Survey 2 (Company Profile) was also mailed (see Appendix C) to a total of 343 randomly selected construction companies that have not filed bankruptcy. The rate of response in this survey was 12 percent.

The demographics of the surveys can be described as follows:

- According to Figure 7.14, while non-bankrupt companies are dominated by family owned businesses (72%), bankrupt companies appear to be mostly privately owned (64%). There aren't any publicly owned bankrupt companies in the sample.
- The age of the non-bankrupt companies is between 3 and 106 (μ= 32.26) whereas for bankrupt companies, it is between 3 and 26 (μ= 11.90). The outcome shows that bankrupt companies in this sample are relatively younger than non-bankrupt companies.
- The data indicate that while 1/3 of non-bankrupt companies are geographically dispersed no bankrupt company has offices in different locations.
- The distributions in Figure 7.15 indicate that bankrupt companies are in general smaller (55% reported no employees) than non-bankrupt companies, but it is not clear if the smallness is a direct result of the company filing for bankruptcy.

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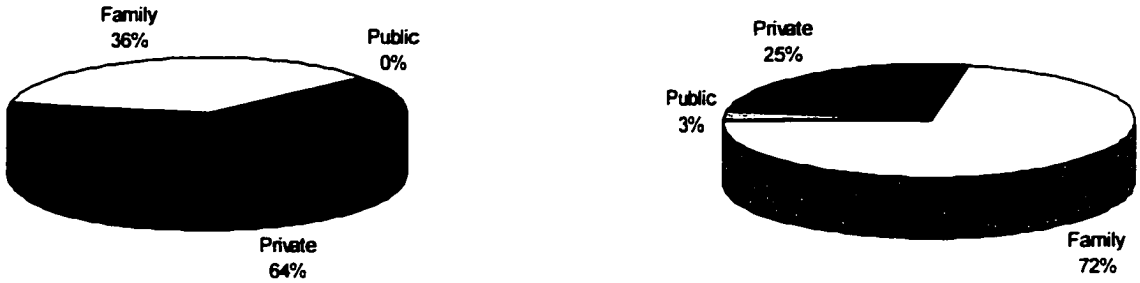
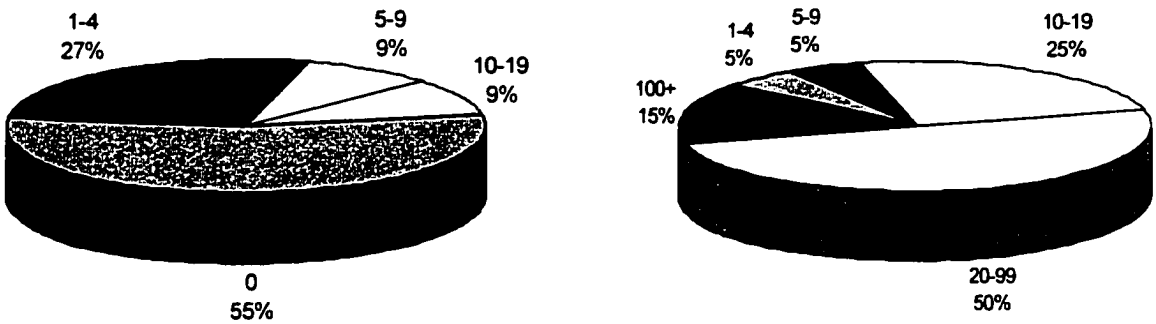


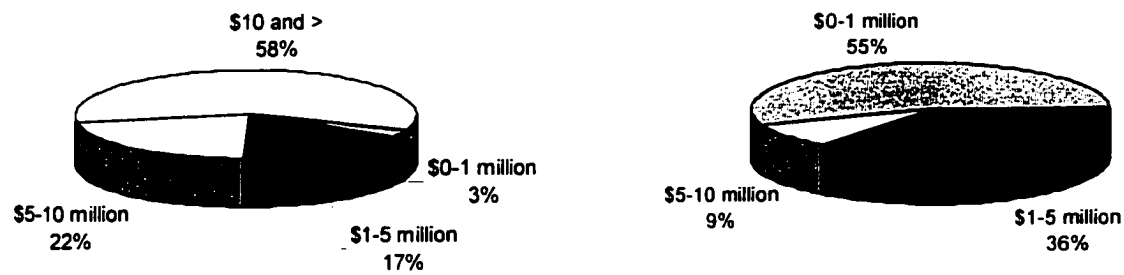
Bankrupt companies Non-bankrupt companies

Figure 7.14 Type of Ownership of Responding Companies



Bankrupt companies Non-bankrupt companies

Figure 7.15 Number of Full-Time Employees Employed by Responding Companies



Bankrupt companies Non-bankrupt companies

Figure 7.16 Annual Turnover of Responding Companies

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- As mentioned in the previous section annual turnover is another parameter for measuring the size of a company. Based on this parameter (Figure 7.16), it can be said that bankrupt companies are in general smaller than non-bankrupt companies. There is no bankrupt company in the sample that has more that $10 million annual turnover. It is not clear whether the bankrupt companies have shrunk in size after filing bankruptcy.
- The respondents' average level of experience in the industry is 30 years for non-bankrupt companies and 21 years for bankrupt companies. This finding is consistent with the younger age and smaller size of bankrupt companies.

7.3.1 Hypothesis testing: The hypotheses developed in Chapter 5 define the causes of construction company decline. The variables used in these hypotheses were formulated in statement form and included in the second part of the Survey 2 (Company Profile) (see Appendix B). The respondents of bankrupt and non-bankrupt companies were asked to rate these statements based on their most objective observations in their respective companies on a scale of 1 to 5 where 1=extremely weak, 2=weak, 3=fairly strong, 4=strong, and 5=extremely strong. The descriptive statistics were calculated for both bankrupt and non- bankrupt companies. Table 7.2 shows the outcome for non-bankrupt companies. According to the information in Table 7.2, aspects of human capital seem to be the strongest characteristic of non-bankrupt companies. Indeed, managers' level of work experience (μ=4.23), education (μ=3.98), and business knowledge (μ=3.85) are rated as the strongest three characteristics. These are followed by adaptation to advances in managerial practices (μ=3.73) and construction technologies (μ=3.71), which

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Table 7.2 Condition of Non-Bankrupt Companies Relative to Decline Variables

Rank	Description of variable	Number of Respondents	Minimum Score	Maximum Score	Mean Score	Std. Deviation
1	Managers' work experience	40	3	5	4.23	0.70
2	Managers' education	40	2	5	3.98	0.80
3	Managers' business knowledge	40	2	5	3.85	0.80
4	Adaptation to advances in managerial practices	41	1	5	3.73	0.98
5	Adaptation to advances in construction technologies	41	2	5	3.71	0.87
6	Managers' managerial experience	40	2	5	3.70	0.65
7	Ability to activate competitive strategy	40	2	5	3.70	0.76
8	Defining company's competitive advantage	40	2	5	3.65	0.70
9	Horizontal communication	41	2	5	3.51	0.87
10	Level of self performance	38	1	5	3.45	1.11
11	Vertical communication	41	2	5	3.37	0.89
12	Resource utilization	40	3	5	3.35	0.58
13	Diversification of company's production market	40	2	5	3.33	0.97
14	Standardization	41	2	5	3.22	0.85
15	Dependence on other organizations	41	2	5	3.22	0.88
16	Decentralization	41	1	5	3.20	0.95
17	Defining the scope of the company	40	2	5	3.20	0.65
18	Formalization	41	1	5	2.80	0.90
19	Specialization	41	1	5	2.78	0.85
20	Diversification of company's production portfolio	39	1	5	2.21	0.95
21	Representation of outside members in the company board	39	1	5	1.79	0.95

Note: The strength of each potential cause of decline was assessed by respondents on a scale of 1 to 5, where 1=extremely weak, 5=extremely strong.

Table 7.3 Condition of Non-Bankrupt Companies Relative to Major Decline Variables

Description of variable	Number of Respondents	Minimum Score	Maximum Score	Mean Score	Std. Deviation
Human capital	40	5	10	7.48	1.30
Strategic posture	41	5	9	7.12	1.14
Organizational structure	41	4	10	6.90	1.39
Overall company condition	41	5	9	7.29	1.10

Note: The strength of each variable was assessed by respondents on a scale of 1 to 10, where 1=extremely weak, 10=extremely strong.

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are related to the organizational aspects of companies. These variables are described in detail in Chapter 5. The respondents in this survey rated "the representation of outside members in the company's executive board" as their weakest characteristic (μ=1.79).

In addition to rating their companies' organizational structure, human capital, and strategic posture, the respondents were also asked to rate the overall condition of their company in the context of the statements listed in the survey, on a 1-10 scale where 1=extremely weak, 10=extremely strong (See Table 7.3). The outcome of this part of the survey is consistent with the overall responses to the remaining parts of the questionnaire. Human capital has the highest rating (μ=7.48) which is followed by strategic posture (μ=7.12) and organizational structure (μ=6.90). The overall rating for the companies in this sample can be considered to be "strong" (μ=7.29).

A similar statistical approach was applied to bankrupt companies as well. The outcome of the bankrupt companies' descriptive analysis is shown in Table 7.4. Similar to non-bankrupt companies' survey, the outcome of the survey of bankrupt companies shows that human capital aspects are the strongest characteristic of bankrupt companies. Managers' level of work experience (μ=4.27), education (μ=3.98), business knowledge (μ=3.64), and managerial experience (μ=3.64) are the characteristics of bankrupt companies where they are strongest. "Dependence on other organizations", which is the company's level of dependence on suppliers, special trades, and other organizations is also considered to be one of the strongest characteristics (μ=3.73) of bankrupt companies.

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Table 7.4 Condition of Bankrupt Companies Relative to Decline Variables

Rank	Description of variable	Number of Respondents	Minimum Score	Maximum Score	Mean Score	Std. Deviation
1	Managers' work experience	11	2	5	4.27	1.10
2	Managers' education	11	2	5	3.91	0.94
3	Dependence on other organizations	11	2	5	3.73	0.90
4	Managers' business knowledge	11	2	5	3.64	1.21
5	Manager's managerial experience	11	2	5	3.64	1.21
6	Adaptation to advances in construction technologies	11	1	4	3.27	1.01
7	Diversification of company's production market	11	2	5	3.27	1.10
8	Horizontal communication	11	2	5	3.18	0.87
9	Vertical communication	11	2	5	3.09	0.94
10	Adaptation to advances in managerial practices	11	1	5	3.00	1.10
11	Resource utilization	11	1	4	3.00	0.77
12	Ability to activate competitive strategy	11	1	5	2.91	1.30
13	Specialization	11	1	4	2.82	0.98
14	Defining company's competitive advantage	11	1	5	2.82	1.40
15	Defining the scope of the company	11	1	5	2.73	1.27
16	Decentralization	11	1	5	2.64	1.29
17	Standardization	11	1	5	2.64	1.21
18	Level of self performance	10	1	4	2.50	1.18
19	Formalization	11	1	4	2.18	0.98
20	Diversification of company's production portfolio	11	1	3	2.18	0.75
21	Representation of outside members in the company board	11	1	5	1.82	1.40

Note: The strength of each potential cause of decline was assessed by respondents on a scale of 1 to 5, where 1=extremely weak, 5=extremely strong.

Table 7.5 Condition of Bankrupt Companies Relative to Major Decline Variables

Description of variable	Number of Respondents	Minimum Score	Maximum Score	Mean Score	Std. Deviation
Human capital	11	3	9	6.45	2.58
Strategic posture	11	3	9	5.36	2.25
Organizational structure	11	2	8	4.45	1.75
Overall company condition	11	3	9	5.55	1.92

Note: The strength of each variable was assessed by respondents on a scale of 1 to 10, where 1=extremely weak, 10=extremely strong.

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Like in non-bankrupt companies, "representation of outside members in the company's executive board" is the weakest characteristic of bankrupt companies.

The ranking of the variables in Table 7.4 is consistent with the overall ratings (human capital, strategic posture, organizational structure, and overall company condition) of bankrupt companies presented in Table 7.5. The respondents in bankrupt companies gave the highest rating to their human capital capabilities (μ=6.45) that is followed by their strategic posture (μ=5.36) and their organizational structure (μ=4.45). The respondents also rated their companies' overall condition "weak" (μ=5.55) (Table 7.5). Although the ranking of the overall ratings for bankrupt and non-bankrupt companies are similar, the mean score of the ratings of bankrupt companies are smaller than the mean scores of non-bankrupt companies. This outcome is expected since the condition of bankrupt companies should be inferior to the condition of non-bankrupt companies.

The Mann-Whitney test was suggested in Chapter 6 for hypothesis testing. Since the distribution of the sample is not normal, the Mann-Whitney test is the most appropriate method to test the significance of hypotheses (Table 7.6). The list of the hypotheses to be tested is as follows:

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Table 7.6 Mann-Whitney Test of Hypotheses Using Decline Variables

Description of Variable	Mann-Whitney U	Z	Asymp. Sig. (2-tailed)
Organizational Structure			
Vertical communication	184,500	-, 970	, 332
Horizontal communication	172,000	-1,272	, 203
Decentralization	160,500	-1,514	, 130
Formalization*	136,000	-2,137	, 033
Specialization	212,000	-, 324	, 746
Standardization*	148,000	-1,818	, 069
Dependence on other organizations*	155,000	-1,665	, 096
Adaptation to advanced managerial practices*	136,500	-2,085	, 037
Adaptation to advanced construction technologies	181,500	-1,048	, 295
Human Capital Issues			
Managers' education	216,000	-, 098	, 922
Managers' work experience	191,000	-, 718	, 473
Managers' business knowledge	196,500	-, 575	, 565
Managers' managerial experience	213,500	-, 163	, 870
Representation of outsiders in the company board	189,000	-, 651	, 515
Strategic Posture			
Defining the scope of company	163,500	-1,476	, 140
Resource utilization	178,000	-1,207	, 228
Exploiting competitive advantage*	143,000	-1,912	, 056
Synergy to activate competitive strategy*	140,000	-1,958	, 050
Diversification of production market	216,500	-, 084	, 933
Diversification of production portfolio	205,000	-, 240	, 810
Level of self-performance*	109,500	-2,139	, 032

*Significant difference at 0.10 level

Table 7.7 Mann-Whitney Test of Hypotheses Using Major Decline Variables

Description of Variable	Mann-Whitney U	Z	Asymp. Sig. (2-tailed)
Organizational structure*	70,000	-3,563	, 000
Human capital	181,500	-, 898	, 369
Strategic posture*	121,500	-2,379	, 017
Overall company condition*	99,000	-2,908	, 004

*Significant difference at 0.10 level

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H_0: The bankrupt and non-bankrupt companies population means for each variable are equal.

$H_{5.2.2.A}$ Organizational structure affects construction company decline.

$H_{5.2.2.1}$ Ineffective vertical communication causes construction companies to decline.

$H_{5.2.2.2}$ Ineffective horizontal communication causes construction companies to decline.

$H_{5.2.2.3}$ Decentralization causes construction companies to decline.

$H_{5.2.2.4}$ Formalization protects construction companies from decline.

$H_{5.2.2.5}$ Specialization protects construction companies from decline.

$H_{5.2.2.6}$ Standardization protects construction companies from decline.

$H_{5.2.2.7}$ High level of dependence on third parties causes construction companies to decline.

$H_{5.2.2.8}$ Advanced managerial practices protect construction companies from decline.

$H_{5.2.2.9}$ Advanced construction technologies protect construction companies from decline.

$H_{5.2.2.B}$ Human capital affects construction company decline.

$H_{5.2.2.10}$ Managers' lack of education causes construction companies to decline.

$H_{5.2.2.11}$ Managers' lack of work experience causes construction companies to decline.

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$H_{5.2.2.12}$ Managers' lack of business knowledge causes construction companies to decline.

$H_{5.2.2.13}$ Managers' lack of managerial experience causes construction companies to decline.

$H_{5.2.2.14}$ The unbalanced composition (internal vs. external members) of the board causes construction companies to decline.

$H_{5.2.3.}$ Strategic posture affects construction company decline.

$H_{5.2.3.1}$ Inability to define the scope of company activities causes construction companies to decline.

$H_{5.2.3.2}$ Inefficient resource utilization causes construction companies to decline.

$H_{5.2.3.3}$ Inability to exploit competitive advantage causes construction companies to decline.

$H_{5.2.3.4}$ Lack of synergy to activate competitive strategy causes construction companies to decline.

$H_{5.2.3.5}$ Inability to diversify the company's production market causes construction companies to decline.

$H_{5.2.3.6}$ Inability to diversify the company's production portfolio causes construction companies to decline.

$H_{5.2.3.7}$ Low level of self-performance causes construction companies to decline.

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The Mann-Whitney test measures the significance of the difference between the means of two samples in a population. In this research, 11 bankrupt construction companies represent one sample and 41 non-bankrupt companies represent the other. The null hypothesis in this test assumes that there is no difference between the means of the two samples selected. The assumption is that if the level of significance for the Mann-Whitney test is 0.10 or less then the null hypothesis is rejected. The Mann-Whitney test does not require the sample sizes of the two groups to be equal.

- **Formalization:** The outcome of this part of the research shows that "formalization" is an organizational feature where the ratings of bankrupt and non-bankrupt companies are significantly (at 10% level) different. Therefore the null hypothesis is rejected. The respondents of bankrupt companies rated their companies' level of formalization "week" (μ=2.18) whereas the respondents of non-bankrupt companies rated this variable "fairly strong" (μ=2.80). As mentioned in Chapter 5, formalization defines the degree of formal job descriptions and the presence of codified rules and procedures in a written format. Therefore, it can be argued that the existence of company rules, policies and procedures provides an order as well as guides the workers to function better in a company. The evidence in this test shows that there is a significant and positive difference between the bankrupt and non-bankrupt companies on the level of formalization, and that non-bankrupt companies are better (even though not extremely strong) in providing rules and procedures as well as job descriptions to improve the condition of their company. The hypothesis for "formalization protects construction companies from decline" ($H_{5.2.2.3}$) is accepted.

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- **Standardization:** Standardization is defined in Chapter 5 as the events, which have regularity of occurrence and are legitimized by the organization to improve its performance. These events consist of the internal reporting activities of a construction company such as monthly cost reports of the active projects, schedule updates, and project meetings, departmental meetings, total quality management meetings, etc. These activities provide a regular information flow within and between the departments of an organization, establishes a thorough monitoring system of the activities and creates incentive to enhance the performance of employees and departments in general. The Mann-Whitney test shows a significant difference in "standardization" between bankrupt and non-bankrupt companies at 90 percent confidence level. The respondents of the bankrupt companies rated their companies' level of standardization "week" (μ=2.62) whereas the respondents of non-bankrupt companies rated this variable "fairly strong" (μ=3.22). Since non-bankrupt companies are better at standardizing the regular activities and hence improving the condition of their company, the hypothesis "standardization protects construction companies from decline" ($H_{5.2.2.5}$) is accepted.

- **Dependence on other organizations:** A "high level of dependence on third parties causes construction companies to decline" ($H_{5.2.2.6}$). The third parties include suppliers, special trades, and other organizations such as surety companies, banks, professional associations, and regulatory agencies. The disadvantage of high dependence on suppliers involves being negatively affected by seasonal sales fluctuations and by shortages of domestic products particularly if these are dependent on foreign markets. Dependence on special trades has the disadvantage of loosing control of certain activities

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as well as the schedule and quality aspects of these activities. Furthermore, dependence on third parties brings extra liabilities to the company. In general a high level of dependence on third parties increases the risk that organizations take; therefore a lower level of dependence indicates a stronger condition for a company. The outcome of the test indicates a significant difference between bankrupt and non-bankrupt companies in this characteristic at 90 percent confidence. The respondents of the bankrupt companies rated their companies' level of dependence "strong" (μ=3.73) whereas the respondents of non-bankrupt companies rated this variable "fairly strong" (μ=3.22). Since non-bankrupt companies have a lower level of dependence on other organizations than bankrupt companies, the hypothesis "high level of dependence on third parties causes construction companies to decline" ($H_{5.2.2.6}$) is accepted.

- **Adaptation to advanced managerial practices:** The history of the use of high technology for the management of a construction company is rather new for the construction industry compared to manufacturing industries. However, the use of modern technologies in cost accounting, scheduling, and estimating are nowadays common practice in the industry. Attempts have also been made to adapt advanced information technology tools that are commonly used in other industries (e.g., banking, retail) such as electronic bidding, enterprise resource planning, etc. In general, it is believed that the use of advanced technologies in the managerial process increases the efficiency of a company and also provides a reliable monitoring system of the activities of the company. The organizational profile survey asked the bankrupt and non-bankrupt company respondents to rate the extent to which advanced technologies are used in their

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managerial practices. The outcome of the test shows that a significant difference exists between bankrupt and non-bankrupt companies. According to this finding, bankrupt companies report the use of advanced managerial practices in their company to be "fairly strong" (μ=3.00) whereas non-bankrupt companies' use of advanced managerial practices appear to be "strong"(μ=3.73). The hypothesis "advanced managerial practices protect construction companies from decline" ($H_{5.2.2.7}$) is therefore accepted.

- **Exploiting competitive advantage and synergy to activate competitive strategy:** There are ranges of techniques that can be used to aid in the planning phase of strategic management. These allow a company to analyze the industry and markets they are in, distinguish which competitive strategy they are following, understand why groups of companies are in certain sectors. By exploiting the competitive arena, a company can benchmark itself against other companies, identify and exploit core competencies, develop a strategic vision and redesign its processes (Betts et al., 1999). Therefore, it is clear that the companies that can define their competitive advantage and activate their strategies based on these assumptions are in better condition than the others. The organizational profile survey asked that respondents rate their ability to define their competitive advantage and to develop strategies accordingly. Defining the competitive advantage and activating a competitive strategy are reported to be "fairly strong" (μ=2.82 and μ=2.91 respectively) by bankrupt companies whereas they are reported to be "strong" by non-bankrupt companies (μ=3.65 and μ=3.70 respectively). The Mann-Whitney test shows a significant difference between the bankrupt and non-bankrupt companies in this respect at 90 percent confidence. Based on these findings, the hypotheses "inability to

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exploit a company's competitive advantage causes construction companies to decline" ($H_{5.2.3.3}$) and "lack of synergy to activate competitive strategy causes construction companies to decline" ($H_{5.2.3.4}$) are accepted.

- **Level of self-performance:** The respondents were asked to rate the level of self-performance in the critical activities of the construction process. The aim of this question was to determine how much of the work is performed by the company itself as opposed to relying on other organizations such as subcontractors. The argument is that if a company's level of self-performance is high, then the level of dependence on other organizations will be low hence reducing the risks taken by a company on the critical activities. The outcome of the Mann-Whitney test shows that there is a significant difference between bankrupt and non-bankrupt companies on the level of self-performance of critical activities. The respondents of the bankrupt companies rated their level of self-performance "weak" (μ=2.50) whereas non-bankrupt companies rated it "strong" (μ=3.45). A high level of self-performance on critical activities reduces the risk of failure in such activities and therefore improves the overall condition of a company. The hypothesis "level of self performance" is therefore accepted.

Survey 2 (Company Profile) aims to map the characteristics of bankrupt and non-bankrupt construction companies according to their organizational structure, human capital and strategic posture. Although in Chapter 5 the causes of organizational decline include environmental factors too, this survey excludes environmental factors because environmental factors constitute external causes of company decline and are not within

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the control of management. Managers can understand the environmental causes and may take measures to protect their company, but environmental factors are not generated by the organization. Therefore, respondents in Survey 2 (Company Profile) survey were asked to rate their organization in three parts including organizational structure, human capital, and strategic posture, but not environmental factors. The respondents rated the items in each part and then they were asked to rate their company's overall condition in organizational structure, human capital, and strategic posture on a 1 to 10 scale, 1 being extremely weak and 10 extremely strong. Respondents also rated the overall condition of their company on the same 1 to10 scale. As it can be seen in Table 7.6, the items that have significant differences between bankrupt and non-bankrupt companies are either organizational structure characteristics or strategic posture characteristics. Correspondingly, Table 7.7 shows that a significant difference exists between bankrupt and non-bankrupt companies concerning organizational structure and strategic posture at 90 percent confidence. This close agreement between the respondents' responses to individual characteristics and to overall condition is proof that the data are consistent and reliable. The respondents of the bankrupt companies rated their organizational structure "weak" (μ=4.45), strategic posture "fairly strong" (μ=5.36), and overall condition "fairly strong" (μ=5.55). On the other hand non-bankrupt companies rated their organizational structure "strong" (μ=6.90), strategic posture "strong" (μ=7.12), and overall condition "strong" (μ=7.29). Note that non-bankrupt companies' respondents rated their companies' condition significantly higher than the bankrupt company respondents. Therefore, the hypotheses "organizational structure affects construction company

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decline" ($H_{5.2.2.A}$) and "strategic posture affects construction company decline"($H_{5.2.3.}$) are accepted.

7.3.2 Factor Analysis Findings: Factor analysis determines the relationships among a set of variables where these relationships are evaluated across a set of individuals under specific conditions (Gorsuch, 1983). The variables are the characteristics being measured and could be anything that can be objectively scored. In the organizational profile survey, the statements that the respondents were asked to rate represent the variables. The 21 variables that are the likely causes of company decline (Tables 7.2 and 7.4) were subjected to factor analysis. Factor analysis attempts to identify underlying variables, or factors, that explain the pattern of correlations within a set of observed variables. Factor analysis is often used in data reduction to identify a small number of factors that explain most of the variance observed in a much larger number of manifest variables. Principal component analysis is used as the extraction method of the factor analysis. Factors are rotated using varimax rotation to maximize the variance of squared loadings for each factor and to produce clear factor loadings. Total variance, the scree plot, and the rotated component matrix are presented in Table 7.8, Figure 7.17, and Table 7.9, respectively. The output of the factor analysis will be used as an input to the Multinomial Logistic Regression analysis described in the following section.

The percent of variance represented by seven factors can be seen in the first four columns of Table 7.8. The *Total* column represents the eigenvalues for the multivariate

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space of the original variables that are ordered by size. An eigenvalue is the sum of the squared loadings of each factor and reflects the proportion of variance explained by each factor (Kline, 1994). The percentage of the total variance extracted is computed by dividing the sum of the eigenvalues for the factors extracted by the total sum of all the variances (Gorsuch, 1983). Rotated scores on the other hand are displayed in the last three columns of Table 7.8. By using this extraction method and rotation method the seven factors account for 73% of the variability of the original 21 variables.

Estimating the number of factors that best describe the phenomenon being analyzed can be done in different ways. Variance analysis and scree plots are the tools that researchers use to determine the number of factors to be considered (Gorsuch, 1983; Kline, 1994; Stevens, 1996). As it can be seen on the scree plot (Figure 7.41) the difference between the eigenvalues decreases sharply for the first three components but becomes quite uniform afterwards. Therefore, the first three components will be used in the next section of the analysis.

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Table 7.8 The Total Variance After Extraction and Rotation.

Factors	Sums of Squared Loadings After Extraction			Sums of Squared Loadings After Rotation		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.975	28.453	28.453	2.708	12.897	12.897
2	2.217	10.557	39.009	2.679	12.756	25.653
3	2.034	9.687	48.696	2.214	10.544	36.197
4	1.605	7.641	56.337	2.177	10.367	46.564
5	1.276	6.075	62.412	2.156	10.266	56.829
6	1.174	5.590	68.002	1.974	9.400	66.229
7	1.0051	4.767	72.769	1.373	6.540	72.769

Extraction Method: Principal Component Analysis.

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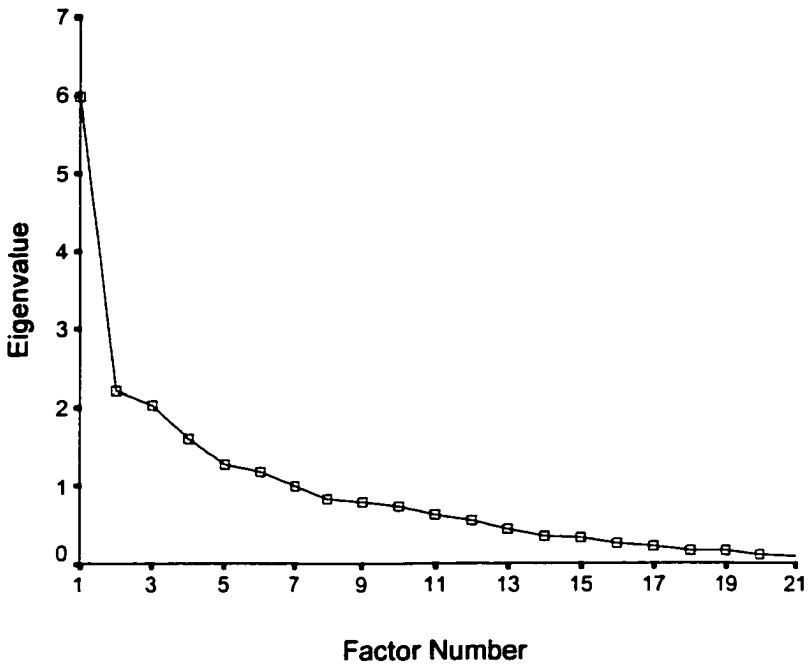

Figure 7.17 Scree Plot

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Table 7.9 Rotated Factor Loadings (Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. Rotation converged in 15 iterations.)

Variables	Factor						
	1	2	3	4	5	6	7
Ability to activate competitive strategy	.872	.115	.149	.112	-.005	.005	-.007
Defining company's competitive advantage	.862	-.005	.155	-.135	-.135	.121	.008
Adaptation to advances in managerial practices	.670	.439	-.127	.205	.198	.008	.147
Adaptation to advances in construction technologies	.620	.228	.005	.170	.316	.005	.201
Standardization	.005	.749	-.010	.362	.143	.293	-.002
Defining the scope of the company	.330	.688	.386	-.009	.125	.172	-.115
Diversification of company's production market	.181	.661	.298	-.005	.248	.005	-.003
Specialization	.000	.641	-.009	.450	.006	-.006	.392
Resource utilization	.297	.425	.419	-.002	.151	.308	.330
Managers' business knowledge	.179	.007	.842	.005	.161	.172	.006
Managers' work experience	.004	.297	.688	.322	-.336	.005	0.009
Managers' managerial experience	-.002	-.009	.570	.171	.106	.491	.420
Vertical communication	.005	.007	.161	.899	.002	.124	-.002
Horizontal communication	.114	.117	.006	.792	.122	.304	-.000
Diversification of company's production portfolio	.126	.007	.149	.211	.730	-.307	-.130
Formalization	.008	.200	-.224	.152	.723	.157	.192
Representation of outsider members in the company board	-.120	.151	.109	-.138	.705	.200	-.005
Level of self-performance	.008	.010	.005	.206	.008	.804	-.006
Managers' level of education	.134	.159	.270	.135	-.005	.580	-.009
Decentralization	.115	.361	.101	.115	.381	.446	.009
Dependence on other organizations	.130	.003	.009	-.002	-.003	-.010	.874

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The loadings of the seven factors are displayed in Table 7.9. The factor loading table provides the relationship between variables for each factor and enables to interpret the factors. The three factors are represented by the following 11 variables.

X_5 = Specialization

X_6 = Standardization

X_8 = Adaptation to advances in managerial practices

X_9 = Adaptation to advances in construction technologies

X_{11} = Managers' work experience

X_{12} = Managers' business knowledge

X_{13} = Managers' managerial experience

X_{15} = Defining the scope of the company

X_{17} = Defining company's competitive advantage

X_{18} = Ability to activate competitive strategy

X_{19} = Diversification of company's production market

In Table 7.9, the first factors' highest loadings consist of activating competitive strategy (0.872), defining competitive advantage (0.862), adaptation to advanced managerial practices (0.670) and adaptation to advanced construction technologies (0.620). Therefore, this factor can be named "competition based on innovation" (Factor 1, Equation 7.1). In the second factor, absence of standardization (0.749), defining the scope of the company (0.688), diversification of the production markets (0.661), and absence of specialization (0.641) are the driving variables. This factor can be named

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"organizational strategy" (Factor 2, Equation 7.2). The third and final factor to be used in the multinomial analysis, includes level of business knowledge (0.842), level of work experience (0.688), and level of managerial experience (0.570) as the leading variables. Therefore, this factor can be named "managers' qualifications" (Factor 3, Equation 7.3). The functions for the three factors are as follows. Note that factor score coefficients (Appendix D) are used to drive the weights of each variable.

$$\text{Factor 1} = 0X_1 + 0.027X_2 - 0.032X_3 + 0.005X_4 - 0.112X_5 - 0.092X_6 - 0.009X_7 + 0.247X_8 + 0.237X_9 + 0.007X_{10} - 0.082X_{11} - 0.006X_{12} - 0.084X_{13} - 0.099X_{14} + 0.019X_{15} + 0.007X_{16} + 0.393X_{17} + 0.388X_{18} - 0.044X_{19} + 0.049X_{20} - 0.001X_{21} \quad \text{(Eq. 7.1.)}$$

$$\text{Factor 2} = -0.124X_1 - 0.122X_2 + 0.063X_3 - 0.057X_4 + 0.314X_5 + 0.359X_6 - 0.032X_7 + 0.097X_8 - 0.059X_9 - 0.003X_{10} + 0.135X_{11} - 0.107X_{12} - 0.213X_{13} - 0.026X_{14} + 0.327X_{15} + 0.116X_{16} - 0.144X_{17} - 0.083X_{18} + 0.318X_{19} - 0.124X_{20} - 0.075X_{21} \quad \text{(Eq. 7.2)}$$

$$\text{Factor 3} = 0.070X_1 - 0.031X_2 - 0.057X_3 - 0.159X_4 - 0.115X_5 - 0.172X_6 - 0.002X_7 - 0.181X_8 - 0.048X_9 + 0.017X_{10} + 0.355X_{11} + 0.453X_{12} + 0.220X_{13} + 0.068X_{14} + 0.127X_{15} + 0.110X_{16} - 0.017X_{17} + 0.001X_{18} + 0.118X_{19} + 0.199X_{20} - 0.144X_{21} \quad \text{(Eq. 7.3)}$$

where,

X_1 = Vertical Communication

X_2 = Horizontal Communication

X_3 = Decentralization

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X_4 = Formalization

X_5 = Specialization

X_6 = Standardization

X_7 = Dependence on other organizations

X_8 = Adaptation to advances in managerial practices

X_9 = Adaptation to advances in construction technologies

X_{10} = Managers' education

X_{11} = Managers' work experience

X_{12} = Managers' business knowledge

X_{13} = Managers' managerial experience

X_{14} = Representation of outside members in the company board

X_{15} = Defining the scope of the company

X_{16} = Resource utilization

X_{17} = Defining company's competitive advantage

X_{18} = Ability to activate competitive strategy

X_{19} = Diversification of company's production market

X_{20} = Diversification of company's production portfolio

X_{21} = Level of Self-Performance

7.3.3 Multinomial Logistic Regression Analysis: Multinomial Logistic Regression (MLR) is useful for situations in which one wants to be able to classify subjects based on values of a set of predictor variables. When one has a dependent variable that is binary, one can use binary logistic regression to model the relationship

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between the dependent variable and a set of independent variables. The logistic model in this case will be built on the binary occurrence of the dependent variable (Eq. 7.4) (SPSS, 1999).

$$\text{logit}\left(\frac{\text{P(event)}}{\text{1 - P(event)}}\right) = B_0 + B_1X_1 + B_2X_2 + \ldots + B_PX_P \qquad \text{(Eq. 7.4)}$$

Where B_0 is the intercept, B_1 to B_p are the logistic regression coefficients, and X_1 to X_p are the independent variables. The function above is called the logit, which is the natural logarithm of the odds that the event will occur. However, if the dependent variable can generate more than two outcomes (i.e., if it is not binary) then the baseline category logit is necessary to define the regression function (Eq. 7.5). The base line logit simply compares each category to a baseline category where all the coefficients for the variables are "0".

$$\text{logit}\left(\frac{\text{P}(category_i)}{\text{P}(category_j)}\right) = B_{i0} + B_{i1}X_1 + B_{i2}X_2 + \ldots + B_{iP}X_P \qquad \text{(Eq. 7.5)}$$

If the baseline category is j then the function in Eq 7.5 defines the i^{th} category of the baseline category j. According to the baseline category logit, if the dependent variable has three conditions, then there will be two sets of logit functions, where each will be compared with the baseline category. It is also possible to calculate the probability of a category's occurrence by using Multinomial Logistic regressions, by means of the following equation (Menard, 1995).

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$$P(group_i) = \frac{e^{gi}}{\sum_{k=1}^{J} e^{(gk)}} \qquad \text{Eq. 7.5)}$$

Where:

$P(group_i)$ = Probability of the occurrence of event i

g_i = Logit function of category i

Chapter 5 describes the phases of organizational decline. The decline development phase begins with a healthy firm and a suitable strategy developed by the firm's top management team who has been successful in determining the firm's character and its environment. The decline development phase can begin with failing to recognize negative forces in and around the organization and/or failing to respond to opportunities, which might affect the present and future condition of an organization. The decline development phase is the phase when the downturn begins for a company. The symptoms at this stage can be observed at two levels. Initial symptoms consist of performance problems associated with strategic and operational parameters of organizations. In this research these parameters are used in formulating the hypotheses of the study. The initial symptoms have been determined through factor analysis in the Section 7.3.2, the Mann-Whitney test in Section 7.3.1, and the findings of Survey 1 (Causes of Decline) in Section 7.2.

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The decline development phase is followed by the decline recognition phase that usually manifests itself as a financial crisis. After a drastic financial crisis, managers recognize that the company is in decline and therefore start taking actions against the downturn. Filing bankruptcy under Chapter 11 is one of the steps that managers can take to overcome the decline of the company. Strategic downsizing of a company's market portfolio, production lines, and human resources are some of the actions that may be considered at this stage.

In Survey 2 (Company Profile) (Appendix B), the respondents were asked to rate the overall condition of their companies on a 10-point scale. This overall rating is converted to a 3-point scale and used as dependent variable in the Multinomial Logistic Regression analysis. "State 1" represents the "advanced decline" state of a company which corresponds decline recognition and response explained in Chapter 5, "State 2" the "decline development" state, and "State 3" the "no-decline state" of a company. The alternative distributions of the ratings to the three states -defined above- are as follows:

Alternative A:

If ($1 \leq$ overall rating of a company ≤ 4) then the company is in State 1

If ($5 \leq$ overall rating of a company ≤ 7) then the company is in State 2

If ($8 \leq$ overall rating of a company ≤ 10) then the company is in State 3

Alternative B:

If ($1 \leq$ overall rating of a company ≤ 3) then the company is in State 1

If ($4 \leq$ overall rating of a company ≤ 7) then the company is in State 2

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If ($8 \leq$ overall rating of a company ≤ 10) then the company is in State 3

Alternative C:

If ($1 \leq$ overall rating of a company ≤ 4) then the company is in State 1

If ($5 \leq$ overall rating of a company ≤ 6) then the company is in State 2

If ($7 \leq$ overall rating of a company ≤ 10) then the company is in State 3

Alternative D

If ($1 \leq$ overall rating of a company ≤ 5) then the company is in State 1

If ($6 \leq$ overall rating of a company ≤ 7) then the company is in State 2

If ($8 \leq$ overall rating of a company ≤ 10) then the company is in State 3

Alternative E

If ($1 \leq$ overall rating of a company ≤ 5) then the company is in State 1

If ($6 \leq$ overall rating of a company ≤ 8) then the company is in State 2

If ($9 \leq$ overall rating of a company ≤ 10) then the company is in State 3

Alternative F:

If ($1 \leq$ overall rating of a company ≤ 6) then the company is in State 1

If ($7 \leq$ overall rating of a company ≤ 7) then the company is in State 2

If ($8 \leq$ overall rating of a company ≤ 10) then the company is in State 3

There may be additional alternative distributions. The choice was restricted to these six because there were some constraints regarding the data. Although respondents were asked to rate their companies on a 10-point scale, there were no ratings under "3" and above "9". Furthermore the number of responses in each state needs to be somewhat balanced in order to be able to run the analysis. Therefore, because of the above

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restrictions only 6 alternatives (Alternative A through F) were considered in this study. The output of the Multinomial Logistic analyses is presented in Table 7.10 where "states" are defined as the dependent variables. The analyses were conducted using five different sets of data.

- The first analysis was run by using the factor scores of the first three factors that were generated by factor analysis (see Section 7.3.2).
- The second analysis was run by using the scores associated with the eleven variables that identify these three factors (See page 178).
- The third analysis was run by using the variables identified by construction company executives in Survey 1 (Causes of Decline) as the most significant causes of decline but using the data collected in Survey 2 (Company Profile). The objective of this analysis is to integrate the outcome of Survey 1 with the data collected in Survey 2. The first survey asked the opinion of company executives about the causes of construction company decline. The variables are rated according to their level of significance in Table 7.1 in Section 7.1. The first ten variables in Table 7.1 have a mean of 3.50 and higher, which means that these variables are considered to have a significant effect on construction company decline. Although the eleventh ranking variable "shortage of competent labor" is considered to have a significant effect over decline too (μ=3.52), this variable is an environmental variable and was therefore not part of the "Company Profile" survey. On the other hand, the third ranking variable in Table 7.1, "overexpansion" was not assessed directly

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in Survey 2. These two variables are eliminated from this analysis. The final nine variables that measured in the analysis are listed in Table 7.1.

- The fourth analysis is run by using the variables that are determined by the Mann-Whitney test to have significantly different values in bankrupt compared to non-bankrupt companies. The seven variables in question are listed in Table 7.6.
- The fifth analysis is run by using the variables obtained in the third (the nine most significant variables identified by construction executives in Survey 1) and the fourth (the seven variables determined by the Mann-Whitney test to be significantly different in bankrupt versus non-bankrupt companies) analyses.

During the analysis of some of the alternatives, unexpected singularities in the Hessian matrix were encountered. Some of the parameter estimates tended to approach infinity. This situation can be caused by the dispersion of the data collected from bankrupt companies. For these alternatives, the validity of the model is uncertain and that is noted in Table 7.10.

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Table 7.10 Multinomial Logistic Analysis Findings for Alternatives (Page 2 of 2)

Alternatives	Model Fitting Information				Goodness of Fit Information			R^2	Notes
	-2Log Likelihood	Chi-Square	df	Sig.	Chi-Square	df	Sig.		
Mann Whitney Test Variables									
Alternative A	77.832	41.701	14	0.000	36.131	78	1.000	0.727	Validity of the model is uncertain
Alternative B	77.832	41.701	14	0.000	36.131	78	1.000	0.727	Validity of the model is uncertain
Alternative C	73.828	30.186	14	0.007	43.642	78	0.999	0.598	Validity of the model is uncertain
Alternative D	94.913	46.820	14	0.000	48.093	78	0.997	0.727	
Alternative E	73.378	60.158	14	0.000	13.219	78	1.000	0.914	Validity of the model is uncertain
Alternative F	100.942	34.053	14	0.002	66.889	78	0.811	0.584	
Mann Whitney + Survey 1 Variables									
Alternative A	77.832	59.120	26	0.000	18.712	66	1.000	0.885	Validity of the model is uncertain
Alternative B	77.832	59.120	26	0.000	18.712	66	1.000	0.885	Validity of the model is uncertain
Alternative C	73.828	41.235	26	0.029	32.593	66	1.000	0.737	Validity of the model is uncertain
Alternative D	94.193	77.405	26	0.000	17.508	66	1.000	0.931	Validity of the model is uncertain
Alternative E	73.378	73.378	26	0.000	0.000	66	1.000	1.000	Validity of the model is uncertain
Alternative F	100.942	60.916	26	0.000	40.026	66	0.995	0.822	

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Table 7.10 Multinomial Logistic Analysis Findings for Alternatives (Page 1 of 2)

Alternatives	Model Fitting Information				Goodness of Fit Information			R^2	Notes
	-2Log Likelihood	Chi-Square	df	Sig.	Chi-Square	df	Sig.		
Factor Scores									
Alternative A	75.988	22.410	6	0.001	53.578	84	0.996	0.477	Validity of the model is uncertain.
Alternative B	75.988	22.410	6	0.001	53.578	84	0.996	0.477	Validity of the model is uncertain
Alternative C	72.918	22.273	6	0.001	50.645	84	0.999	0.483	Validity of the model is uncertain
Alternative D	93.069	9.399	6	0.152	83.670	84	0.490	0.213	Validity of the model is uncertain
Alternative E	72.722	14.281	6	0.027	90.763	84	0.985	0.336	
Alternative F	99.099	10.026	6	0.124	89.072	84	0.332	0.222	Validity of the model is uncertain
Variables Representing the Factors									
Alternative A	88.609	59.742	22	0.000	28.868	78	1.000	0.837	Validity of the model is uncertain
Alternative B	83.800	54.922	22	0.000	28.879	78	1.000	0.817	Validity of the model is uncertain
Alternative C	83.925	53.016	22	0.000	30.908	78	1.000	0.801	Validity of the model is uncertain
Alternative D	103.899	75.585	22	0.000	28.315	78	1.000	0.899	Validity of the model is uncertain
Alternative E	79.066	79.066	22	0.000	0.000	78	1.000	1.000	Validity of the model is uncertain
Alternative F	108.534	56.787	22	0.000	63.950	78	0.990	0.762	
Survey 1 Variables									
Alternative A	88.609	47.913	18	0.000	40.696	82	1.000	0.739	Validity of the model is uncertain
Alternative B	83.800	49.564	18	0.000	34.237	82	1.000	0.771	Validity of the model is uncertain
Alternative C	83.925	41.897	18	0.001	42.028	82	1.000	0.694	Validity of the model is uncertain
Alternative D	103.899	52.072	18	0.000	51.827	82	0.996	0.736	
Alternative E	79.066	59.154	18	0.000	19.912	82	1.000	0.871	Validity of the model is uncertain
Alternative F	108.534	47.344	18	0.000	61.190	82	0.959	0.687	

The validity of the analysis is determined by three major parameters; these are model fitting information, goodness of fit information, and R^2 (Table 7.10). In the model fitting information the –2log likelihood value is the intercept only of the model and the Chi-square value is the difference between the intercept-only and the final model. If the observed significance level is small, the null hypothesis can be rejected that all coefficients for the variables or factors are "0". It can be concluded that the final model is significantly better than the intercept-only model. According to the model fitting information "Alternative E" appears to be significant (0.027) when the factor scores are used for the analysis, "Alternative F" is significant (0.000) when the eleven variables that represent the three factors are used, "Alternative D and F" are significant (0.000) where the first survey variables are used, "Alternative D" appear to be significant (0.000) for the analysis where the seven variables obtained from the Mann-Whitney test are used, and "Alternative F" is significant (0.000) when Mann-Whitney + Survey 1 variables are used.

Whenever one builds a model, fitness of the data to the model is important. The goodness of fit test measures the fitness of the data collected to the model that is being proposed. Deviance chi-square is used to assess goodness of fit. Deviance chi-square is the change in –2log-likelihood when the model is compared to a saturated model that is when it is compared to a model that has all main effects and interaction. If the model fits well, the log-likelihood should be small and the observed significance level should be large. According to the goodness of fit parameter "Alternative E" is significant (0.985) when factor scores are used, "Alternative F" is significant (0.990) when the eleven variables that represent the three factors are used, "Alternative D" is significant (0.996)

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when Survey 1 variables are used, "Alternative D" is significant (0.997) is significant when Mann-Whitney test variables are used, and "Alternative F" is significant (0.995) when Mann-Whitney + Survey 1 variables are used.

The R^2 statistic represents the proportion of variability in the dependent variable that can be explained by the independent variables. Correlation between the variables increases with higher values of the R^2 statistic. This statistic is 0.336 for "Alternative E" which uses factor scores, and 0.762 for "Alternative F", which uses the eleven variables that represent the three factors. The best R^2 statistics for the analysis where the Survey 1 variables are used is "Alternative D" (0.736). Similarly "Alternative D" gives the highest R^2 value (0.727) when the Mann-Whitney test variables are used. In the final analysis where the Mann-Whitney + Survey 1 variables are used, "Alternative F" provides the highest value (0.822).

The analysis also provides a classification table (Table 7.11), which compares the observed and predicted groups with their prediction probability. In a way, the classification table shows how well a model fits its data. As it can be seen in Table 7.11, the prediction rate of the model using factor scores (Alternative E) was 80.4%. Although, the prediction rate of 80.4 percent is high, there appear to be a dumping in the data, such that most responses fall into State 2, which represents the decline development state of the companies. This causes an inconsistency in the prediction rates, such that while the prediction rate of State 2 is perfect (100%), the prediction rate of State 1 and 3 are much less reliable (29% and 33%). On the other hand Mann-Whitney + Survey 1

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Table 7.11 Classification Table for Alternatives

Analysis	Observed	Predicted			
		State 1	State 2	State 3	Percent Correct
Factor Scores	**Alternative E**				
	State 1	2	4	1	28.6%
	State 2	0	33	0	100.0%
	State 3	1	3	2	33.3%
	Overall Percentage	6.5%	87.0%	6.5%	**80.4%**
Variables Representing the Factors	**Alternative F**				
	State 1	16	0	3	84.2%
	State 2	3	6	2	54.5%
	State 3	1	3	17	81.0%
	Overall Percentage	39.2%	17.6%	43.1%	**76.5%**
Survey 1 Variables	**Alternative D**				
	State 1	6	1	1	75.0%
	State 2	0	17	5	77.3%
	State 3	1	4	16	76.5%
	Overall Percentage	13.7%	43.1%	43.1%	**76.5%**
Mann-Whitney Test Variables	**Alternative D**				
	State 1	6	1	0	85.7%
	State 2	0	15	6	71.4%
	State 3	0	7	12	63.2%
	Overall Percentage	12.8%	48.9%	38.3%	**70.2%**
Mann-Whitney + Survey 1 Variables	**Alternative F**				
	State 1	12	2	3	70.6%
	State 2	4	7	0	63.6%
	State 3	1	0	18	94.7%
	Overall Percentage	36.2%	19.1%	44.7%	**78.7%**

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variables (Alternative F) has an overall correct prediction rate of 78.7 percent. Despite the fact that the overall prediction rate is lower, the responses are distributed more homogeneously through the three states of construction company decline making the prediction of each state equally highly reliable.

The purpose of this research was to develop a model to determine the condition of a construction company based on its non-financial qualities. The variables considered in the study were identified based on a literature review. Other studies conducted in the construction industry as well as in other industries were reviewed and likely causes of construction company decline were extracted. The critical causes and the joint factors were established by using factor analysis, the variables from Survey 1, and Mann-Whitney test for Survey 2. The three states of construction company decline were defined by using multinomial logistic regression. According to the information presented in this section, the logit functions of these three states for the five analysis (factor scores, variables that represent factors, Survey 1 variables, Mann-Whitney test variables, Mann-Whitney + Survey 1 variables) are as follows:

Factor Score:

Logit State 1 = 0.745 – 0.346 Factor 1 – 1.781 Factor 2 – 0.528 Factor 3 (Eq. 7.6)

Logit State 2 = 2.497 – 0.534 Factor 1 + 1.5 Factor 2 – 0.641 Factor 3 (Eq. 7.7)

Logit State 3 = 0 (baseline category) (Eq. 7.8)

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Variables that represent the three factors identified in Factor Analysis:

$$\text{Logit Phase 1} = 62.003 + 1.775X_5 - 2.703X_6 - 4.346X_8 + 2.968X_9 + 1.892X_{11} + 1.224X_{12} - 7.309X_{13} - 5.845X_{15} - 4.379X_{17} - 0.003X_{18} - 1.518X_{19} \quad \text{(Eq. 7.9)}$$

$$\text{Logit Phase 2} = 39.201 + 1.256X_5 - 2.403X_6 - 2.989X_8 + 3.641X_9 + 2.817X_{11} + 0.503X_{12} - 4.467X_{13} - 6.043X_{15} - 4.402X_{17} - 0.422X_{18} - 0.360X_{19} \quad \text{(Eq. 7.10)}$$

$$\text{Logit Phase 3} = 0 \text{ (baseline category)} \quad \text{(Eq. 7.11)}$$

Where

X_5 = Specialization

X_6 = Standardization

X_8 = Adaptation to advances in managerial practices

X_9 = Adaptation to advances in construction technologies

X_{11} = Managers' work experience

X_{12} = Manager's business knowledge

X_{13} = Manager's managerial experience

X_{15} = Defining the scope of the company

X_{17} = Defining company's competitive advantage

X_{18} = Ability to activate competitive strategy

X_{19} = Diversification of company's production market

Survey 1 Variables:

$$\text{Logit Phase 1} = 36.894 + 0.154X_1 - 1.328X_8 + 0.788X_9 + 0.220X_{11} + 2.243X_{12} - 5.997X_{13} - 4.349X_{16} - 0.629X_{17} - 2.297X_{18} \quad \text{(Eq. 7.12)}$$

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$$\text{Logit Phase 2} = 27.072 - 0.687X_1 - 1.196X_8 + 1.313X_9 - 0.042X_{11} - 0.003X_{12} - 1.737X_{13} - 3.632X_{16} + 0.297X_{17} - 2.224X_{18} \quad \text{(Eq. 7.13)}$$

$$\text{Logit Phase 3} = 0 \text{ (baseline category)} \quad \text{(Eq. 7.14)}$$

Where

X_1 = Vertical Communication

X_8 = Adaptation to advances in managerial practices

X_9 = Adaptation to advances in construction technologies

X_{11} = Managers' work experience

X_{12} = Managers' business knowledge

X_{13} = Managers' managerial experience

X_{16} = Resource utilization

X_{17} = Defining company's competitive advantage

X_{18} = Ability to activate competitive strategy

Mann-Whitney Test Variables:

$$\text{Logit Phase 1} = 22.285 - 2.260X_4 - 3.192X_6 + 3.135X_7 - 0.014X_8 - 6.606X_{17} + 3.656X_{18} - 3.677X_{21} \quad \text{(Eq. 7.15)}$$

$$\text{Logit Phase 2} = 14.768 - 0.403X_4 - 0.797X_6 - 0.388\,X_7 + 0.192X_8 - 0.480\,X_{17} - 0.848X_{18} - 1.595X_{21} \quad \text{(Eq. 7.16)}$$

$$\text{Logit Phase 3} = 0 \text{ (baseline category)} \quad \text{(Eq. 7.17)}$$

Where

X_4 = Formalization

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X_6 = Standardization

X_7 = Dependence on other organizations

X_8 = Adaptation to advances in managerial practices

X_{17} = Defining company's competitive advantage

X_{18} = Ability to activate competitive strategy

X_{21} = Level of Self-Performance

Mann-Whitney + Survey 1 Variables:

$$\text{Logit Phase 1} = 175.605 - 7.283X_1 - 1.467X_4 - 5.667X_6 - 5.532X_7 + 1.216X_8 + 2.628X_9 + 12.429X_{11} + 2.520X_{12} - 11.345X_{13} - 12.949X_{16} - 4.782X_{17} - 9.921X_{18} - 13.597X_{21} \quad \text{(Eq. 7.18)}$$

$$\text{Logit Phase 2} = 154.200 - 7.951X_1 - 0.1637X_4 - 5.484X_6 - 5.746X_7 + 3.515X_8 + 3.232X_9 + 13.958X_{11} + 2.128X_{12} - 8.636X_{13} - 14.678X_{16} - 3.648X_{17} - 10.453X_{18} - 14.193X_{21} \quad \text{(Eq. 7.19)}$$

$$\text{Logit Phase 3} = 0 \text{ (baseline category)} \quad \text{(Eq. 7.20)}$$

Where

X_1 = Vertical Communication

X_4 = Formalization

X_6 = Standardization

X_7 = Dependence on other organizations

X_8 = Adaptation to advances in managerial practices

X_9 = Adaptation to advances in construction technologies

X_{11} = Managers' work experience

X_{12} = Managers' business knowledge

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X_{13} = Managers' managerial experience

X_{16} = Resource utilization

X_{17} = Defining company's competitive advantage

X_{18} = Ability to activate competitive strategy

X_{21} = Level of Self-Performance

7.3.4 Validation of the Model: The construction company decline model was tested using hypothetical values and randomly selected sample values. The outcomes of the tests are shown in Table 7.12. One of the bankrupt companies and two of the non-bankrupt companies were picked at random and were used to validate the model.

First the logit functions are calculated for the three states using Eqs. 7.6, 7.7, and 7.8, and then probabilities of occurrence of each state are calculated. The outcome shows that there is 63 percent probability that the company "B8" (one of the bankrupt companies) is in advanced decline state -State 1-, 36 percent probability that it is in decline development state –State 2- and 0 percent in no decline state –State 3. On the other hand, company 13's (one of the non-bankrupt companies) condition shows that there is a 60 percent probability that the company is in the no-decline state, 38 percent probability that it is in the decline development state and only 2 percent probability that it is in an advanced state of decline.

A similar analysis is also run, where this time hypothetical rates are assigned. Each column in this test assumes that the respondent company executives assigned the stated rating to all variables involved in the model. Logit functions are calculated

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according to the functions defined in Eqs. 7.9, 7.10, and 7.11, and the probabilities of occurrence are calculated. The outcome shows that if a hypothetical respondent rates all the variables "2", the probability that the company is in an advanced state of decline is very high; similarly if all variables are rated "5", the probability that the company is not in a state of decline is very high. The outcome of the tests is proof that the model is working.

These two sets of validation tests are run using not only the three factors identified in the factor analysis but also the 11 variables that represent the factors, the Survey 1 variables, Mann-Whitney test variables, and Mann-Whitney + Survey 1 variables. The probabilities obtained using hypothetical rates and one bankrupt (B8) and two non-bankrupt companies (13 and 23) are presented in Table 7.12.

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Table 7.12 The Model Validation (Page 1 of 3)

Factor Scores	All variables rated "2"	All variables rated "3"	All variables rated "4"	All variables rated "5"
State 1	-2.504	-4.128	-5.752	-7.377
State 2	0.388	-0.667	-1.721	-2.776
State 3	0.000	0.000	0.000	0.000
Prob. (State1)	0.03	0.01	0.00	0.00
Prob. (State2)	0.58	0.34	0.15	0.06
Prob. (State3)	0.39	0.65	0.85	0.94
	Company B8	Company 13	Company 23	
State 1	4.957	-3.415	-0.963	
State 2	4.396	-0.473	1.618	
State 3	0	0	0	
Prob. (State1)	0.63	0.02	0.06	
Prob. (State2)	0.36	0.38	0.78	
Prob. (State3)	0.00	0.60	0.16	
Variables that Represent Factors	**All variables rated "2"**	**All variables rated "3"**	**All variables rated "4"**	**All variables rated "5"**
State 1	25.582	7.371	-10.839	-29.050
State 2	15.151	3.126	-8.899	-20.924
State 3	0	0	0	0
Prob. (State1)	0.99	0.98	0.00	0.00
Prob. (State2)	0.00	0.02	0.00	0.00
Prob. (State3)	0.00	0.00	0.99	0.99
	Company B8	Company 13	Company 23	
State 1	35.351	-24.808	-0.017	
State 2	23.266	-16.522	-0.677	
State 3	0	0	0	
Prob. (State1)	1.00	0.00	0.39	
Prob. (State2)	0.00	0.00	0.20	
Prob. (State3)	0.00	1.00	0.40	

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Table 7.12 The Model Validation (Page 2 of 3)

Survey 1 Variables	All variables rated "2"	All variables rated "3"	All variables rated "4"	All variables rated "5"
State 1	13.904	2.409	-9.086	-20.581
State 2	11.431	3.611	-4.209	-12.030
State 3	0.000	0.000	0.000	0.000
Prob. (State1)	0.92	0.23	0.00	0.00
Prob. (State2)	0.08	0.75	0.01	0.00
Prob. (State3)	0.00	0.02	0.99	1.00

	Company B8	Company 13	Company 23
State 1	19.016	-16.232	-3.385
State 2	16.945	-8.398	-0.456
State 3	0.000	0.000	0.000
Prob. (State1)	0.89	0.00	0.02
Prob. (State2)	0.11	0.00	0.38
Prob. (State3)	0.00	1.00	0.60

Mann-Whitney Test Variables	All variables rated "2"	All variables rated "3"	All variables rated "4"	All variables rated "5"
State 1	4.369	-4.589	-13.548	-22.506
State 2	6.130	1.811	-2.508	-6.827
State 3	0.000	0.000	0.000	0.000
Prob. (State1)	0.15	0.00	0.00	0.00
Prob. (State2)	0.85	0.86	0.08	0.00
Prob. (State3)	0.00	0.14	0.92	1.00

	Company B8	Company 13	Company 23
State 1	9.593	-21.642	-5.072
State 2	7.669	-5.173	-0.036
State 3	0.000	0.000	0.000
Prob. (State1)	0.87	0.00	0.00
Prob. (State2)	0.13	0.01	0.49
Prob. (State3)	0.00	0.99	0.51

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Table 7.12 The Model Validation (Page 3 of 3)

Mann-Whitney + Survey 1 Variables	All variables rated "2"	All variables rated "3"	All variables rated "4"	All variables rated "5"
State 1	68.105	14.355	-39.395	-93.145
State 2	57.962	9.843	-38.276	-86.395
State 3	0	0	0	0
Prob. (State1)	1.00	0.99	0.00	0.00
Prob. (State2)	0.00	0.01	0.00	0.00
Prob. (State3)	0.00	0.00	1.00	1.00
	Company B8	**Company 13**	**Company 23**	
State 1	93.380	-85.429	-1.591	
State 2	80.157	-82.421	-4.021	
State 3	0	0	0.000	
Prob. (State1)	1.00	0.00	0.167	
Prob. (State2)	0.00	0.00	0.015	
Prob. (State3)	0.00	1.00	0.819	

Note : B8 is the 8th company in the list of Bankrupt Companies.
13 is the 13th company in the list of Non-Bankrupt Companies.

Note : Variables are rated on a 1-5 scale where 1=extremely weak, 2=weak, 3=fairly strong, 4=strong, 5=extremely strong.

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7.4 Summary

In this chapter the decline model of construction companies is tested. Two separate surveys are administered to two different populations. Figure 7.18 describes the content of each survey including the sample size, the objective, the response rate, and the type of statistical analysis used to evaluate the results.

The demographic information of the respondents in Survey 1 (Causes of Decline) is first introduced in this chapter. This is followed by the analysis of the respondents' answers to the survey. The outcome of the Survey 1 shows that "lack of managerial experience", "lack of business knowledge", "overexpansion", and "resistance to advanced construction technologies" are regarded as very significant variables that affect construction company decline. The implications of these findings on construction companies are discussed in this chapter. The analysis shows that the significance that respondents attach to some of the variables varies according to the respondents' demographic characteristics. The affected variables include a company's young age, absence of formalization, absence of specialization, absence of standardization, inability to define the scope of the company, economic recession, high interest rates, insufficient profitability, decrease in construction demand, supply shortage, shortage of competent labor, effect of natural disasters, and federal and state regulations.

Survey 2 (Company Profile) was returned by 41 non-bankrupt companies and 11 bankrupt companies. The statistical analyses that were conducted using these data are

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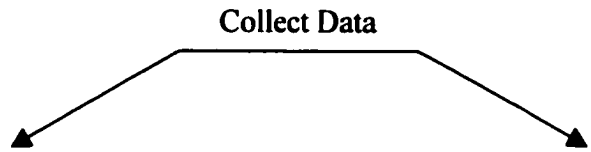

	Survey 1 "Causes of Decline"		Survey 2 "Company Profile"
Type:	Opinion survey	**Type:**	Self-rating survey
Sample:	Top 588 general and specialty contractors reported by ENR.	**Sample:**	135 construction companies that filed bankruptcy in the last 5 years and 343 randomly selected construction companies from the AGC membership directory.
Return:	100 responses received; 17% return rate.	**Return:**	41 non-bankrupt construction companies and 11 bankrupt construction companies.
Objective:	Determine the relative significance of construction company decline causes as perceived by industry professionals.	**Objective:**	Determine the differences between bankrupt and non-bankrupt companies. Develop a model to rate the condition of a construction company vis-à-vis decline.
Statistics:	Descriptive analysis (mean, variance, standard deviation, minimum, and maximum)	**Statistics:**	Descriptive analysis (mean, variance, standard deviation, minimum, and maximum), Mann-Whitney Test (hypothesis testing), Factor Analysis, Multinomial Logistic Regression

Figure 7.18 The Content of the Two Surveys Conducted in this Research

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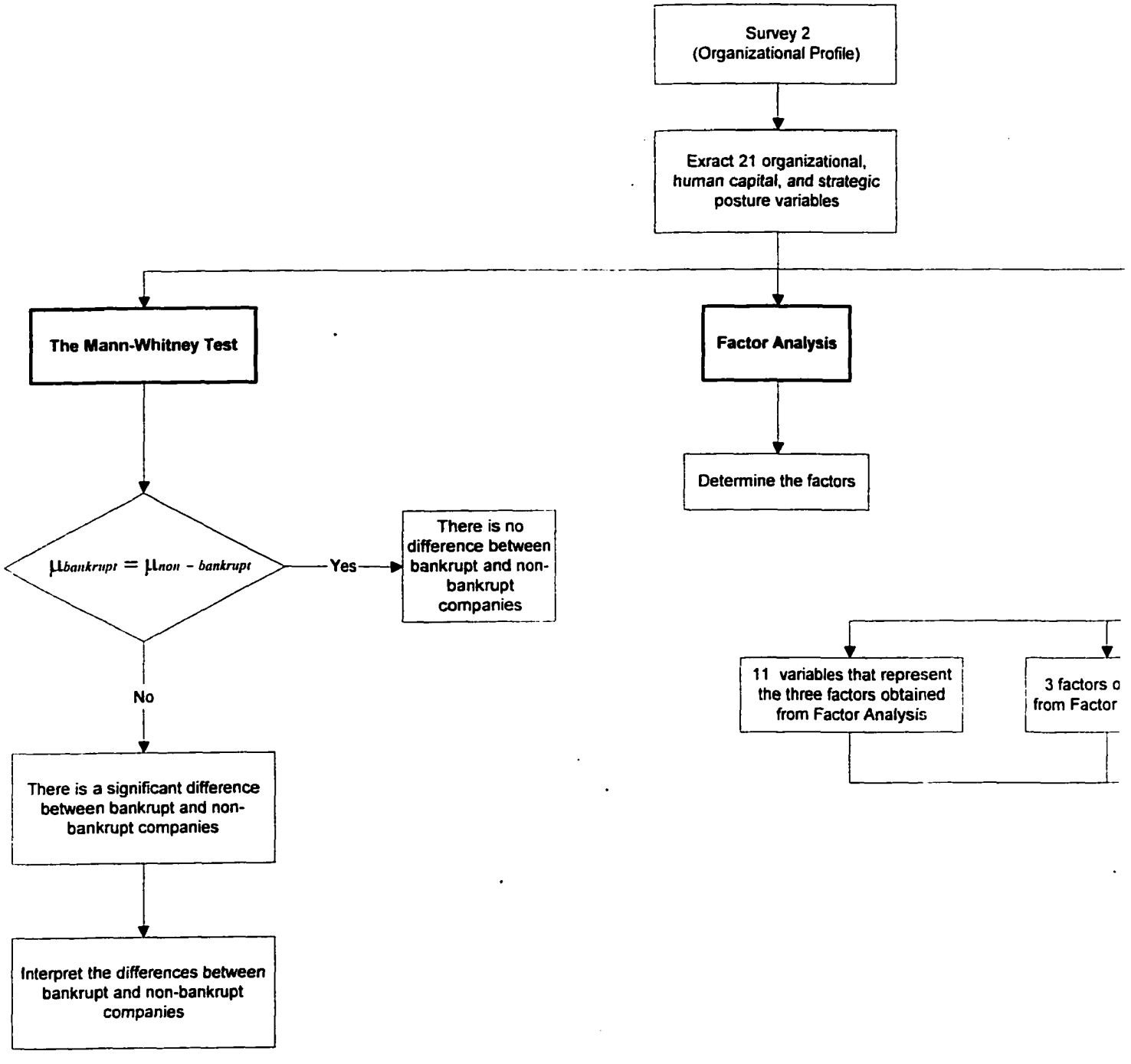

Figure 7.19 The Statistical Analysis Conducted in the Re

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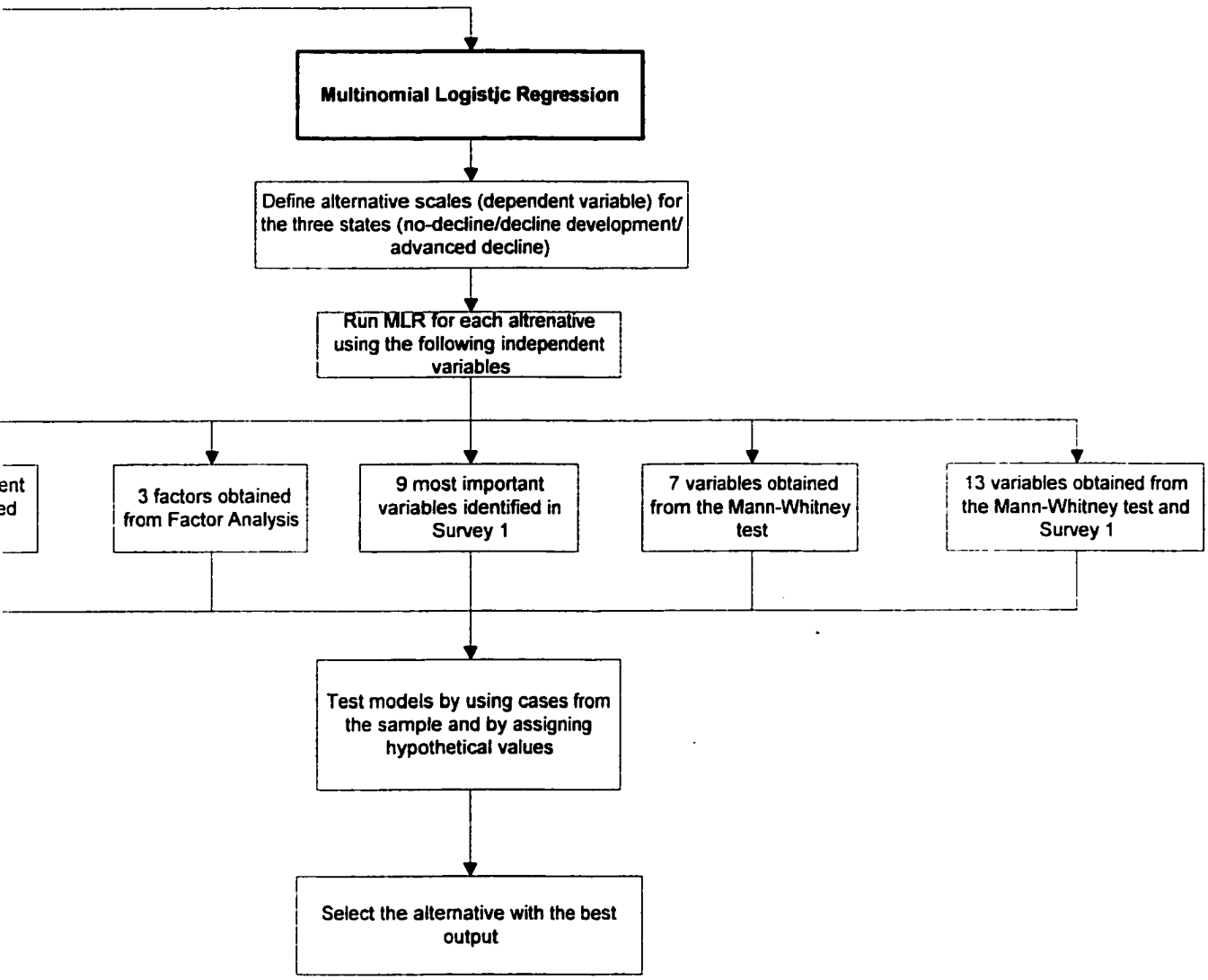

onducted in the Research

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described in the flow chart presented in Figure 7.19. The Mann-Whitney test is used to determine if the differences between the bankrupt and non-bankrupt companies are significant. Factor analysis is used to reduce the number of variables. Multinomial Logistic Regression analysis is used to develop a model that allows a user to determine the condition of a construction company relative to decline, i.e., whether the company is in a state of no-decline, in the decline development state, or in advanced decline state.

The outcome of the Mann-Whitney test indicates that there is a significant difference between bankrupt and non-bankrupt companies on level of formalization, standardization, dependence on other organizations, adaptation to advanced managerial practices, exploiting competitive advantage, synergy to activate competitive advantage, and level of performance. These variables are considered to be stronger in non-bankrupt companies than in bankrupt companies. Furthermore, the organizational structure and the strategic posture of non-bankrupt companies are also significantly more developed than in bankrupt companies. The significant differences between bankrupt and non-bankrupt companies are discussed in this chapter in detail.

The outcome of the factor analysis indicates that the phenomenon can be explained by 11 critical variables contained in 3 factor groups. These factor groups are named "competition based on innovation", "organizational strategy", and "managers' qualifications". The 11 critical variables are level of specialization, standardization, ability to adapt to advances in managerial practices, ability to adapt to advances in construction technologies, managers' work experience, business knowledge, managerial

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experience, ability to define the scope of the company, its competitive advantage, ability to activate a competitive strategy, and ability to diversify a company's production market.

In the following section of the analysis multinomial logistic regression is used to calculate the probability of the condition of a construction company. According to this model, the condition of a construction company can be in no-decline, decline development, or advanced decline states. Alternative classifications for the three states are established and two of them are selected. Five approaches are followed to conduct multinomial logistic regression analysis, these are using the three factor scores, using the scores of the 11 critical variables representing these three factors, using the top nine variables obtained in Survey 1, using the seven variables identified in the Mann-Whitney test, and using the variables from the Mann-Whitney test + Survey 1. Each alternative is analyzed using the five approaches. The validity of the model is tested by using hypothetical values and randomly selected companies form the sample.

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CHAPTER VIII

CONCLUSIONS

The use of financial statements is a common practice in evaluating the condition of a company and drawing future projections out of them. Hence one might argue that the financial statements are sound indicators of the condition of a company. Many studies have been conducted to take advantage of these theories in the organizational management science and the construction management literature. The most popular ones are reviewed in Chapter 2 thoroughly. In this research however, it is argued that financial statements can be manipulated for several reasons (such as to portray the company's condition better than it already is to stockholders, banks, insurance companies, bonding companies and other institutions to gain benefit). Therefore, it is suggested that financial statements are not the most reliable sources to determine the condition of a company. Furthermore, it is also argued that financial deterioration follows strategic and operational deterioration. So in this research, organizational structure, human capital, and strategic posture are considered to be the parameters that can indicate as early as possible whether a company is healthy or declining.

8.1 Summary

Survey 1: The main objective of this research was to develop a tool for the use of construction company executives that would allow them to evaluate their companies' condition based on non-financial aspects of their company. The first step to reach the main objective was determining the causes of construction company decline. A field

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survey was conducted and construction company executives were asked to rate the significance of potential decline causes that are grouped under environmental, operational (human capital and organizational structure), and strategic factors. The outcome of the survey shows that human capital, organizational structure, and strategic posture related aspects have a higher effect on company decline than environmental factors. The following are the major findings of this survey:

- Inadequate human capital is a key factor in company decline as three of the four human capital variables are ranked number 1, 2, and 4 by the respondents (Table 7.1). Lack of managerial, business, and work experience appear to be the crucial variables that cause decline in construction companies. However, despite the human capital theory that suggests that a manager's level of education is an important performance parameter, the outcome of the survey indicates the contrary. The craftsman/apprentice system of the industry and the relatively low level of technology do not require a high level of education in order to work in the industry.

- Organizational structure is the second most important factor that causes construction companies to decline. Construction company executives believe in integrating the use of technology into routine managerial practices as they rank three organizational structure variables number 5, 6, and 7 (Table 7.1). Company executives' high ratings of "resistance to advances in managerial practices" and "lack of vertical communication" build a strong ground for

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studies to improve the efficiency of construction company management (e.g., enterprise resource planning, scheduling, cost estimating, etc.). On the other hand, the outcome of this survey suggests that the use of advanced technology should be reflected in construction processes as well.

- The most important strategic factors conducive to decline are inability to define a company's competitive advantage, inability to activate the strategy, inefficient resource utilization, and overexpansion. Obviously these factors are closely related to each other and each factor's success depends on the other.

- The outcome of the survey also shows that construction company decline does not primarily depend on environmental factors as none of the environmental variables are ranked within the first 10 causes of decline. Yet, the respondents do not ignore the effects of environment entirely. Shortage of competent labor, complex delivery systems, decreases in construction demand are considered to have some effect on company decline. It should also be noted that even though the environmental variable "federal and state regulations" is ranked 30th (out of 36 variables) by the respondents, when analyzed by respondent company type, it is found that heavy and highway contractors rated this variable consistently and significantly higher than building and specialty contractors (Figure 7.13). Regardless of the respondents'

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demographic character, in general there is a consensus in this survey on the factors that have the highest effect over decline.

The next important causes of decline identified in Survey 1 are used as independent variables in a Multinomial Logistic Regression analysis that makes use of data collected in Survey 2 and determines the probability of a company being in one of three states: no-decline, decline development, advanced decline.

Survey 2 - Mann-Whitney Test: After completion of the first field survey, a second survey was administered to construction companies that filed bankruptcy and to companies that did not. These companies were asked to rate the condition of their organizational structure, human capital and strategic posture in their organization. The initial objective in the second survey was to understand if there are any significant differences between bankrupt and non-bankrupt companies. The following are the major findings of the Mann-Whitney test:

- The organizational structure and strategic posture of non-bankrupt companies are stronger than bankrupt companies. However, unlike industry executives' opinion in the Survey 1, human capital aspects of the two groups do not show any significant difference. It appears that the respondents in bankrupt companies (i.e., typically occupying managerial positions) have a hard time taking the blame for the failure of their company. It is possible that these

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respondents have not been totally candid when answering human capital issues associated with their organization.

- The *organizational structure* of a company can be defined by the interaction between construction sites –production centers-, supporting departments – purchasing, estimating, contracting, and other administrative departments- and the executive level. Tests of hypotheses by Mann-Whitney show that non-bankrupt companies' level of standardization, formalization, and ability to adapt to advances in managerial practices is higher than bankrupt companies. Tests of hypotheses also show that bankrupt companies are highly dependent on third parties, making them less in control and more fragile. When a company enters the downturn phase, the level of dependence on third parties increases.

- *Strategic posture* is the second major decline variable which displays a significant difference between bankrupt and non-bankrupt companies.

- The importance of defining and activating the competitive advantage of a company seems to be a common factor between Survey 1 (Causes of Decline) and Survey 2 (Company Profile). The analysis of the latter survey indicates that non-bankrupt companies are significantly stronger in defining and activating the competitive strategy of their company.

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Several studies have been conducted in the management science literature on the size and the age of a company and its association with failure. In this research, no evidence was found to support the theory that young age and small size cause construction companies to decline.

The variables that are identified in the Mann-Whitney test to be statistically different in bankrupt companies compared to non-bankrupt companies, are used as independent variables in a Multinomial Logistic Regression analysis. The statistical model thus generated can predict the probabilities of a company being in any of the three states of no-decline, decline development, or advanced decline.

Reconciliation of Survey 1 and Survey 2: The findings of Survey 1 (Causes of Decline) and of the Mann-Whitney test administered to the data collected in Survey 2 (Company Profile) are reconciled by consolidating them and forming a joint set of variables that reflect the opinions of construction executives (Survey 1) and the actual differences between bankrupt and non-bankrupt companies (Survey 2). This new consolidated set of variables is also used as independent variables in a Multinomial Logistic Regression Analysis.

The data collected in the company profile survey were also used in building a model that allows construction company executives to evaluate the condition of their company, i.e., whether the company is in a state of no-decline, whether decline is developing, or whether decline is in an advanced state. By using this model, company

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executives can determine the condition of their company simply by rating eleven critical variables on a scale of 1 to 5 (1 being extremely weak and 5 being extremely strong).

Survey 2 – Factor Analysis: The data collected from bankrupt and non-bankrupt companies were subject to factor analysis to reduce the number of variables in the final model. Three factors, namely "competition by motivation", "organizational strategy", "managers' qualifications" were identified that were driven by eleven critical variables: specialization, standardization, ability to adapt to advances in managerial practices, ability to adapt to advances in construction technologies, managers' work experience, business knowledge, managerial experience, ability to define the scope of the company, its competitive advantage, ability to activate the competitive strategy, and ability to diversify the company's production market. The factor scores and the scores of the 11 variables were used separately in two Multinomial Logistic Regression Analysis.

Multinomial Logistic Regression Analysis: Six different alternative classifications were developed to represent the three states of companies, i.e., the state of no-decline, decline development, advanced decline using the 1-10 subjective rating of the respondents in the bankrupt and non-bankrupt companies in Survey 2. The five sets of independent variables (i.e., three factor scores, the 11 variables that represent the three factors, 9 variables identified by company executives as being most important in Survey 1, the 7 variables that came out of the Mann-Whitney test as being difficult in bankrupt versus non-bankrupt companies, and the Mann-Whitney + Survey 1 variables) were regressed against the alternative independent variables. The results are presented in

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Tables 7.10 and 7.11. The models were validated by using company data and hypothetical values.

8.2. Conclusions

The conclusions can be summarized as follows:

- The three objectives set in Chapter 1 have been achieved. First, the theoretical foundation of a model that explains the decline phenomenon in construction companies has been developed (Figure 5.2). This model is radically different from existing financial models and allows company executives to take early action at the subset of downturn. Second, causes of construction company decline have been identified not only by means of an opinion survey of construction executives but also a comparison of the characteristics of bankrupt and non-bankrupt companies. Finally a statistical prediction model has been developed that allows construction executives to assess the condition of their company at any time.
- Environmental factors appear to have less impact on decline than other factors including organizational structure, human capital and strategic posture.
- There is reasonable agreement between the opinions of construction company executives surveyed in Survey 1 and the differences between bankrupt and non-bankrupt companies surveyed in Survey 2. An attempt was made to reconcile the minor differences by consolidating these variables. This approach strengthens the methodology used in that the final analysis is

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conducted not only by opinions but by a combination of opinions and actual company data.

- The data used in developing the scales for the dependent variable of the Multinomial Logistic Regression Analysis consist of a subjective rating of the overall condition of the respondents' companies and as such are open to criticism as to their accuracy. These data were found to be quite representative of the respondents' respective companies in that the differences between bankrupt and non-bankrupt companies were statistically significant and that these ratings were in agreement with the ratings of the individual variables. It can therefore be argued that the data (both dependent and independent variables) used in the Multinomial Logistic Regression Analyses were reliable, realistic, and representative of the companies surveyed.
- Out of the many results of the Multinomial Logistic Regression Analyses presented in Tables 7.10 and 7.11, it appears that two stand out. While the model that uses factor scores as independent variables and Alternative E as the dependent variable has the highest rate of prediction of 80.4%, the other model that uses the Mann-Whitney + Survey 1 variables as independent variables and Alternative F as the dependent variables has the highest R^2 of 82.2%. The pros and cons of these two models were discussed earlier and the latter model is preferred not only because its R^2 is very high (82.2%) but because its rate of prediction is almost as high (78.7%) as the former model and because the users have to rate only 13 variables in this model as opposed

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to rating 21 and then calculating factor scores using lengthy equations in the other.

This dissertation demonstrates the importance of non-financial aspects in assessing the condition of a company and shows that this assessment can be done by simply rating the strength of a few variables associated with the company. Thanks to this model, companies that detect the signs of decline before the advent of a financial crisis should be able to take the necessary measures in good time to start a turnaround.

8.3 Future Research

The research study showed that it is extremely difficult to collect information from bankrupt companies. Any method of data collection that facilitates locating, approaching and retrieving information from these companies will be helpful in increasing the sample size of bankrupt companies. A larger sample is expected to result in a more reliable model. If one uses the Mann-Whitney + Survey 1 variables to see if one's company is in distress or not, one will have to assess the condition of the company relative to 13 variables. It would be helpful to develop sub-constructs that will facilitate the rating process of these variables and standardize the operation.

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APPENDIX A

SURVEY ON CAUSES OF DECLINE
ADMINISTERED TO GENERAL AND SPECIAL CONTRACTING COMPANIES

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DEPARTMENT OF CIVIL AND ARCHITECTURAL ENGINEERING
CONSTRUCTION ENGINEERING AND MANAGEMENT PROGRAM

CAUSES OF DECLINE

I. BACKGROUND OF SURVEY RESPONDENT

Name:.....
Company:.....
Position:.....

Your organization is 1. Publicly owned ☐ 2. Private ☐ 3. Family ☐

What is the company's major activity line (e.g. Building, road, commercial, M.E.P, etc.)?
.....

When was the company established?
.....

Is your company geographically dispersed? If yes how many regional offices do you have?
.....

How many full-time personnel are employed currently?
.....

Which of the following categories would the company's annual turnover fall into?

☐ $0-1 Million ☐ $1-5 Million ☐ $5-10 Million
☐ $10-50 Million ☐ $50-100 Million ☐ $100-500 Million
☐ $500 Million and upper

How long have you been working in the construction industry?
.....

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II CRITICAL FACTORS IN CONSTRUCTION COMPANY DECLINE

Please rate the significance of the following factors that may cause a construction company to decline, eventually leading to business failure. We are seeking YOUR OPINION regardless of your company's performance.

	Not Significant	*Fairly Significant*	*Significant*	*Very Significant*	*Extremely Significant*
The company's young age (1-5 years old)	1	2	3	4	5
The company's small size (less than 10 full-time employees)	1	2	3	4	5
The company's ownership by family (as opposed to public shareholders)	1	2	3	4	5
Ineffective vertical communication (quality of written and oral communication between peers)	1	2	3	4	5
Ineffective horizontal communication (quality of written and oral communication between superiors and subordinates)	1	2	3	4	5
Decentralization (the condition of spreading the decision-making authority to different groups in the organization.)	1	2	3	4	5
Absence of formalization (absence of formal job descriptions and of codified rules and procedures, usually in written format)	1	2	3	4	5
Absence of specialization (activities divided into few (rather than many) specialized roles, e.g., marketing, scheduling, purchasing etc.)	1	2	3	4	5
Absence of standardization (few (rather than many) events which have regularity of occurrence and are legitimized by the organization, e.g., internal reporting activities, project meetings, departmental meetings, etc.)	1	2	3	4	5
High level of dependence (for example on suppliers, special trades, and parent organization)	1	2	3	4	5
Resistance to advances in managerial practices (such as the use of computers in reporting, estimating, scheduling, etc.)	1	2	3	4	5
Resistance to advances in construction technologies (such as the use of new methods and machines in the construction process)	1	2	3	4	5

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	Not Significant	*Fairly Significant*	*Significant*	*Very Significant*	*Extremely Significant*
Managers' lack of education	1	2	3	4	5
Managers' lack of work experience	1	2	3	4	5
Managers' lack of business knowledge (in-depth industry knowledge, market savvy, and practical knowledge of how to find and attract clients, and suppliers)	1	2	3	4	5
Managers' lack of managerial experience (i.e., the ability to lead, delegate and control the organizational activities)	1	2	3	4	5
Absence of outside members in the company board	1	2	3	4	5
Inability to define the scope of the company (includes long term targets and achievements)	1	2	3	4	5
Inefficient resource utilization (includes human resources and operational decisions).	1	2	3	4	5
Inability to define the company's competitive advantage	1	2	3	4	5
Lack of synergy to activate competitive strategy	1	2	3	4	5
Inability to diversify the company's production market (into other construction markets such as commercial and residential, heavy and road construction, etc.)	1	2	3	4	5
Inability to diversify the company's production portfolio (production activities in related businesses such as real estate management, material manufacturing or retail)	1	2	3	4	5
Inability to self-perform critical activities in the production line (reliance on many subcontractors)	1	2	3	4	5
Overexpansion (includes new markets and/or production capacity)	1	2	3	4	5
Economic recession	1	2	3	4	5
High interest rates	1	2	3	4	5
Sufficient profitability of projects to attract investors	1	2	3	4	5
Poor industry growth prospects	1	2	3	4	5
Decrease in construction demand	1	2	3	4	5
Major supply shortages in the industry	1	2	3	4	5

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	Not Significant	*Fairly Significant*	*Significant*	*Very Significant*	*Extremely Significant*
Difficulty to adapt to complex project delivery systems (design/build, guaranteed maximum price, built operate transfer (BOT), etc.)	1	2	3	4	5
Shortage of competent labor in the industry	1	2	3	4	5
Difficulty to adapt to technological changes of construction services and products	1	2	3	4	5
Effects of natural disasters (earthquakes, floods, tornados, storms, etc.)	1	2	3	4	5
Unsupportive federal and state regulations	1	2	3	4	5

*****Thank you very much for your kind support and valuable contribution to the survey.*****

Please return this survey using the prepaid envelope provided to:

Ms. Almula Koksal
Illinois Institute of Technology
Department of Civil and Architectural Engineering
3201 South Dearborn Street, Room 228
Chicago, IL 60616-3793

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APPENDIX B

COMPANY PROFILE SURVEY ADMINISTERED TO BANKRUPT COMPANIES

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DEPARTMENT OF CIVIL AND ARCHITECTURAL ENGINEERING
CONSTRUCTION ENGINEERING AND MANAGEMENT PROGRAM

COMPANY PROFILE SURVEY

I. BACKGROUND OF SURVEY RESPONDENT

Name:.....
Company:.....
Position:.....

Your organization is 1. Publicly owned ☐ 2. Private ☐ 3. Family ☐

What is the company's major activity line (e.g. Building, road, commercial, M.E.P. etc.)?
.....

When was the company established?
.....

In what year did your company file for bankruptcy?
.....

Is your company geographically dispersed? If yes how many regional offices do you have?
.....

How many full-time personnel are employed currently?
.....

Which of the following categories would the company's annual turnover fall into?

☐ $0-1 Million ☐ $1-5 Million ☐ $5-10 Million
☐ $10-50 Million ☐ $50-100 Million ☐ $100-500 Million
☐ $500 Million and upper

How long have you been working in the construction industry?
.....

How long have you been working for this company?
.....

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I. COMPANY CHARACTERISTICS

This section is composed of three parts; organizational structure, human capital, and strategic posture. Please rate each phrase's applicability to your company. It is important to note that the following sections seek your observations about the state of your organization at the time of bankruptcy and *not* your expectations and/or wishes.

1. Rating of Organizational Structure

	Extremely Weak	*Weak*	*Fairly Strong*	*Strong*	*Extremely Strong*
Horizontal communication (written and expressed quality of communication within peers)	1	2	3	4	5
Vertical communication (written and expressed quality of communication within superiors and subordinates)	1	2	3	4	5
Decentralization (the condition of spreading the decision-making authority to different groups in the organization. The contrast of keeping the control authority at the top management)	1	2	3	4	5
Formalization (the degree of formal job descriptions and the presence or absence of codified rules and procedures, usually in written format)	1	2	3	4	5
Specialization (the degree to which an organization's activities are divided into specialized roles e.g. marketing, scheduling, purchasing etc.)	1	2	3	4	5
Standardization (events which have regularity of occurrence and are legitimized by the organization e.g. internal reporting activities, project meetings, departmental meetings, TQM meetings etc.)	1	2	3	4	5
Dependence (defines the level of dependence on suppliers, special trades, and parent organization)	1	2	3	4	5
Adaptation to advances in managerial practices (such as the use of computers in reporting, estimating, scheduling, etc.)	1	2	3	4	5
Adaptation to advances in construction technologies (such as the use of new methods and machines in the construction process)	1	2	3	4	5

Please rate the condition of your company considering only the organizational structure on a scale of 1 to 10 ('1' being 'extremely weak' and '10' being extremely strong')

1 2 3 4 5 6 7 8 9 10

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1. Rating of Human Capital

	Extremely Weak	*Weak*	*Fairly Strong*	*Strong*	*Extremely Strong*
Managers' level of education	1	2	3	4	5
Managers' level of work experience	1	2	3	4	5
Managers' level of business knowledge (in-depth industry knowledge, market savvy, and practical knowledge of how to find and attract clients, and suppliers)	1	2	3	4	5
Managers' level of managerial experience (i.e., the ability to lead, delegate and control the organizational activities)	1	2	3	4	5
Representation of outside members in the company executive board.	1	2	3	4	5

Please rate the condition of your company considering only the human capital issues on a scale of 1 to 10 ('1' being 'extremely weak' and '10' being extremely successful')

1 2 3 4 5 6 7 8 9 10

2. Rating of Strategic Posture

	Extremely Weak	*Weak*	*Fairly Strong*	*Strong*	*Extremely Strong*
Defining the scope of company (includes long term targets and achievements)	1	2	3	4	5
Resource utilization (includes human resource and operational decisions).	1	2	3	4	5
Defining company's competitive advantage	1	2	3	4	5
Ability to activate competitive strategy	1	2	3	4	5
Diversification of the company's production market (includes engagement in different type of construction markets such as commercial and residential, heavy and road construction and etc.)	1	2	3	4	5
Diversification of the company's production portfolio (production activities in related business such as material manufacturing or retail)	1	2	3	4	5

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	Extremely Weak	*Weak*	*Fairly Strong*	*Strong*	*Extremely Strong*
Self-performance of critical activities in the production line.	1	2	3	4	5

Please rate the condition of your company considering only strategic posture on a scale of 1 to 10 ('1' being 'extremely weak' and '10' being extremely successful')

1 2 3 4 5 6 7 8 9 10

Please rate your company's condition overall in the context of the statements above on a scale of 1 to 10 ('1' being 'extremely weak' and '10' being 'extremely successful')

1 2 3 4 5 6 7 8 9 10

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APPENDIX C

COMPANY PROFILE SURVEY ADMINISTERED TO NON-BANKRUPT COMPANIES

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DEPARTMENT OF CIVIL AND ARCHITECTURAL ENGINEERING
CONSTRUCTION ENGINEERING AND MANAGEMENT PROGRAM

COMPANY PROFILE SURVEY

I. BACKGROUND OF SURVEY RESPONDENT

Name:.....
Company:.....
Position:.....

Your organization is 1. Publicly owned ☐ 2. Private ☐ 3. Family ☐

What is the company's major activity line (e.g. Building, road, commercial, M.E.P, etc.)?
.....

When was the company established?
.....

Did your company ever file for bankruptcy? If yes, in what year?
.....

Is your company geographically dispersed? If yes how many regional offices do you have?
.....

How many full-time personnel are employed currently?
.....

Which of the following categories would the company's annual turnover fall into?

☐ $0-1 Million ☐ $1-5 Million ☐ $5-10 Million
☐ $10-50 Million ☐ $50-100 Million ☐ $100-500 Million
☐ $500 Million and upper

How long have you been working in the construction industry?
.....

How long have you been working for this company?
.....

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I. COMPANY CHARACTERISTICS

This section is composed of three parts; organizational structure, human capital, and strategic posture. Please rate each phrase's applicability to your company. It is important to note that the following sections seek your observations about the state of your organization at the time of bankruptcy and *not* your expectations and/or wishes.

1. Rating of Organizational Structure

	Extremely Weak	*Weak*	*Fairly Strong*	*Strong*	*Extremely Strong*
Horizontal communication (written and expressed quality of communication within peers)	1	2	3	4	5
Vertical communication (written and expressed quality of communication within superiors and subordinates)	1	2	3	4	5
Decentralization (the condition of spreading the decision-making authority to different groups in the organization. The contrast of keeping the control authority at the top management)	1	2	3	4	5
Formalization (the degree of formal job descriptions and the presence or absence of codified rules and procedures, usually in written format)	1	2	3	4	5
Specialization (the degree to which an organization's activities are divided into specialized roles e.g. marketing, scheduling, purchasing etc.)	1	2	3	4	5
Standardization (events which have regularity of occurrence and are legitimized by the organization e.g. internal reporting activities, project meetings, departmental meetings, TQM meetings etc.)	1	2	3	4	5
Dependence (defines the level of dependence on suppliers, special trades, and parent organization)	1	2	3	4	5
Adaptation to advances in managerial practices (such as the use of computers in reporting, estimating, scheduling, etc.)	1	2	3	4	5
Adaptation to advances in construction technologies (such as the use of new methods and machines in the construction process)	1	2	3	4	5

Please rate the condition of your company considering only the organizational structure on a scale of 1 to 10 ('1' being 'extremely weak' and '10' being extremely strong')

1 2 3 4 5 6 7 8 9 10

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1. Rating of Human Capital

	Extremely Weak	*Weak*	*Fairly Strong*	*Strong*	*Extremely Strong*
Managers' level of education	1	2	3	4	5
Managers' level of work experience	1	2	3	4	5
Managers' level of business knowledge (in-depth industry knowledge, market savvy, and practical knowledge of how to find and attract clients, and suppliers)	1	2	3	4	5
Managers' level of managerial experience (i.e., the ability to lead, delegate and control the organizational activities)	1	2	3	4	5
Representation of outside members in the company executive board.	1	2	3	4	5

Please rate the condition of your company considering only the human capital issues on a scale of 1 to 10 ('1' being 'extremely weak' and '10' being extremely successful')

1 2 3 4 5 6 7 8 9 10

2. Rating of Strategic Posture

	Extremely Weak	*Weak*	*Fairly Strong*	*Strong*	*Extremely Strong*
Defining the scope of company (includes long term targets and achievements)	1	2	3	4	5
Resource utilization (includes human resource and operational decisions).	1	2	3	4	5
Defining company's competitive advantage	1	2	3	4	5
Ability to activate competitive strategy	1	2	3	4	5
Diversification of the company's production market (includes engagement in different type of construction markets such as commercial and residential, heavy and road construction and etc.)	1	2	3	4	5
Diversification of the company's production portfolio (production activities in related business such as material manufacturing or retail)	1	2	3	4	5

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	Extremely Weak	*Weak*	*Fairly Strong*	*Strong*	*Extremely Strong*
Self-performance of critical activities in the production line.	1	2	3	4	5

Please rate the condition of your company considering only strategic posture on a scale of 1 to 10 ('1' being 'extremely weak' and '10' being extremely successful')

1 2 3 4 5 6 7 8 9 10

Please rate your company's condition overall in the context of the statements above on a scale of 1 to 10 ('1' being 'extremely weak' and '10' being 'extremely successful')

1 2 3 4 5 6 7 8 9 10

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APPENDIX D

FACTOR SCORE COEFFICIENT MATRIX

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Factor Score Coefficient Matrix

Variables	1	2	3	4	5	6	7
Vertical communication	.000	-.124	.070	.495	-.007	-.093	-.063
Horizontal communication	.027	-.122	-.031	.398	.025	.064	-.056
Decentralization	-.032	.063	-.057	-.061	.119	.224	.034
Formalization	.005	-.057	-.159	.019	.339	.074	.129
Specialization	-.112	.314	-.115	.154	-.103	-.152	.262
Standardization	-.092	.359	-.172	.052	-.091	.098	-.061
Dependence on other organizations	-.009	-.032	-.002	-.044	-.035	-.076	.674
Adaptation to advances in managerial practices	.247	.097	-.181	.036	.003	-.016	.045
Adaptation to advances in construction technologies	.237	-.059	-.048	.049	.122	-.053	.086
Managers' level of education	.007	-.003	.017	-.026	-.082	.326	-.105
Manager's work experience	-.082	.135	.355	.143	-.210	-.167	-.068
Manager's business knowledge	-.006	-.107	.453	-.016	.117	-.084	-.036
Managers' managerial experience	-.084	-.213	.220	.023	.069	.217	.293
Representation of outsiders in the company board	-.099	-.026	.068	-.135	.367	.084	-.062
Defining the scope of the company	.019	.327	.127	-.173	-.048	-.030	-.171
Resource utilization	.007	.116	.110	-.136	-.002	.084	.191
Defining company's competitive advantage	.393	-.144	-.017	-.085	-.075	.064	.009
Ability to activate competitive strategy	.388	-.083	.001	.053	-.053	-.049	-.139
Diversification of company's production market	-.044	.318	.118	-.133	.028	-.107	-.093
Diversification of company's production portfolio	.049	-.124	.199	.163	.430	-.350	-.162
Level of self-performance	-.001	-.075	-.144	-.014	-.026	.524	-.060

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. Component Scores.

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APPENDIX E

COMPANY PROFILE SURVEY RESPONSE DATA

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COMPANY	FAC1_1	FAC2_1	FAC3_1	FAC4_1	FAC5_1	FAC6_1	FAC7_1	SCALE
27	.58339	.43731	-.08233	-.80607	-.06630	-1.48945	-1.20754	3.00
28	.45900	-.96468	.70527	-.71983	.41513	.49440	.18878	2.00
29	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	3.00
30	.52076	.67444	-1.51558	-.14259	1.32160	1.56650	-1.43244	3.00
31	.55316	-.18871	.51766	-1.18536	-.77361	-.15976	.06927	2.00
32	.07287	1.34196	.34656	-1.38541	-.06693	-.52166	.47528	3.00
33	.05439	1.35942	-1.21244	.54756	-.04187	1.06839	1.36308	3.00
34	1.61036	.96477	.84618	1.92784	.81327	-1.46737	-2.75545	3.00
35	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	3.00
36	-.18983	.24443	-.11463	.75349	-1.40152	.26190	.74034	3.00
37	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	3.00
38	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	2.00
39	.01991	-.15785	-.16410	-.65913	.91424	.97262	.22646	2.00
40	-.35721	-.46172	-1.01015	-.39194	-.03249	-.29327	-.04743	2.00
41	.32009	.28783	.32409	.27875	.84269	-.60470	.42070	3.00
B1	-.35561	-.96051	.03517	-.94811	2.44786	-.21136	1.37756	2.00
B2	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	1.00
B3	.22214	-1.37987	-.77768	-.62417	.50792	.06198	1.12358	2.00
B4	-.22598	.53024	1.29181	-1.10021	-1.62137	.42687	.14297	2.00
B5	.31534	-2.72837	1.55430	1.88918	-.47563	-1.84800	1.41258	1.00
B6	1.24446	.94208	1.96659	-1.22171	-.27000	-.62770	.84142	3.00
B7	-.52902	-.32141	.69525	-.30811	-1.49324	-.18033	.35953	3.00
B8	-2.44798	-1.34332	-1.86058	-.86991	-.55312	-.94741	-1.81657	1.00
B9	-2.18875	-.27257	-.14041	.80256	-.62497	-1.07132	.09732	2.00
B10	-3.08373	1.45591	1.29410	.71881	2.05339	1.27689	1.01813	3.00
B11	-.87492	2.03766	-.44576	.25393	-1.18095	-2.07911	-.53404	2.00

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COMPAN\	FAC1_1	FAC2_1	FAC3_1	FAC4_1	FAC5_1	FAC6_1	FAC7_1	SCALE
1	.30154	.29568	-.16841	.39176	-.03073	.99822	.13878	3.00
2	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	3.00
3	.18873	.14268	-.62518	.88069	1.49427	-.24280	-1.65633	3.00
4	-.97180	1.25997	-1.00625	.77583	.67614	-.38446	.86393	3.00
5	-.09276	-.24579	-.32537	.58271	1.17757	-.01895	-.06848	3.00
6	-2.24520	-.05871	2.10928	-.86216	-.60511	2.26678	-1.24100	3.00
7	.36040	-.63731	.29609	-1.65923	-1.63622	.94064	.29561	3.00
8	-.76455	.17469	.59119	-1.22283	1.40734	-.69220	.42589	3.00
9	.37605	-1.70618	-.46740	.14871	-.86254	-.03691	.79658	3.00
10	.68930	.90093	.46940	-2.15539	-.01822	-1.80063	-.87029	2.00
11	-.07355	-1.40473	.41936	2.21102	.79143	.04648	-.16530	3.00
12	.72736	-.11236	-2.04671	.10648	-.16294	-.46880	1.36506	3.00
13	.90833	1.82625	1.10532	1.33721	.12940	.68577	1.64579	3.00
14	-.24957	.22225	-.95885	-.21322	-.10620	-.82609	.28905	2.00
15	-1.07589	-.51822	1.18216	1.00889	-.95224	-.56552	-1.04908	2.00
16	.83382	-.66612	-.05195	1.36181	-.99126	1.06430	-.72797	3.00
17	-.00941	-.30864	1.08680	1.03041	-.31828	.37280	-.63079	3.00
18	-.20626	-.64775	-.55352	.02863	-.08561	.20681	-.29224	2.00
19	1.14286	-1.42624	-.63805	-.91566	1.10561	1.30370	-.38032	3.00
20	1.68856	.56902	.90225	-.10562	.54989	1.27857	-1.48626	3.00
21	.37270	-.38898	.64629	-.53374	1.35660	-1.17845	-.32625	3.00
22	1.06779	.14143	-.63961	-.32251	-.47614	.44600	.14373	3.00
23	-.19253	1.52662	-2.04945	.89322	-1.70893	.80675	-.28897	2.00
24	.67546	-.59251	.00499	.55379	-1.18931	1.73089	-.53326	3.00
25	-.20002	-.62676	-1.20325	-.78971	.09308	.08636	-.28812	2.00
26	1.02583	.78376	-.33246	.65933	-.35170	-.64737	1.97670	3.00

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COMPAN	OMPBRD	SCOPE	RESUTIL	MADVNT	CTCOMP	OMARKT	ROPRTFL	ELF_PRM	RG_RATE	JM_RATE	TR_RATE	OVERALL
27	1	4	3	3	4	3	2	1	7	8	6	7
28	2	3	4	4	3	3	2	4	6	9	7	6
29	#NULL!	3	4	4	4	2	3	4	8	8	8	8
30	5	4	3	3	4	3	2	5	9	9	8	9
31	1	3	3	4	4	2	2	3	4	5	5	5
32	2	3	4	4	3	4	3	3	7	7	6	7
33	1	3	4	3	3	5	2	5	9	8	9	9
34	2	5	3	4	5	5	5	4	8	7	9	8
35	1	4	5	5	5	3	#NULL!	#NULL!	6	10	8	8
36	1	3	3	4	3	3	1	4	8	7	7	8
37	1	3	3	4	4	2	1	#NULL!	7	9	6	8
38	2	3	3	3	3	3	2	#NULL!	7	6	6	6
39	4	3	3	3	4	3	2	3	7	8	5	6
40	2	3	3	3	3	2	2	3	6	6	6	6
41	3	3	3	4	4	4	3	3	7	8	7	7
B1	4	3	3	3	3	4	3	3	3	6	5	5
B2	2	2	3	4	4	4	2	#NULL!	4	3	3	4
B3	2	2	3	4	3	2	3	3	4	5	4	6
B4	1	4	3	4	4	4	1	4	4	9	8	6
B5	1	1	3	3	4	2	2	1	3	9	3	3
B6	1	5	4	5	5	5	3	3	7	9	8	8
B7	1	3	3	3	2	3	1	1	5	9	7	7
B8	1	1	1	1	1	2	2	2	2	3	3	3
B9	1	2	3	1	2	2	2	3	5	4	4	5
B10	5	4	4	1	1	4	3	4	8	9	9	9
B11	1	3	3	2	3	4	2	1	4	5	5	5

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COMPAN	OMPBRD	SCOPE	RESUTIL	MADVNT	CTCOMP	OMARKT	ROPRTFL	ELF_PRM	G_RATE	IM_RATE	R_RATE	OVERALL
1	1	3	4	4	4	4	2	4	7	8	8	8
2	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	3	7	#NULL!	8	8
3	2	3	3	3	4	4	4	3	8	7	7	8
4	2	3	3	2	3	4	2	4	8	7	7	7
5	2	3	3	3	3	4	3	3	8	8	7	7
6	2	4	4	2	2	4	1	5	6	9	7	9
7	1	3	3	4	4	3	1	4	5	8	8	8
8	3	3	3	3	3	4	4	3	6	6	6	7
9	2	2	3	4	4	2	1	3	6	7	5	7
10	3	4	4	4	4	4	2	1	4	5	9	5
11	1	2	3	3	3	2	4	4	7	7	7	7
12	1	3	3	4	4	3	2	2	7	6	8	8
13	2	5	5	4	5	5	3	5	10	10	9	9
14	1	3	3	4	2	3	2	3	6	6	6	6
15	1	3	3	3	3	3	2	3	4	8	6	6
16	2	3	3	5	5	2	2	5	7	9	8	8
17	2	3	3	4	4	4	2	4	8	7	8	8
18	1	3	3	3	3	2	2	3	6	7	6	6
19	1	3	4	4	4	2	3	5	7	8	8	8
20	3	4	4	5	5	5	2	4	9	9	9	9
21	3	3	3	4	4	4	3	1	7	7	7	7
22	1	3	3	4	4	5	1	4	7	8	7	7
23	1	3	3	3	4	3	1	3	7	6	6	6
24	1	3	3	4	4	3	1	5	8	7	7	8
25	2	2	3	4	3	4	2	3	4	5	7	6
26	1	4	4	4	4	3	2	2	8	9	8	8

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COMPANY	RT_COM	RZ_COM	CENZTN	RMLZTN	ECLZTN	ANDZTN	PENDNC	PMNGPR	PCONST	EDCTN	WREXP	USKNOW	MNGEX
27	2	3	2	3	2	3	2	4	4	3	4	4	3
28	3	3	2	3	2	2	3	4	4	4	4	5	4
29	4	4	2	4	4	4	3	4	4	4	4	4	4
30	3	4	3	4	3	4	2	5	5	5	4	3	3
31	2	2	4	2	2	3	4	4	3	4	5	5	3
32	2	2	4	2	3	4	4	4	4	4	5	4	3
33	4	4	5	3	4	4	4	5	5	4	4	3	4
34	5	5	3	2	3	4	2	5	5	4	5	4	3
35	3	3	2	2	3	3	3	2	3	5	5	5	5
36	4	4	3	2	3	4	4	4	3	3	5	4	4
37	3	4	4	2	2	3	4	5	4	4	5	4	4
38	3	2	3	4	3	3	4	3	4	3	4	3	3
39	3	3	4	3	2	4	4	4	4	5	4	4	4
40	3	3	3	2	3	2	3	3	3	3	3	3	3
41	3	4	4	3	3	4	4	4	4	3	5	4	4
B1	3	3	4	4	2	2	5	3	4	3	3	4	4
B2	4	3	2	2	3	4	4	5	3	4	4	2	2
B3	2	3	3	2	3	2	4	3	4	4	3	3	4
B4	3	2	2	2	3	3	4	2	3	5	5	5	4
B5	5	4	1	2	2	1	5	3	4	4	5	5	4
B6	2	3	4	2	4	2	4	4	4	4	5	5	5
B7	3	3	2	1	2	2	3	4	4	5	5	3	5
B8	2	2	1	1	1	2	2	1	1	3	2	2	2
B9	3	4	3	2	3	2	3	2	2	2	5	3	3
B10	4	5	5	4	4	5	4	3	3	5	5	5	5
B11	3	3	2	2	4	4	3	3	4	4	5	3	2

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COMPANY	RT_COM	RZ_COM	CENZTN	RMLZTN	ECLZTN	ANDZTN	PENDNC	PMNGPR	PCONST	EDCTN	WREXP	USKNOW	MNGEX
1	4	4	5	3	3	4	3	3	4	4	4	4	4
2	4	4	3	5	2	3	3	5	4	#NULL!	#NULL!	#NULL!	#NULL!
3	4	4	3	4	3	4	2	4	3	5	3	4	3
4	4	3	2	5	5	4	3	5	3	3	4	4	4
5	4	4	4	3	3	3	3	4	4	4	3	4	4
6	3	4	3	2	1	3	2	1	2	5	5	5	5
7	2	2	2	1	2	2	4	3	3	5	4	4	4
8	2	2	3	3	3	3	4	3	3	4	4	4	4
9	3	4	1	2	2	2	4	3	3	3	4	3	4
10	2	2	2	2	2	2	3	4	3	3	4	4	2
11	5	4	4	3	3	3	3	3	5	5	5	4	4
12	3	4	2	4	3	3	5	4	3	4	3	2	3
13	5	5	4	3	5	5	5	5	5	5	5	5	5
14	3	3	3	3	3	3	3	3	4	2	4	3	3
15	5	3	2	2	3	2	2	2	2	4	5	4	4
16	4	5	3	2	3	4	3	4	2	4	5	4	4
17	4	5	4	2	3	3	3	3	3	4	5	5	4
18	3	3	3	3	3	2	2	3	4	4	4	3	4
19	2	3	3	4	2	2	2	4	4	4	3	4	4
20	4	4	5	3	2	4	2	5	5	5	5	5	4
21	3	3	4	3	2	3	3	3	4	3	4	4	4
22	3	4	3	3	2	3	4	4	5	4	4	4	3
23	4	4	4	2	4	5	3	4	3	5	4	2	3
24	4	4	4	2	2	3	3	4	4	5	5	4	4
25	3	3	4	2	2	2	3	2	3	3	3	2	3
26	4	4	3	3	4	4	5	5	5	4	4	4	4

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