STRATEGY IMPLEMENTATION: THE RELATIONSHIP BETWEEN INTEGRATED PROJECT MANAGEMENT, KNOWLEDGE MANAGEMENT AND STRATEGIC PROJECT PORTFOLIO PERFORMANCE

A

Dissertation

Presented to the

Graduate Faculty of the

Marshall Goldsmith School of Management

Alliant International University

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by

Robert Cholip

San Diego, 2008

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Abstract of Dissertation

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By

Robert Cholip

Alliant International University

Committee Chairperson: Louise Kelly, PhD.

THE PROBLEM. The purpose of this study was to investigate strategy implementation and the relationship between integrated project management, knowledge management and strategic project portfolio performance.

METHOD. A survey was administered to companies in the aerospace and defense industries. There were 130 responses that were analyzed using regression and structural equation modeling for the purpose of defining relationships between the dependent variable strategic project portfolio performance and the independent variables project management, knowledge management, planned emergence and upper management leadership. Also the moderating effects of strategy and structure along with project

management and knowledge management as they relate to strategic project portfolio performance.

RESULTS. The results indicate that project management and knowledge management have a positive effect on strategic project portfolio performance. Strategy is emergent and requires modification as better information becomes available. The type of strategy and the structure of the organization were found to be not as important when measured with respect to performance. Additionally, leadership was found to be necessary whether or not the firm was successful in completing its strategic projects.

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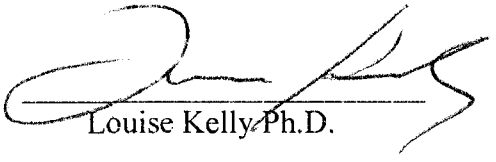

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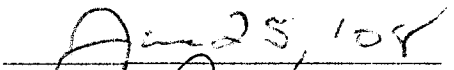

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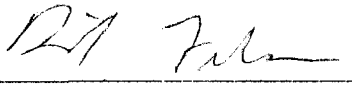

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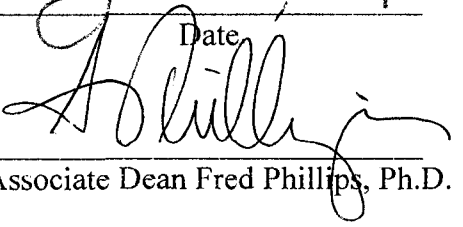

Associate Dean Fred Phillips, Ph.D.

Steven Gabriel, DBA

DEDICATION

To my loving wife who has endured my passion for education and remained understanding even though this commitment required that a great deal of time be spent at school and doing school work.

ACKNOWLEDGMENTS

I would like to thank my committee members for their support through the dissertation process. The discussions that took place during the dissertation process proved to be invaluable and helped to bring forward some of the major points in this study. Dr Kelly gave her time generously and provided excellent guidance. Dr Felsen and Dr Gabriel reviewed data then raised significant points requiring that I provide additional information or clarification of my ideas.

TABLE OF CONTENTS

Page

Chapter

Page

Chapter

LIST OF TABLES

LIST OF FIGURES

Figures Page

Chapter 1

INTRODUCTION

The purpose of this chapter is to define the following: (1) the research problem, (2) background of the problem, (3) statement of the problem, (4) purpose of the study, (5) contribution of the study, and (6) definition of terms.

This research assesses the strategy implementation process, the use of project management and knowledge management during the process, the impact of planned emergence and leadership, and the effect they have on strategic project portfolio performance. Prior research on strategy implementation has concentrated on matching company capabilities to the requirements derived by the environment or environmental changes and also changing the structure to match the strategy that the company intends to employ. Most research on strategy implementation has concentrated on issues such as systemic and behavioral resistance, resource allocation problems, lack of management commitment, communication problems, failure to implement change when it is needed, lack of clear objectives, lack of a clear understanding of measurements of success, and failure to prioritize the organization's strategic project portfolio. This research looks at the existing strategy literature and adds project management and knowledge management content with the intent of adding to the strategic management literature in the area of strategy implementation.

The Research Problem

The use of project management as a method for implementing strategy is not new, and previous literature was used in this study as supporting data. An examination of

strategy implementation business research and literature shows that very little has been published on the process of implementing strategy in comparison to strategy formulation. Most research conducted on strategy implementation does not provide empirical evidence and has concentrated on the framework or strategy process including problems with implementation, actions required to implement strategy, matching company resources to environmental changes, and matching structure to strategy.

The lack of information can be a problem for industry as strategic management requires that strategy be formulated and then implemented for an organization to realize its organizational objectives. Evidence is needed that shows that projects can be used to implement strategy in an effective and efficient manner as the business environment is changing rapidly. The need to ensure that the project portfolio is aligned with the corporate strategy may also be important.

There are no studies discovered that link strategy implementation, project management and knowledge management. Claims have been made about the competitive advantage these variables may provide to an organization; therefore, empirical evidence may help organizations to achieve project success or failure depending on how the concepts are utilized. Evidence is also required that supports the claim that successful implementation requires organizations to take long-term objectives and translate them into short-term objectives in the form of strategy implementation projects.

This research study was designed to determine the relationships between project management, knowledge management, planned emergence, leadership, the moderating effects of strategy and structure, and strategic project portfolio performance.

Background of the Problem

This study was based on the premise that strategy formulation and strategy implementation are both important in business, and that project management and knowledge management provide companies with a competitive advantage that can be effectively used to implement short-term objectives. Strategy formulation is widely researched and the strategy implementation conceptual studies that have been published provide a good foundation for continued research. Project management literature contains information on what it takes to execute a project and is starting to explore the need to integrate knowledge management. This makes the study of strategy implementation using project management and knowledge management important.

There were three important aspects of the background of the problem for the current study: *(1) Lack of enough prior empirical research on strategy implementation, (2) Lack of adequate prior empirical research on the effects project management has on strategic project portfolio performance, and (3) Lack of adequate prior empirical research on knowledge management and the effects that it has on strategic project portfolio performance.*

Strategy implementation is how strategy is converted to action and how strategy is realized. A method that demonstrates strategy implementation can be beneficial and should be considered an important area of study. Project management standardizes the process of realizing objectives. It should be recognized that standardization has benefits and drawbacks that need to be understood if it is to be used during the strategy implementation process. Knowledge management can be important if it uses repositories and standard processes, and establishes a culture that is conducive to a project or matrix type organization. The link between knowledge management and project management is

in its infancy. Likewise, the linkage between strategy and knowledge management is just beginning to be researched and literature published has identified the need for strategy to drive knowledge management in an organization.

With the competitiveness of the marketplace, organizations need to invest wisely in the initiatives they are going to pursue. They also need to know that strategies selected have been transitioned into action plans and that the projects pursued have been successful. Therefore, it is necessary to study strategy implementation projects to determine whether organizations are successfully implementing strategy. This is because an organization's ability to leverage from project management and knowledge management provides it with a competitive advantage. Therefore, a clear understanding of how project management and knowledge management are used during the strategy implementation process becomes important.

The end of the 20th century and the beginning of the 21st century can be described as a period of rapid change for American businesses. The pace of change continues to increase, causing organizations to look for ways to adapt to those changes in a timely manner. For large and small companies alike, there is an increasing need for: adaptation to market conditions, methods for determining what changes need to be made, and the ability to execute those changes.

Additional study of strategy implementation is necessary for several reasons. The first is that implementation failure has been reported as being between 60 and 90 percent (Kaplan & Norton, 2005). The second is that strategy formulation literature is readily available where strategy implementation literature is lacking (Alexander, 1985; Al-

Ghamdi, 1998). Lastly, there are not enough conceptual models for strategy implementation (Alexander, 1991).

Al-Ghamdi (1998) states that implementation is still not treated with the same importance as strategy formulation. This can be attributed to senior management's perspective that implementation is less glamorous, that it is easier to perform, and that anyone can do it. This perception is incorrect, as transforming strategy into action is much more difficult than allocating resources and changing the structure (Aaltonen & Ikavalko, 2002). Another key point is that strategy is useless without execution and the successful execution of strategic plans is based on having the necessary skills and knowledge (Aaltonen, 2004). Senior management should ensure that the correct people are assigned and that they are encouraged to perform well.

Projects are seen as critical steps for organizational growth and with today's fast paced business environment combined with a knowledge-driven economy it is necessary to carry on research on project management in cooperation with research on knowledge management (Koshkinen, 2004).

Statement of the Problem

While there is an abundance of strategy formulation research there has been limited research conducted on strategy implementation. This most likely has to do with management's belief that strategy implementation is not as important as strategy formulation. There may also be a belief that anyone can implement strategy and therefore it is less glamorous and easier to perform. This perception is misguided, as a strategy is useless unless it is successfully implemented.

There is also literature that provides reasons for why strategy implementation fails, but limited data on those things that positively impact strategy implementation. This study proposes that project management, knowledge management, planned emergence, and upper management involvement influence performance. This includes the adjustment of strategy as more or better information is made available. Furthermore, this can be accomplished only if there is a system that allows communication to flow from the top down and from the bottom up. This study also proposes that there is a need for a standardization of processes that allow for projects to be completed more efficiently and effectively.

Purpose of the Study

The main motivation behind this study was the need to further understand strategy implementation and project performance. Studies performed have linked the following: strategy and project management (Srivannaboon, 2006), strategy and knowledge management (Nicolas, 2004), and project management and knowledge management (Brookes & Leseure, 2004). This study proposes that project management, knowledge management, and strategy all impact strategy implementation and, as a result, also impact strategic project portfolio performance. This study is not only unique but it also expands on current strategy implementation literature.

For organizations that already have an infrastructure that supports project management, it would be easier to expand the types of projects to include strategy implementation. Historically, these companies have used project management for new product introduction. The advantage for these companies would be that people are trained and accustomed to working in this environment and the procedures and practices would

already be in place. Finding an additional use for project management in a company would certainly be efficient. It would also be positive for the company as it would only expand the types of projects that are a part of the project portfolio.

Knowledge management has become important to companies as the time allowed for companies to adjust to environmental changes has decreased. Having information readily available for project teams can provide them with a distinct advantage and allow them to complete projects more quickly than if the information were not available. Project teams today come together for shorter amounts of time; there needs to be a method for them to transfer their data to the company as well as to take the time to understand what they are learning. A company culture that supports projects and the need for people to learn and share data will have an advantage over companies that do not and people that perform better will positively affect the project performance.

Strategy implementation action may be dependent on certain factors, as listed in table 1, specifically: communicating, controlling, interacting with the environment, formulating strategy, managing resources, and organizing (Aaltonen, 2003). The Aaltonen study added interacting with the environment during the implementation of strategy even though this has been known to impact strategy formulation since Andrews (1971) reported it. This study applies action through the use of project management and knowledge management; these applications can be seen in table 1.

Understanding the actions necessary to execute a strategy, as well as the issues that impede progress, is included in this study so that is it clear where research has already taken place and where there is a need for advancement. Likewise, it is important for implementation to keep pace with the advancement of formulation as most companies

are pursuing third generation strategy using second generation structures and processes and first generation managers (Carroll, Dromgoole, Gorman, & Flood, 2000). Included in table 1 are the actions that this study is analyzing with the goal of advancing knowledge in the area of strategy implementation.

Table 1.

Strategy implementation actions adapted from Aaltonen (2003).

Action categories MODEL	Communicating	Controlling	Interacting with environment	Formulating strategy	Managing resources	Organizing
Alexander (1991)	information and decision processes	*reward systems *management processes		objectives	people / human resources	*organization structure *task
Johnson & Scholes (1999)	communicating change			diagnostic strategic change needs	* identifying resource requirements * developing competence * allocating and controlling resources	* choosing or changing organization structure and configuration *changing organizational routines and symbols
Shirvasta (1994)		changing performance evaluation and reward systems			*changing resource allocation * changing skills and staff	* changing structures and systems
Higgins (1985)	utilizing communication systems	* utilizing integrated planning and control systems * utilizing leadership and motivation systems			utilizing human resources functions (recruiting, training, developing, etc.)	choosing a structure

Action categories MODEL	Communicating	Controlling	Interacting with environment	Formulating strategy	Managing resources	Organizing
Hambrick & Cannella (1989)	selling of strategic change upward, downward, across, and outward	changing incentives and rewards		*involving people in the development and debate of strategic options *assessment of obstacles * creation of plans, programs, and policies	*resource allocation * changing and developing human resources	changing structure
Peters & Waterman (1982)		changing systems		changing goals	*changing staff * changing skills	changing the structure
Pearce & Robinson (2005)		*developing and communicating concise policies *using reward systems *controlling implementation		*setting annual objective * developing functional strategies		structuring an effective organization
Hrebiniak (1990)		*incentives *control systems			coordination	choosing appropriate structure
Aaltonen (2003)	*bottom-up communication * making sense of strategy * sharing information	* controlling performance *exerting influence	*acquiring information *choosing customers *modifying external communication *modifying services and products *networking *reacting to customer activity	*analyzing strategy *formulating plans *setting goals	*changing resource allocation * developing competence	*adjusting processes and procedures *changing organization structure *collaborating across departments *managing projects *rationalizing activities and systems
Cholip (2007)	*communication management *knowledge management	*rewards and incentives *project management controls	*knowledge management * procurement management *risk management	*goals objectives * involvement of people in development and debate of strategic options * planned emergence	human resource management	*managing projects *adjusting processes and procedures * changing structure *collaboration across departments

Al-Ghamdi (1998) provides a study that supports and expands on Alexander's study, which addresses the obstacles to successful implementation. Alexander (1985) identified 22 potential implementation problems and Al-Ghamdi (1998) used 15 of these potential issues to support and expand on Alexander's work. This study looks at some of those implementation obstacles as it analyzes project management and knowledge management.

This study will also analyze a portion of the list of 22 implementation issues that Alexander identified. Table 2 contains 19 of the 22 implementation issues. The result will be an empirical study that looks at probable drivers for successful strategy implementation using project management and knowledge management during the implementation process.

There is a correlation between implementation gaps and behavioral impediments; these can be removed concurrently (Cicmal, 1999). Behavioral impediments are defined as slow learning, fast forgetting, and organized resistance. The literature review uncovered information indicating that project management and knowledge management may be suitable to close the implementation gaps and remove or minimize the impacts of the behavioral impediments.

Table 2.

Nineteen issues that effect strategy implementation from Alexander (1985).

Nineteen Implementation Issues
1. Took more time than originally allocated
2. Major problems surfaced which had not been identified earlier
3. Coordination of implementation activities was not effective enough
4. Competing activities distracted attention from completing this decision
5. Capabilities of employees involved were insufficient
6. Training and instruction given to lower level employees were inadequate
7. Uncontrollable factors in the external environment had an adverse impact on implementation
8. Leadership and direction provided by departmental managers were inadequate
9. Key implementation tasks and activities were not sufficiently defined
10. Information systems used for implementation were inadequate
11. Advocates and supporters of the strategic decision left the organization during implementation
12. Overall goals were not sufficiently well understood by employees
13. Changes in roles and responsibilities of key employees were not clearly defined
14. Key formulators of the strategic decision did not play an active role in implementation
15. Problems requiring top management involvement were not communicated early enough.
16. Rewards and incentives utilized to get employee conformance to program were not sufficient
17. Support and backing by top management in this SBU and at the corporate level were not adequate
18. Financial resources made available were not sufficient
19. Organizational structural changes made were not effective

Contributions of the Study

This study will make five major contributions.

1. The study examines project management and its effect on strategic project portfolio performance. Project management in this case is responsible for providing leadership on the project as well as providing communication to all levels of the

organization and the external environment. Project management may provide a competitive advantage for the firm. It also defines the project and the time, cost, and requirements to complete the project; this enables the organization to resource the project correctly with respect to the entire portfolio.

2. This study also examines knowledge management and its effect on strategic project portfolio performance. Knowledge management will be evaluated for the potential benefits it can provide the organization such as the use of an Enterprise Resource Planning (ERP) System to control manufacturing, supply chain management, financials, projects, human resources, customer resources and marketing, and data warehouse. Additionally, there is a need for a repository and past project data can be provided to those who need it for future needs. Business processes can also be used to process project tasks, report on project status and results, provide for corrective action, request additional resources, and open and close projects.

3. Strategy will be examined to determine whether cost leadership or differentiation impacts project management, knowledge management, or strategic project portfolio performance. The standardization of processes can be of great benefit to organizations that want to establish highly effective and efficient project teams. For a cost leadership strategy, which may evolve more slowly than a differentiation strategy, it might not be a problem of how fast the process moves; at this point, standardization is not an issue. For certain industries, this may be true, such as when product development cycles are long and allow for slower moving processes. Flexibility may be required for a firm to employ a differentiation strategy.

4. The formulation process is examined to see its impact on strategy implementation and the outcomes of the entire process. The expectation is that poor strategy formulation will result in poor performance. Successful implementation will require that the strategy formulation and the implementation both be successful. The formulation process is also impacted by change or by the receipt of better information. The feedback and controls that project management utilizes will be the mechanism for changing the strategy and the creation of new ones.

5. Leadership will be examined to determine the impact of having upper management involvement throughout the implementation process. Historically, upper management has been involved in strategy formulation and turned over implementation to lower level management. This was attributed to the perception that formulation was more difficult and important than implementation.

Definition of Terms

This section offers conceptual definitions of the terms used in this study. Operational definitions are presented in chapter 3.

Business Processes refers to the importance of business processes during the strategy implementation process. The processes can be built around any of the following standards: ISO9000, AS9100, CMMI, etc. Business processes include procedures and practices that cover all areas of the business: finance, contracts, project management, human resources, engineering, manufacturing, service, purchasing, quality, and distribution.

Competence is the importance of selecting a qualified project team with the correct knowledge and skills needed to implementation the strategy.

Culture is the importance of culture in the strategy implementation process. It is how well the company culture allows for collaboration, how well implicit knowledge is converted to explicit knowledge, and how well those in the organization work with the external environment.

Enterprise Resource Planning (ERP) refers to the importance of an ERP system during the implementation process and the reuse of the information in the future. An ERP system can be used for manufacturing, supply chain management, financials, projects, human resources, customer resources and marketing, and data warehouse.

Feedback and Controls is the importance of having feedback and controls for the strategy implementation process. Feedback can be given to those that formulated the strategy or to those that are providing resources to the project and can be in the form of project reviews or project gates. Controls can be for cost, schedule, or scope and are meant to limit those areas and to predict or measure performance.

Knowledge Management (KM) is the importance of having knowledge management during the strategy implementation process. This can include repositories, business processes, Enterprise Resource Planning (ERP) systems, and aspects of the culture. Culture in this case is collaborative and promotes knowledge sharing which is considered effective when working on projects.

Knowledge Transfer is the importance of knowledge transfer during the implementation process so that it can be used in the future. Knowledge transfer requires that those on the project team create knowledge that the company can use in the future. This means that those things learned in the course of the project need to be codified so that the information can be stored in a repository.

Leadership (Upper Management) is defined as the need for upper management involvement during the strategy implementation process. Upper management involvement during implementation ensures that politics do not stop project progress and that those in the organization understand that upper management is committed to the success of the projects undertaken.

Leadership and Planning is the responsibility of the project manager or leader. This includes leading the project team in the planning of the project as well as the execution of the plans. The project may require planning in any or all of the following areas: project scope management, project time management, project cost management, project quality management, project human resource management, project communications management, project risk management and project procurement management (Program Management Institute, 2004).

Objectives refers to the importance of identifying clear, achievable, measurable objectives that are communicated to the project team implementing the strategy. Short-term objectives are derived from long-term objectives and are used to drive action in the organization. Short-term objectives are the starting point for creating a project. A strategy dictionary defines objectives as the ends toward which effort is directed and resources are focused in an effort to achieve a firm's strategic vision (Kelly & Booth, 2004).

Planned Emergence is how well the organization plans and evolves the company's strategy and its impact on the strategy implementation process. This allows the company to make fast decisions and react quickly to the changing environment while

maintaining strategic processes for more alternatives, more information, and more integration (Wiltbank, Dew, Read, & Sarasvathy, 2006).

Project Management is a variable that measures the importance of project management during strategy implementation and is made up of six sub-variables: objectives, leadership and planning, resource allocation, competence, feedback and controls, and rewards and incentives. Project management is used to open, plan, execute, monitor and report, and close a project.

Repository is the importance of a repository during the implementation process and for future use. A repository can be a library that is or is not electronic. There should be a mechanism so that the library can be searched, thus making information available to those that need it when they need it.

Resource Allocation is the importance of having the required resources when implementing strategy. The areas that will be assessed are: budgeting, people, materials, information, and facilities/workspace/equipment.

Rewards and Incentives refers to the importance of having rewards and incentives when implementing strategy. Rewards are provided to team members when a project meets/exceeds the expected outcomes for cost, time, scope, quality, and objectives. Incentives can be provided to encourage team members to provide extra effort in order for the project to typically meet/exceed the time requirement.

Strategic Project Portfolio Performance is the project performance of an organization on a portfolio of projects. This includes how well the firm did with respect to meeting the objectives and the project measures for cost, time, quality, and scope.

Strategy is defined as the three generic strategies for cost leadership, differentiation, and focus (Porter, 1980). Companies that have the highest profitability usually possess a competitive advantage by combining cost leadership and differentiation. Cost leadership has to do with being able to offer products or services at a cost below what competitors can achieve. Differentiation requires that businesses have a sustainable advantage that allows them to provide buyers with something uniquely valuable to them (Pearce & Robinson, (2005). A combination of cost leadership and differentiation is referred to as best-cost strategy (Srivannaboon, 2006). A Focus Strategy is where a firm concentrates on a select few target markets.

Structure is defined as the organizational structure that the firm uses: functional, weak matrix, balanced matrix, strong matrix, or projectized. The structure can have an impact on project outcomes, as functional managers can decide whether or not to resource a project. There is the opportunity for operational work to take over and for strategic work to get a lower priority.

Chapter Summary

Chapter 1 presented the research problem, background of the problem, purpose of the study, contributions of the study, and definition of terms used in this study. The research problem called for research in strategy implementation, the use of project management and knowledge management, and the effects of this on strategic project portfolio performance. There has been no other conceptual or empirical study discovered that links these three items to project performance.

The background of the problem provides information about the lack of strategy implementation studies and shows there is a need for empirical studies to advance this

area of study. The linkage between strategy and project management (Srivannaboon, 2006), strategy and knowledge management (Nicolas, 2004), and knowledge management and project management (Brookes & Leseure, 2004) has been made. But as stated, all three have not been linked together and there is a need for empirical research.

The current business literature provides information about the problems encountered during the implementation process as well as the actions required to implement a strategy. This information was used to formulate research questions, conceptual and operational definitions, the research model, and hypotheses. This research is expected to add to the limited strategy implementation information available and to aid companies in implementing strategy.

Chapter 2

REVIEW OF THE LITERATURE

This chapter presents a review of the literature relevant to the strategic management process, strategic objectives, strategy formulation, environment, strategy implementation *(including project management)*, knowledge management, performance and feedback. Strategy processes are provided, as well as a proposed strategy implementation process that incorporates the variables studied in this paper. Defining the process is important as it provides a systematic approach to getting through strategy formulation and implementation.

Theoretical Framework

This study combines project management and knowledge management during the strategy implementation process to understand how this impacts strategic project portfolio performance. Project management looks at the knowledge areas of project management and the use of these while implementing strategic projects. Knowledge management is also considered beneficial to the project team and the organization as they go through the process of implementing the strategy.

In this section, information from the literature will be provided to support the claim that strategy that is not properly executed is meaningless and that there is a need for the organization to understand the environment, formulate a strategy, and then make changes within the organization to adapt to changes in the market. This section is broken down into seven sections: the strategic management process, strategic objectives, strategy

formulation, environment, strategy implementation, knowledge management, performance, and strategic feedback.

Strategic Management Process

The strategy process involves the following steps: establishing main strategic objectives, strategy formulation, strategy implementation, and strategic feedback (Barber, Dewhurst, Munive-Hernandez & Pritchard, 2004). In understanding this process it is also important to note that the strategy process requires that planned strategy and emergent strategy happen simultaneously (Mintzberg, 1998), and that strategy implementation includes communicating, interpreting, adopting, and enacting strategies (Noble, 1999).

Henry Mintzberg (1998) defines strategy as the five Ps: plan, pattern, position, perspective, and ploy. The first P is plan, which is how we get from here to there. The second P is pattern, which are actions over time, such as having a low-end strategy and releasing inexpensive products. The third P is position, which is where decisions are made to offer particular products or services in particular markets. The fourth P is perspective, which is the vision and direction. The fifth P is ploy, which is where a company can act as if they are going to do something when in fact they are hoping that their competition will react to the ploy.

Mintzberg (1998) also stated that some strategies are planned and that some emerge. This means that no one can state that one hundred percent of their strategies were planned and executed as originally planned. Therefore, organizations can and do make adjustments to their original strategies when better information is made available.

Traditional approaches to planning do not work in highly dynamic environments and as a result strategy development does not yield the intended results (Chaharbaghi &

Feurer, 1997). Chaharbaghi and Feurer prescribe that organizations must go to a more dynamic concept as the environment continues to change before strategies can be implemented. They have also provided a strategy and implementation process in their study based on the design school, see figure 1. There is additional support for the need for organizations to be aware of environmental changes and to plan to match the appropriate capabilities to changes in the environment (Ansoff, 1990).

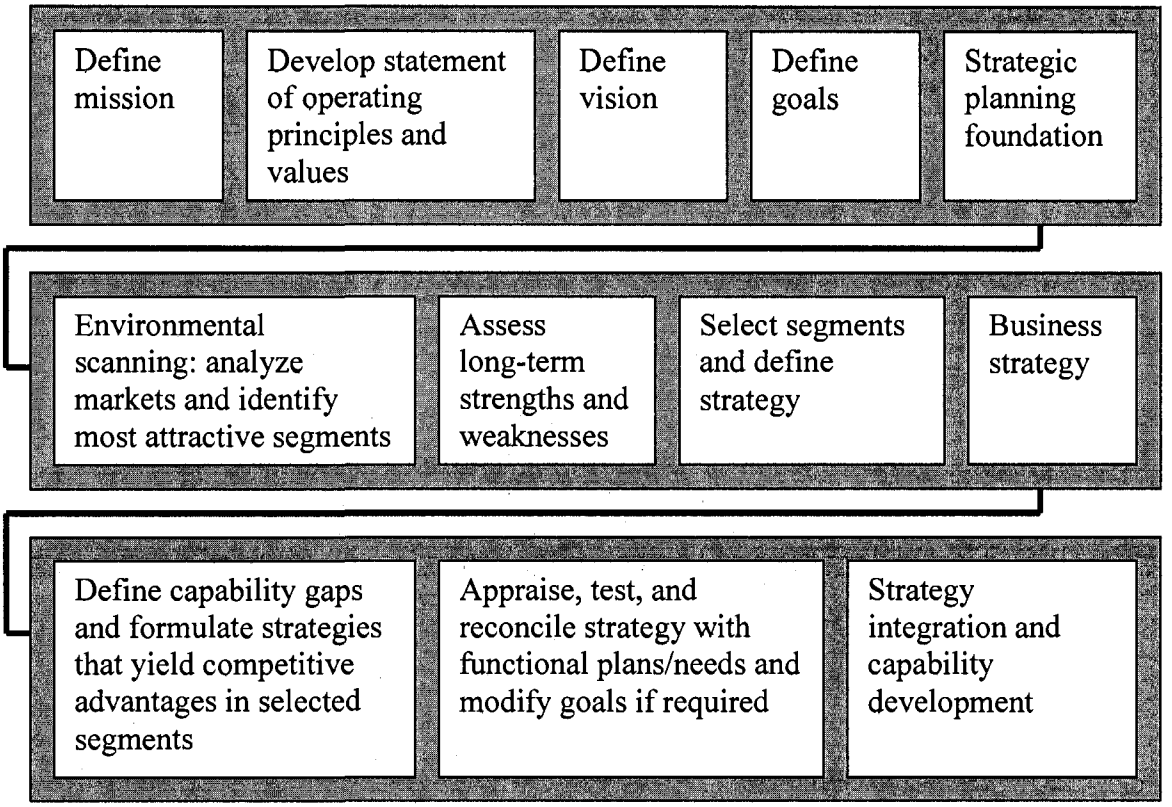

Figure 1. The strategy formulation and implementation process.

The design school is one of 10 schools of thought for strategy formation. The ten schools of thought are: the design school, the planning school, the positioning school, the entrepreneurial school, the cognitive school, the learning school, the power school, the cultural school, the environmental school, and the configuration school (Mintzberg, Ahlstrand, & Lampel, 1998). Mintzberg, Ahlstrand, and Lampel (1998) define the design

school as a model of strategy making that seeks a fit between internal capabilities and external possibilities.

In knowledge intensive companies, intellectual capital generally represents the most critical resource in the value creation chain. A dynamic environment requires that these firms be more flexible and a simpler model was proposed (Peppard & Rylander, 2003). Figure 2 is an Intellectual Capital (IC) perspective of the linkages between strategy and resources that are required to achieve the vision.

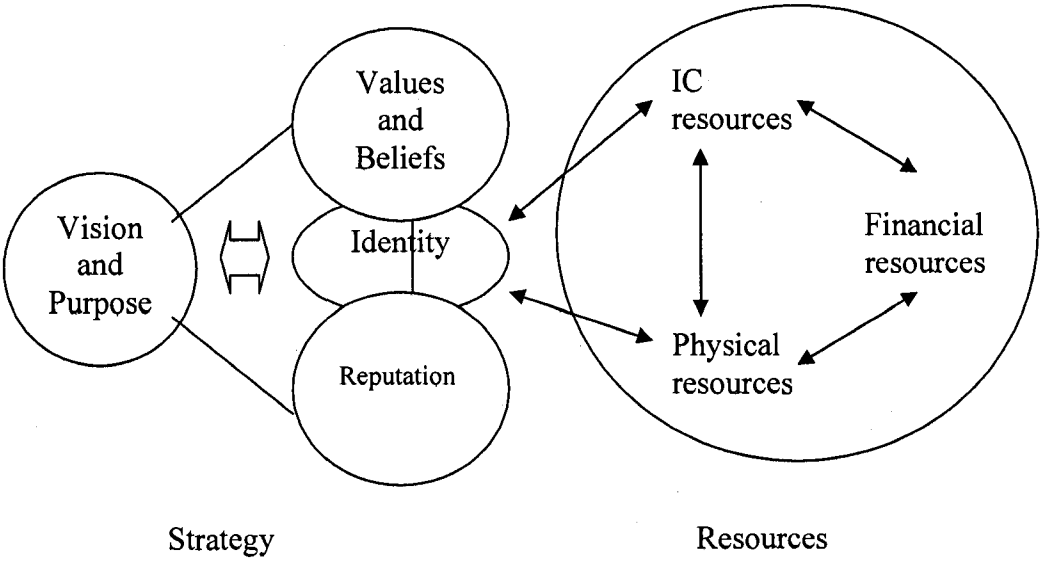

Figure 2. Resources needed to support vision (Peppard & Rylander, 2003).

Another assessment of strategy implementation was performed using Sun Tzu's Art of War (Chow, Wu & Wu, 2004). It was reported that firms that adopted Sun Tzu's principles of situation appraisal, strategy implementation, and strategic control performed better on meeting objectives.

The overall strategy process as it is defined can be seen in figure 3. This was adapted from Okumus (2001), who proposed a framework that included external content, strategic content, internal content, strategic process, and outcome. Internal context covers some knowledge management topics such as culture and the learning process. The strategic process calls for planning, resource allocation, communication, people, and monitoring and feedback.

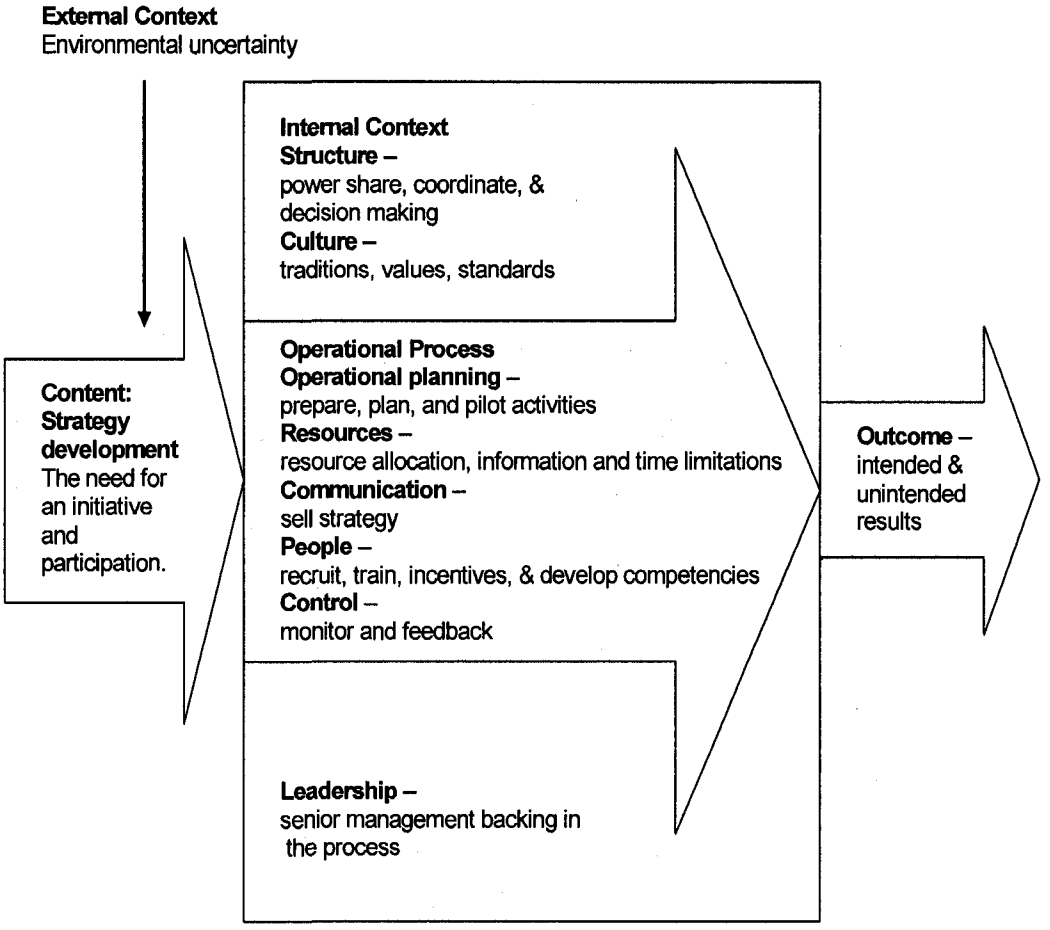

Figure 3. Strategy implementation framework adapted from Okumus, (2001).

The strategy process to implement projects at a lower level can be seen in figure 4. This is a theoretical process that is proposed based on the variables that are studied in

this paper and is partially based on the contents in figure 3. The process shows how project management and knowledge management might fit into the implementation process. It also shows the feedback loop that takes place from the project team in the form of reviews and the measurement reports that can be generated by a system.

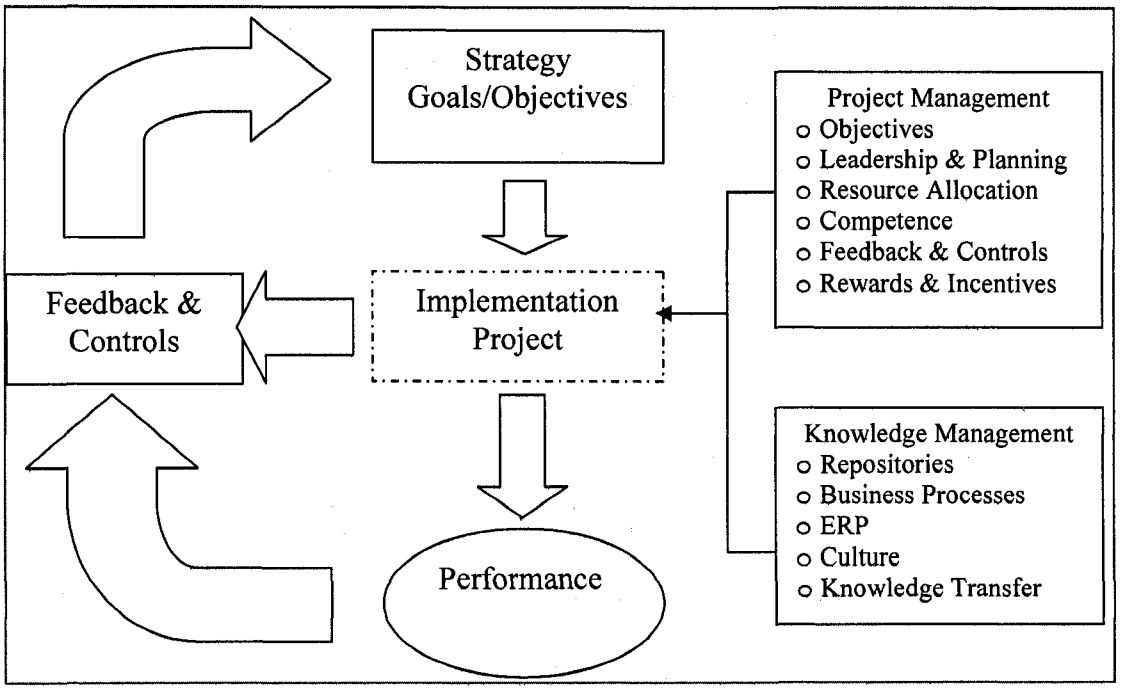

Figure 4. Strategy implementation process for projects.

When providing information on strategy implementation or execution, the discussion would not be complete without mentioning the balanced score card (BSC). The BSC is being used by many companies throughout the world and is considered their system for effective strategy implementation (Kaplan, 2005). Additionally, Kaplan reports that the McKinsey 7-S model developed by Tom Peters and Robert Waterman aligns very well with the BSC, even though they were developed independently.

Strategic Objectives

Whether we are talking about objectives, strategies, or performance targets we are looking at company goals that need to be accomplished in order for the firm to compete in its market space. An explanation will be provided in this section.

Objectives need to be set in eight distinct areas: marketing, innovation, human resources, financial resources, physical resources, productivity, social responsibility, and profit requirements (Drucker, 2001). Seven long-term objectives are profitability, productivity, competitive position, employee development, employee relations, technological leadership, and public responsibility (Pearce & Robinson, 2005).

Five success strategies are production driven, market driven, product driven, environment driven, and research driven (Ansoff & Antoniou, 2005). Generic strategies are overall cost leadership, differentiation, and focus. Grand strategies, on the other hand, are concentrated growth, market development, product development, innovation, horizontal integration, vertical integration, concentric diversification, conglomerate diversification, turnaround, divestiture, liquidation, joint ventures, strategic alliances, and consortia (Pearce & Robinson, 2005). Any of these 14 grand strategies can be used to help a firm achieve its long-term objectives.

A combination of long-term objectives with the right strategy can help an organization to compete. However, this is not the case until the long-term objectives are translated into action plans and short-term objectives. The project management areas of knowledge will be used for plan development at this level. The knowledge areas are: integration management, scope management, time management, cost management, quality management, human resource management, communication management, risk management, and procurement management (Program Management Institute, 2004). The

short-term objectives should be linked to the long-term objectives of the firm, be measurable, and be prioritized (Pearce & Robinson, 2005).

Strategy Formulation

Strategy formulation is viewed as a process with specific steps that need to be completed. The current literature contains strategy assessment approaches and a depiction of the strategy formulation process. Planned emergence includes a planning and an adaptive approach to strategy formulation (Wiltbank, Dew, Read, & Sarasvathy, 2006). This requires an understanding of what constitutes planning and adapting strategies. A planning strategy would require that a company be able to better predict and position itself in the market in which it competes based on the environmental changes it envisions. An adaptive strategy would require that the company be able to move faster to adapt to a rapidly changing environment.

Acur and Englyst (2006) developed an assessment tool that integrated three strategy assessment approaches: goal-centered, comparative, and improvement approaches. Their study also reported that there are three phases in the strategy formulation process: strategic thinking, strategic planning, and embedding of strategy.

The goal-centered approach deals with how well an organization attains its objectives. The comparative approach refers to how well the organization performs against the competition. The normative approach is used to measure the company's performance in relation to some standard in the field in which it operates. The improvement approach is used to determine how well the strategy has adapted over time.

Strategic thinking requires that the external environment is monitored and that changes that affect the organization are reflected in the company's strategy. The

outcomes of the strategic thinking process should be the identification of business opportunities, as well as company strengths and weaknesses, so that managers can apply internal competencies to the external environment.

The strategic planning document needs to be clear and contain sufficient detail, including the delegation of authority for any action described if the company wishes to achieve acceptance and commitment to the strategy proposed. Formalized strategy requires that the organization create written action plans, objectives, and procedures.

The embedded strategy requires that key actors should act as teams and that they are prepared, committed, and motivated to implement the new strategy. It is also important that there is change management to oversee employees, resources, and capabilities for planning strategies and changes. Change management is then responsible for ensuring that any conflicts between the company's objectives and business performance are resolved.

Acur and Englyst (2006) reported that strategy formulation could be considered a success if it facilitates: *Strategic Thinking* (1) development of awareness of the industry in which you operate and your competitors, (2) self-criticism such as identifying strengths, weaknesses, opportunities, and threats, (3) awareness of strengths and opportunities to exploit them, (4) awareness of key problem areas, (5) decision-making through effective and adaptive process, (6) maintenance and understanding of changing organizational processes and procedures, (7) understanding of the strategic priorities of top management, (8) learning from experience, (9) confidence that business is more successful as a result; *Strategic Planning* (10) redesign of the goal of the company, (11) development of a good document that is accurate and simple to understand, (12)

development of a clear plan with clear responsibilities, (13) development of a detailed plan; *Embedding* (14) shared understanding of strategic objectives and priorities for all levels, (15) education of all people on the importance of company strategy, (16) coordination and flow of objectives, measures, and actions from high to low levels, (17) achieving a general level of agreement, (18) open lines of communication, (19) involvement of staff in decision-making and taking into account their ideas to let them feel that they have a say in their own future, (20) change by motivating people, (21) adaptation of technology to help strategic change, (22) trading-off of strategic choices to optimize business performance, and (23) effective change management, avoiding overlapping and conflicted development.

Environment

This study is interested in the business environment to which organizations are exposed both internally and externally. An explanation of environmental conditions that affect business will be pulled from strategic management studies as well as a definition of environment from Webster's dictionary.

Webster's dictionary defines environment as all conditions, etc. surrounding, and affecting the development of, an organism. If we substitute the word business for organism, we have a good understanding of the term. We can further clarify how environment is viewed by those in strategic management.

Strategic management has its own language and as a result there are dictionaries, encyclopedias, journal articles, strategic management books, and textbooks on the subject that can be used to provide a definition for environment. Samples will be taken from

some of these publications and provided so that the reader understands how environment is viewed by those in the strategic management field.

The first sample is from a dictionary of strategy. The definition is from a Kenneth Andrews (1971) study that defines environment as the pattern all external conditions and influences that affect the life and development of the firm (as cited in Kelly & Booth, 2004).

A textbook sample comes from Pearce and Robinson (2005) that breaks down environment into three distinct global and domestic factors: (1) remote environment, (2) industry environment, and (3) operating environment. See figure 5 for a Pearce and Robinson (2005) listing of the factors and their respective components. The external factors influence the firm's choice of direction, action, structure, and processes (Pearce & Robinson, 2005).

The external environment impacts the organization positively or negatively and the elements of this are: society, government, markets, customers, industry, competition, and suppliers (Ansoff, Declerck, & Hayes, 1976). Turbulence is used to describe how changes that occur in an industry affect a firm and require that the firm respond accordingly to the changing environment (Ansoff, 1979). Turbulence can have a positive or a negative affect on an organization and addresses not only the changeability of the environment but also the novelty of the change and the speed with which the changes occur (Ansoff, Antonio, & Lewis, 2004).

Comprehensiveness has to do with how exhaustive a company is in making and integrating strategic decisions. Formalization is the existence of structure, techniques, written procedures, and polices guiding the planning process. Focus is the balance

between creativity and control in the strategic planning system. Top-down flow deals with the initiation of planning management with support from staff. Broad participation means getting involvement from different functional areas in the company as well as any key stakeholders at lower levels of the organization. High consistency is characterized by frequent meetings and assessments of the overall strategy.

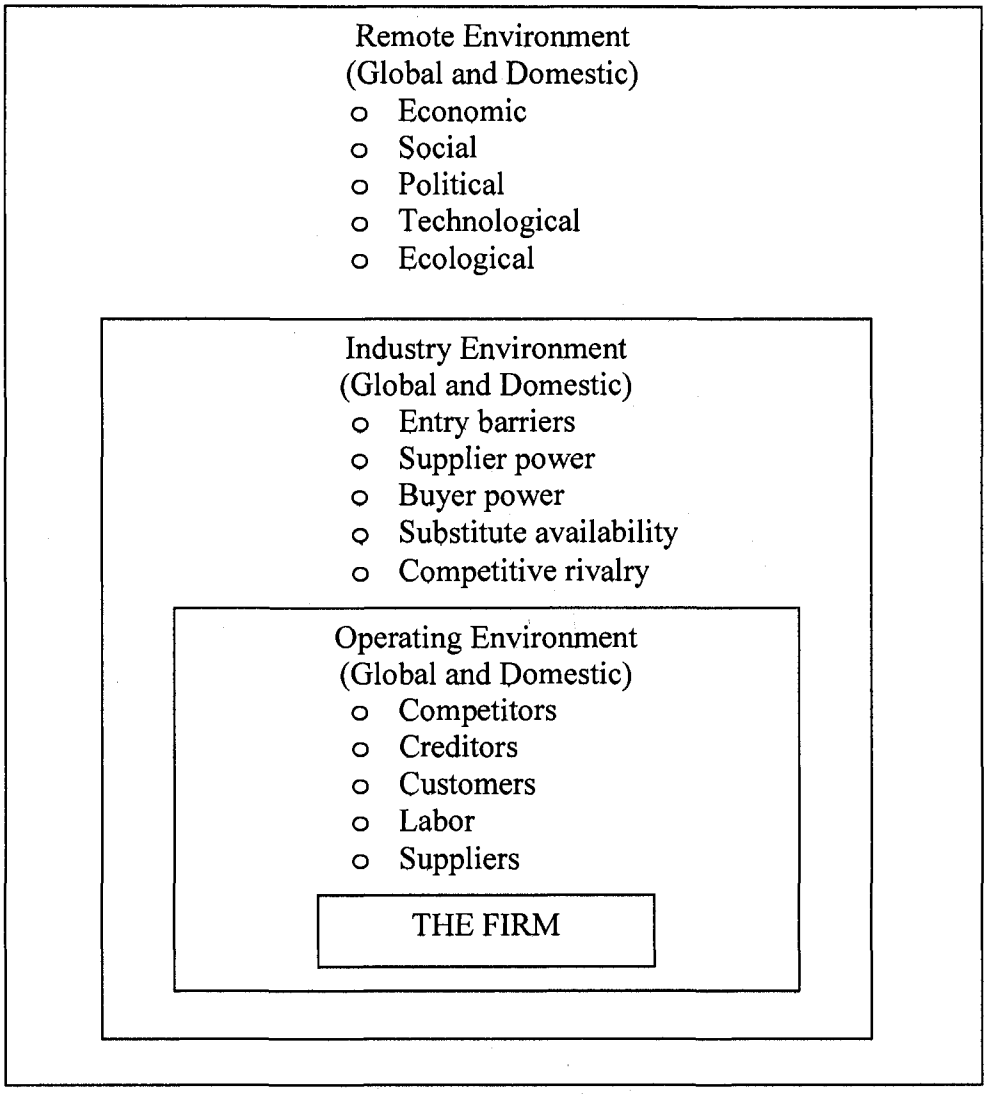

Figure 5. External environment (Pearce & Robinson, 2005).

Strategy Implementation

This section of the study will analyze the use of project management and its effect on strategy implementation performance. Project management and implementation issues will be discussed. Project management and strategy have been linked in studies and although conceptual studies exist, there are only a limited number of empirical studies. One such conceptual study indicates that the pattern of change can be broken down into a set of steps that must function within the limitations of time, resources, and performance objectives (Svetlana Cicmal, 1999). Strategy implementation or execution is necessary as it takes the company's formulated strategies and translates them into action.

Strategy implementation can be viewed as a project or set of projects. Projects are a means of organizing activities that are not a part of the normal operational limits of the firm. Also, a project is a temporary endeavor undertaken to create a unique product, service, or result (Program Management Institute, 2004).

Project management is the application of knowledge, skills, tools, and techniques to project activities in order to meet project requirements. Project management is accomplished through the application and integration of the following processes: initiating, planning, executing, monitoring, controlling, and closing. The project manager is responsible for: identifying requirements, establishing clear and achievable objectives, and balancing competing demands on quality, scope, time, and cost (Project Management Institute, 2004).

Project management processes, tools and techniques will now be described. Project managers can choose to use certain tools to overcome issues encountered during

the implementation process. Appendix A contains a list of the 142 project management tools and techniques associated with the project management processes listed in table 3. Illustrated in table 3 are the knowledge areas, processes and also a reference to the corresponding tools and techniques listed in appendix B.

Leintz and Rea (1995) state that the following items affect project success: the clarity of project objectives, the fit betweens the project's scope and the objectives that it tries to achieve, the strong relationship of all projects with the standard structure of the company, the identification and proper management of potential difficulties early in the project, and the maintenance of a small, effective project management team that possesses the necessary skills to achieve the project objectives.

A scorecard was developed that describes the principles of effective implementation. This was established in a manufacturing environment. Eight principles were identified, specifically: (1) never stop asking the question: "how can we improve our track record for the effective implementation of manufacturing strategy?", (2) prepare a plan of action, (3) surface the force for effective implementation as a function of: the clarity regarding what you want to achieve, expressed in outcome terms, the confidence in knowing how to achieve this outcome, and the conviction as to why it is necessary to do so, (4) use the force of effective implementation to elicit appropriate behavior from stakeholders who: have the power to sabotage the intervention, or whose supportive behavior is highly likely to determine the degree to which the outcome is achieved and sustained, (5) have dual organization capability, (6) take the first small steps, (7) lead like a relentless but reflective bulldozer driver, and (8) create a fault-tolerant environment for the above seven points to flourish (Faull & Fleming, 2005).

Table 3.

Project management knowledge areas and their corresponding processes.

Knowledge Area	Project Management Processes (Tools & Techniques, appendix A)
Integration Management	1. Develop project charter (1,2,3,&4) 2. Develop preliminary scope statement (2,3,&4) 3. Develop project management plan (2,3,&4) 4. Direct and manage execution (2&3) 5. Monitor and control work (2,3,4,&5) 6. Integrated change control (2,3,&4) 7. Close project (2,3,&4)
Scope Management	1. Scope planning (4&6) 2. Scope definition (4,7,8,&9) 3. Creation of WBS (10&11) 4. Scope verification (12) 5. Scope control(13,14,15,&16)
Time Management	1. Activity definition (4,6,11,17&18) 2. Activity sequencing (19,20,21,22,&23) 3. Activity resource estimating (4,24,25,26, &27) 4. Activity duration estimating (4, 28-31) 5. Schedule development (21,23,26,&32-36) 6. Schedule control (14, 26, 39-42)
Cost Management	1. Cost estimating (26-29, 31, 43-45) 2. Cost budgeting (29,31,46&47) 3. Cost control (26, 48-52)
Quality Management	1. Quality planning (45, 53-56) 2. Perform quality assurance (57-60) 3. Perform quality control 61-70)
Human Resource Management	1. Human resource planning (71-73) 2. Acquire project team (74-77) 3. Develop project team (78-83) 4. Manage project team (84-87)
Communication Management	1. Communication planning (88&89) 2. Information distribution (90-93) 3. Performance reporting (94-98) 4. Manage stakeholders (87,100)
Risk Management	1. Risk management planning (100) 2. Risk identification (101-105) 3. Qualitative risk analysis (106-110) 4. Quantitative risk analysis (111&112) 5. Risk response planning (113&116) 6. Risk monitoring and control (31, 117-121)
Procurement Management	1. Plan purchase and acquisitions (4, 122&123) 2. Plan contacting (4 & 124) 3. Request seller responses (125-127) 4. Select sellers (4, 128-133) 5. Contract administration (134-141) 6. Contract closure (140 &142)

Turner and Speiser (1992) state that difficulties exist in managing multiple projects because of three main factors. The first is that projects have interfaces with other projects and day-to-day operations, sharing common deliverables, resources, information or technology across the interfaces. The second is that projects must negotiate priorities on almost a daily basis with other projects and with day-to-day operations. The third is projects deliver related objectives that contribute to the overall development objectives of the parent organization.

When culture changes are required, or when dealing with resistance in the implementation process, those affected by the change need to be brought into the process. There has been much said about the negative aspects of politics, such as: it divides the company and can be costly; it uses resources that could be used in more beneficial ways; and it can allow ineffective legitimate leaders to remain in power and illegitimate leaders to exist and cause disruptions in the business (Mintzberg, Ahlstrand, & Lampel, 1998). Team leadership should be considered legitimate power and should ensure that members of the team are motivated, able and competent to implement change and to provide project deliverables when they are needed. There are four benefits to politics: it ensures that the leaders are the strongest members of the organization, ensures that issues are debated, stimulates change blocked by legitimate leaders, and eases the execution of change (Mintzberg, Ahlstrand, & Lampel, 1998).

Powerful people in an organization can slow or stop the incorporation of change. If these people have vested interests in maintaining the status quo, they can attack the change with the hope of stopping the strategy execution process. To overcome political forces, tipping point leaders seek alliances with those that benefit most from the change,

attempt to silence those that oppose them and have the most to lose, and look for top management support from someone who understands the problems, including who will and will not support the project process (Kim & Mauborgne, 2005).

If technological change transforms the market place by changing the relative cost, features, and availability of products, then when the rate at which products are introduced is increased there is a corresponding increase in the rate at which products will become obsolete (Krell, 2000). Rapid change requires that the workforce be highly skilled and highly flexible. In the 1920s, the average lifecycle for a product was 25 years; in the 1970s, the average lifecycle was 2 years (Scheuing, 1974). Product lifecycle therefore needs to be managed so that companies can introduce new products and remove others from the market as needed.

The project management process can be viewed as a strategic asset that contributes to a company's competitive advantage (Jugdev & Mathur, 2006). Projects themselves are different in that their requirements and project durations differ, but they are the same in that they share common characteristics (Cohen, Mandelbaum, & Shtub 2004).

For strategic information systems planning, such as is used for implementing an Enterprise Resource Planning (ERP) system, written documents help to structure strategic direction and implementation (Segars et al., 1998). Segars et al. (1998) identify six dimensions of a strategic information systems planning process: comprehensiveness, formalization, focus, top-down flow, broad participation, and high consistency.

It is possible that there could be implementation problems, as there is a need for two-way communication during the implementation process (Alexander, 1985). If

management attempts to separate itself from operational work, the two-way communication may not be possible. If implementation is going to be successful during the implementation process, it is also important that certain questions are answered: Where does the process start and end? Is there a customer for the process? Which are the main phases of the process? Who participates in the process and in what kind of role? What is the product of the process? What is the schedule of the process? (Aaltonen & Ikavalko, 2002).

The 22 original implementation problems given in the Alexander (1985) study and the 15 posed by the Al-Ghamdi (1998) study have been reduced to the top 10 reported problems in this research. The top 10 lists for these two studies differed in chronological order, and the results differed by one problem. In the Alexander (1995) study, insufficient training of lower level employees was in the top 10; this was replaced in the Al-Ghamdi (1998) study with the issue that problems requiring top management involvement were not communicated to them fast enough. The top ten problems for both the Alexander (1985) and Al-Ghamdi (1998) studies can be found in table 4.

The reason that this information is being provided is the belief that if a problem is understood, a solution can typically be found. Each of the top ten items will be addressed next with respect to corresponding project management literature that addresses that particular problem. Items that are similar in nature can be grouped so that they can be explained at the same time and there is no need to repeat information.

For projects that take more time than originally allocated, project management uses scheduling of projects and provides tools and techniques for compressing schedules. Project management is not an exact science, and many problems associated with time-

cost tradeoffs are as much social, political, and organizational as they are resource related (Haga & Marold, 2004). It is also important to note that, in a multi-project organization, the higher the organizational utilization, the lower the project throughput time (Cohen, Mandelbaum, & Shtub 2004).

Table 4.

Top ten implementation issues. Reported by Alexander (1995) and Al-Ghamdi (1998).

Alexander Top Ten	Al-Ghamdi Top Ten
Implementation took more time than originally allocated.	Competing activities and crisis distracted attention from implementing this decision.
Major problems surfaced during implementation that had not been identified beforehand.	Implementation took more time than originally allocated.
Coordination of implementation activities was not effective enough.	Coordination of implementation activities was not effective enough.
Competing activities and crisis distracted attention from implementing this decision.	Major problems surfaced during implementation that had not been identified beforehand.
Capabilities of employees involved were not sufficient.	Key implementation tasks and activities were not defined in enough detail.
Training and instruction given to lower level employees were not adequate.	Information systems used to monitor implementation were not adequate.
Uncontrollable factors in the external environment had an adverse impact on implementation.	Leadership and direction provided by departmental managers were not adequate.
Leadership and direction provided by departmental managers were not adequate.	Capabilities of employees involved were not sufficient.
Key implementation tasks and activities were not defined in enough detail.	Problems requiring top management involvement were not communicated to them fast enough.
Information systems used to monitor implementation were not adequate.	Uncontrollable factors in the external environment had an adverse impact on implementation.

Time increases can be also be attributed to previously unidentified risk. Risk management is one of the nine knowledge areas listed in *A Guide to the Project Management Body of Knowledge* (Project Management Institute, 2004). One aspect of project risk has to do with project schedule duration and uncertainty. There is a need for project managers to analyze the effects of uncertainty on their project schedule; scenario analysis is a tool that can be used to assess project schedule uncertainty (Liberatore & Pollack-Johnson, 2005).

Risk assessment should address any major problems that surface during a project which had not been identified earlier. Bourne and Walker (2005) reported that standard control processes are appropriate for known problems, risk management is appropriate for known unknowns, and unknown unknowns are seen by senior management as a project that is out of control. This can be viewed by management as incompetence whether it is a functional area or as it applies to projects.

When dealing with complex systems, management of the project is complex not only because of technical complexity but primarily because of changes in the market, the regulatory process, and the knowledge requirements impacting the project (Alderman & Ivory, 2005).

Managing issues may result in better project performance. This can be done by managing schedule, including establishing a timeframe for specific tasks. This allows for the effective coordination of implementation activities. The management of projects requires that key implementation tasks and activities are sufficiently defined.

A communications plan should be developed, and should address how communication will take place with top management. The documentation of the project

in the project plan and subordinate plan should adequately define what needs to be done so that anyone can take over if a new leader or team is required. These plans also include: the communication of goals and that they understood by employees, that changes in roles and responsibilities of key employees are clearly defined, that key formulators of the strategic decision play an active role in implementation, and the financial resources and rewards and incentives.

Project planning requires the team member definition of roles and responsibilities. The role of the division project management leadership is to: participate as a member of the governance body and provide guidance to teams in creating and aligning strategies within portfolios; provide systems, procedures, and supporting staff; identify the appropriate project planning documents; and communicate the role of project management staff with regard to developing strategies, and leading teams, analyzing, and choosing alternatives with other managers (Jamieson & Morris, 2004).

The role of project leadership is to: identify how the project relates to the wider portfolio; lead the team in selecting alternatives that may be best for the portfolio and not just the project; review the development strategy through use of tools and procedures; initiate, implement, and manage the development of project documents; review documents on a regular basis to ensure that they are current, that objectives are being met, and that the team is aware of strategic issues; and ensure that new members can access documentation and that the objectives are understood (Jamieson & Morris, 2004).

The role of the project members is to: provide input into the development strategy; communicate project strategy to their department and ensure their department

supports the strategy; and alert project leadership of any internal or external changes that can impact the existing strategy (Jamieson & Morris, 2004).

Competing activities can distract project members from the tasks that need to be completed. Ash and Smith-Daniels (2004) acknowledge that there is an impact on development projects as project knowledge workers are moved to customer support projects. The recommendation is that preemptive rules be put in place and that these rules be based on criticality or learning progress. Management should minimize interruptions to development projects and, if it is necessary, take into account the relearning penalty.

Project team members may find it necessary to provide deliverables to a project team and to their functional manager at the same time. Although this conflict may exist, this does not mean that it will exist and this can be resolved by managing relationships (Dooley, Lupton, & O'Sullivan, 2005).

When discussing the capabilities of employees involved in the project and whether they are at the required level, there must be attention paid to the knowledge and skills that they possess or that can be obtained. Required project management skills include: controlling and managing schedule, cost, scope and relationships (Bourne & Walker, 2004).

Program management requires that change be implemented and relationship management skills are needed so that the project manager can achieve project necessities. This means that project managers need to understand the alliance of power, influence and resource availability, and be willing to engage with powerful stakeholders to ensure project success (Bourne & Walker, 2004).

Loo (2003) defines the requirements for project success with respect to project management and staff, technical and people skills, as well as the ability of an organization to facilitate the process or inhibit progress. If project managers and staff have weak technical and people skills, even if the organization facilitates success, there will be poor project performance. If the project managers and staff have strong technical and people skills and the organization facilitates success, then the organization should have strong technical capabilities. If project managers and staff have strong technical and people skills and there are performance inhibitors, there will be poor project performance.

Training and instruction given to lower level employees can ensure that the project team has the required skills and knowledge to perform the tasks they need to complete. In their study, Cheung and Lloyd-Walker (1999) found that training evaluation is required to ensure the successful implementation of future Information Technology (IT) projects. When this evaluation takes place, it should ensure that the budget needed for training is available and that the required training is scheduled for those that need it so that the usage is at the level expected when implementation is complete.

Sense (2005) discovered that impediments existed that precluded conversational learning taking place during work or projects. The culture studied required that those working on business tasks perform a particular action, but time was not allocated for reflecting and sharing information. This meant that those who did learn something did so individually and there was no conversational learning taking place. This can be attributed to highly demanding, disruptive, and dynamic environments requiring individuals to deliver on multiple projects (Sense, 2005).

When uncontrollable factors in the external environment have an adverse impact on implementation, this can be defined as realized risk. The project proposal is prepared at the beginning of the project lifecycle. The proposal itself is generated in response to internal and external forces as they are understood at the beginning of the project (Woodhead, 2000). If the environment in which project management takes place is wrongly assessed, the knowledge the project team requires will be either lacking or in too much abundance and the project team will therefore be either over or under challenged (Koshkinen, 2004).

Understanding and acknowledging the source of uncertainty in the environment has benefits (Doll, Hong, & Nahm, 2004). Those benefits include: better up front planning, the creation of clearer project targets, a reduced number of conflicts, improved decision making, improved communication between functions, support for the allocation of resources, and a project team better able to make trade-off decisions.

Leadership needs to come from the project team leader but also from the functional departments. Middle managers are critical in assuring that strategy implementation is successful. They have the responsibility to communicate strategy and to translate that strategy into goals and objectives for their organization. This is critical to success, as communication does not itself assure successful implementation; it is the act of interpreting, accepting, and adopting that is important (Aaltonen & Ikavalko, 2002).

The organization should have a culture that promotes results. The company should avoid creating a huge bureaucracy that might stop innovation. The company should also take a disciplined approach. This means that people should feel free to contribute within the framework established. The assumption should be that the right

people have been hired and that they will perform given the opportunity. There also needs to be discipline when defining what action is going to be performed; this ensures that the organization is focused and not trying to be all things to all people. Finally, the organization needs to take disciplined action (Collins, 2001).

Information systems used on the project should be adequate so that the appropriate information can be accessed when it is needed and by the people that need it. There is a need for tools to gather required project information and to disseminate that information to those that need it for problem solving and decision making (Czuchry & Yasin, 2003). There is also a need for project information to be stored in a central organizational database and in external databases so that comprehensive, accurate and complete records are available to those that need it.

The use of project teams requires that people are brought together for a limited period of time until they achieve a particular outcome. Since the same group does not always reform, it is important that the project information be recorded so that it can be used on future projects (Cheung & Lloyd-Walker, 1999).

There must be support and backing by top management in the strategic business unit (SBU) and at the corporate level for the project. This is usually obtained when projects are selected and funded. Cheung and Lloyd-Walker (1999) concluded that projects require support from strategic planners so that projects can be fully implemented.

For an organization to succeed, it needs to understand which organizational structure works best for the strategy it is pursuing (Chandler, 1962). Project implementation issues can result from any of the areas already discussed. For organizations that use projects to implement change, the information in figure 6 may be

helpful. The influence of organizational structure on projects specifically addresses some issues that are contained in this paper. These include resource allocation, whether functional managers are supporting the project, budgets, and project leadership.

Organizational Structure / Project Characteristics	Functional	Matrix Weak	Matrix Balanced	Matrix Strong	Projectized
Program Manager (PM) Authority	Little or None	Limited	Low to Moderate	Moderate to High	High to Almost Total
Resource Availability	Little or None	Limited	Low to Moderate	Moderate to High	High to Almost Total
Who Controls the Project Budget	Functional Manager	Functional Manager	Mixed	Project Manager	Project Manager
Program Manager's Role	Part Time	Part Time	Full Time	Full Time	Full Time
Project Management Administrative Staff	Part Time	Part Time	Part Time	Full Time	Full Time

Figure 6. Organizational influence on projects (Project Management Institute, 2004).

Thus far we have discussed new product introduction projects, but there is also a need to talk about organizational change projects. There are similarities between projects and project management should be considered a viable method for introducing change. For organizational change, it is important to know that change content, context, process, and individual differences have the ability to influence change success (Walker, Armenakis, & Bernerth, 2007). It is also important to understand change communication and the organization's ability to embrace change (Frahm & Brown, 2007). This can be especially important for companies that practice continuous improvement. Companies

that continually introduce new products need employees to embrace this and to have the ability to function in this environment.

Knowledge Management

Knowledge management can be looked at as the systematic process of creating, acquiring, disseminating, leveraging, and using knowledge to gain a competitive advantage or to achieve an organizational objective (Nicolas, 2004). Knowledge itself is usually embedded in repositories, documents, routines, operational processes, practices, and norms (Lin, Tseng, & Yeh, 2005). Since knowledge is treated as a competitive resource, it is driving organizations to implement various knowledge management initiatives to identify, share, and exploit knowledge assets (Chua & Lam, 2005). These initiatives can be the result of business process-modeling and/or re-engineering, quality management, business intelligence movements, or the learning organization (Bernus & Kalpic, 2006). The benefits can be improved decision-making, increased productivity and innovation, less reinvention and duplication, better staff development, and a lesser impact of attrition (Chua & Lam, 2005).

Chourides, Longbottom, and Murphy (2003) report that: organizations put knowledge management high on the agenda and believe that the importance will grow; that it is new and are seeking to better understanding of it; most efforts have begun in the last two to three years; most activity has been in the information technology area; there has been little activity in strategy, TQM, marketing, and finance; there has been confusion over structure and its link to strategy; there is positive perception of results but a lack of evidence; performance measures are not well developed; there are possible links

to TQM and business excellence; and the chief reasons for knowledge management are information management, competitive advantage, rapid response, and innovation.

Brookes and Leseure (2004) report a strong correlation between good project management practices and evidence that good project teams use good practices for managing knowledge. Likewise, companies that had problems with knowledge reuse across projects also had problems implementing good project management practices. Firms that want a competitive advantage are concerned with the external environment and knowledge that impacts on cost, quality, time, and flexibility (Krajewski & Ritzman, 2002). Three major influences for the management of knowledge in an organization are managerial, resource, and environmental (Holsapple & Joshi, 2000). The four main factors for managerial influences are coordination, control, measurement, and leadership. The four main factors for resource influences are knowledge, human, material, and financial resources. Environmental influences consist of competition, markets, time pressure, and governmental and economic climates.

If knowledge transfer is to take place between individuals and groups, a collaborative culture needs to exist in the organization (Goh, 2002). Knowledge management is a managed process that leads to the creation, acquisition, storage, access or transfer of knowledge (Blackman & Henderson, 2005).

Organizations can look at existing strategy and determine what knowledge will make it work, or they can take existing knowledge and determine what strategy capitalizes on it (Aronsons, Halawi & McCarthy, 2006). These options allow the organization to create a strategic or competitive advantage if it can effectively manage knowledge and create a strong strategy-knowledge relationship. When planning a

knowledge management strategy, it is important to identify the goals and objectives up front (Gupta, Narain, Shankar, & Singh, 2003).

Knowledge management strategy is the process of generating, codifying, and transferring explicit and tacit knowledge within an organization. It requires getting the right information to the right people, in the right place, and at the right time. The knowledge strategy defines the needs, methods, and actions to achieve the objectives (Aronsons, Halawi, & McCarthy, 2006).

When linking knowledge management with project management, we are looking to take advantage of the standardization of processes. Standardization requires that individuals take knowledge and create artifacts. This allows different people to perform similar tasks in different locations and get similar results. Moreover, standardization is a distinct process and requires that results be written down as they occur and that they stay frozen until such time as revisions are required (Ungan, 2006). This can be effective for companies that are iteratively changing and are pursuing a cost leadership strategy.

Difficulties arise in getting the right information to the right people at the right time as there can be uncertainty with flawed information (Lang, 2001). This is not a problem with incremental change, but there most certainly will be a problem with a change that results in something new being created. This could result in new information being created and a difficulty in terms of managing codified and uncodifiable information. The codified information may provide limited value to the organization unless there is a clear use for the data (Hall, 2006).

Knowledge repositories aim to improve productivity by reducing the time and effort necessary to complete a task by allowing individuals access to existing codified

explicit knowledge (Gray, 2001). The disadvantages are that people will not be as likely to exchange information socially in the organization, so that direct information sharing is reduced and power moves from the employee to the manager.

There has been difficulty creating a model linking knowledge management and strategy formulation for the following reasons: the inability to recognize knowledge as a strategic resource; differences in opinion with regard to the strategy formulation process; and differences in opinion with regard to strategic knowledge management (Kruger & Snyman, 2004).

Performance

Strategy formulation and implementation cannot be separated. They are dependent on each other and therefore should be viewed together. When describing results, it is important to talk about how strategy formulation and implementation affect each other. Hrebiniak (2005) suggests that poor strategy will result in poor results no matter how good the execution is (see figure 7). This indicates that good strategy and good execution will provide good results.

It is important to discuss rewards when talking about performance because developing strategic rewards can motivate employees to continually make strategic objectives happen (Van Den Berghe & Verweire, 2004). Figure 8 shows a proposed reward management model that shows how the environment, strategy, culture, and values drive results.

Additionally, compensation for those who perform strategic work as opposed to those that do not should be considered important to an organization (Marler & Yanadori, 2006). If teams are formed that contain strategic and non-strategic workers, there may be

inequality in compensation. Rewards may be a way to balance compensation inequalities for those that work on strategy implementation teams and are not normally considered to be strategic workers.

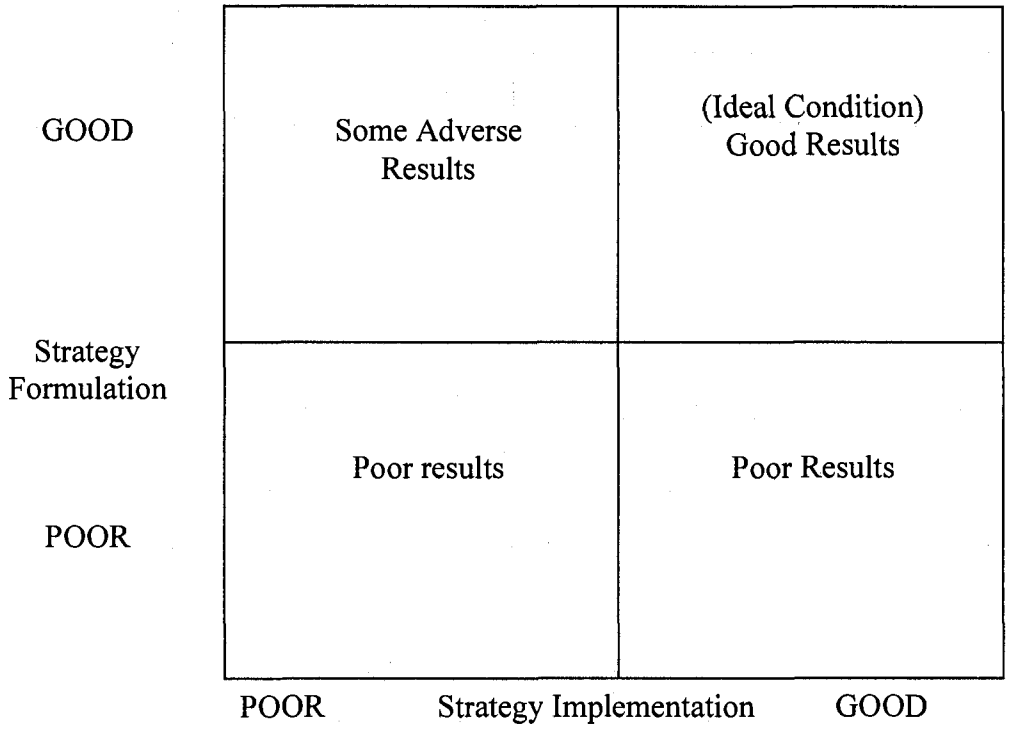

Figure 7. The impact of strategy formulation and implementation on results. Adapted from Hrebiniak (2005).

Team rewards have been reported as being negative in that they constitute a distraction to the real objective of accomplishing the project. Rewards in this case were found to foster competition. It was recommended that rewards be offered in the form of recognition as opposed to financial rewards (McGuiness, Morgan, & Oxtoby, 2000).

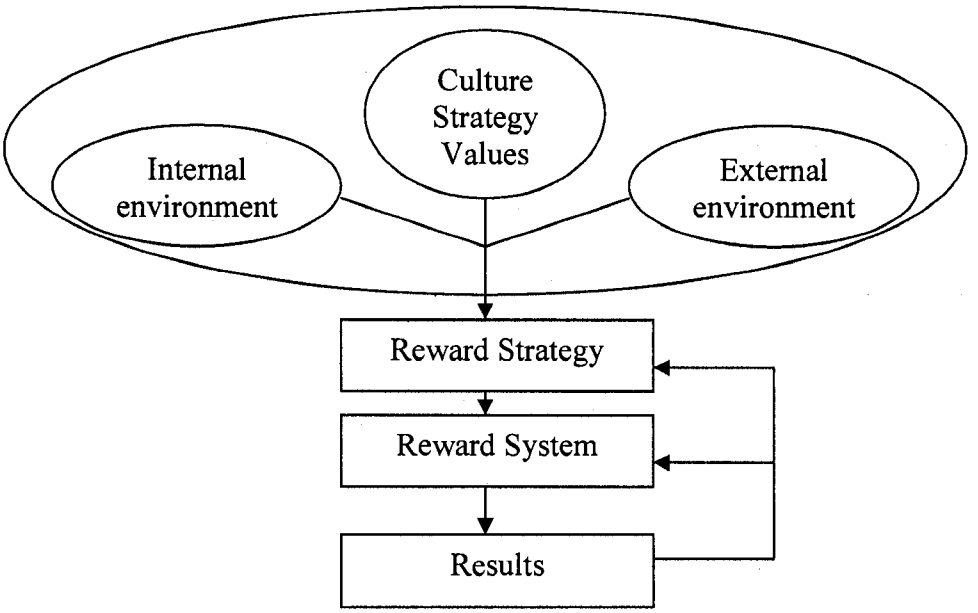

Figure 8. Reward management model (Van Den Berghe & Verweire, 2004).

The measurements for strategic project portfolio performance are: cost, time, quality, scope and how well the objectives are achieved. This was derived from a couple of sources. The first is from ERP system implementation and lists the dependent variable as ERP implementation success and has measures of cost, time, performance, and benefit (Hong & Kim, 2002). The second source lists the triple constraints of a project as the ability to perform tradeoffs between project scope, cost, and time (Program Management Institute, 2004). Quality is added because quality projects deliver the required product within scope, on time, and within budget.

Strategic Feedback

The final component of a performance model is the feedback loop. The feedback loop is important as it is designed to reinforce effective actions and trigger corrective

action (Loo, 2003). To ensure that a project is successful there is ongoing project monitoring and project reviews. The monitoring and reviews are used for early identification and correction of problems.

Perez and Sanchez (2004) indicate that the early warning signals for research and development project monitoring that are used most are project cost, time deviations, and achievement of technological goals. It is important that management control of strategy implementation and performance management be consistent with the strategy to be implemented (Van Den Berghe & Verweire, 2004).

For monitoring and controlling project work, it is necessary to monitor and control the processes required to initiate, plan, execute, and close a project to meet the performance objectives defined in the project management plan and the project scope statement (Program Management Institute, 2004).

Feedback-based change such as experiential learning, learning from others, and variation/selection assume that procedures and/or attributes associated with success will survive and replicate more rapidly than procedures and/or attributes that are associated with failure (March, 2006). A negative aspect of this is that adaptive histories are inefficient as they move slowly, include error, and lead organizations to seek stability, which may not be the best strategy given the environment the firm operates in.

The Research Model

The research model represents the area under study: the relationships among project management, knowledge management, and strategic project portfolio performance. The model (Figure 9) shows these relationships and the moderating effects

that strategy and structure have on that relationship. Figure 10 shows the research model with the variables assigned to its respective factors.

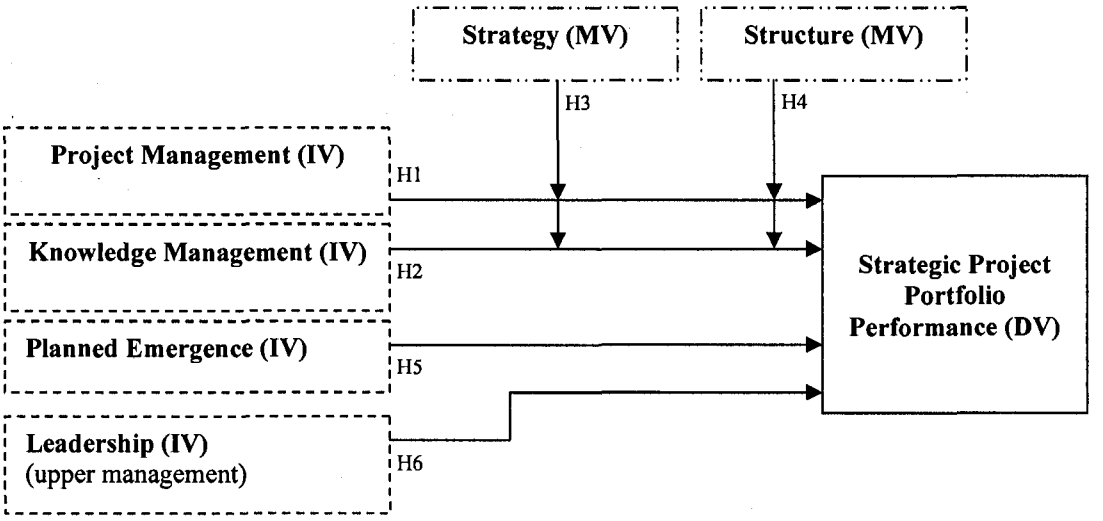

Figure 9. Research model.

The phases of the strategy process can be seen in figure 3. The elements have been defined by strategic management practitioners and supporting data for this process is provided in the literature review. The research model elements are derived from the implementation framework.

The strategy process shown in figure 4 was also derived from the implementation framework using a portion of the key variables focusing on implementation, as opposed to the whole process, which includes both formulation and implementation. This framework contained information pertaining to the external context, strategic content, internal context, strategic process and outcome. The external context included environmental uncertainty in the general and task environment. The strategic content included strategic decisions and multiple project implementations. Internal context

included organizational structure, organizational culture, and organizational learning. The strategic process included operational planning, resource allocation, communication, people, monitoring and feedback, and external partners. Finally, outcome included the intended and unintended outcomes of a project.

The research model will attempt to provide empirical data in support of some of the variables listed in the Okumus (2001) study, as well as other variables contained in the area of knowledge management and project management. The research model takes into account that there is a portfolio of projects that the organization is trying to manage. The beginning point is the strategy objective or performance targets. Here we are referring to the short-term objectives or performance targets that need to be implemented in order for the long-term objectives and strategies to be achieved. These then necessitate the need for a project to be opened. There are difficulties in translating strategies and long-term objectives into action and this will be discussed in the literature review. This is important in terms of those items that might have a negative impact on the proposed strategy implementation process but is not a part of the research model.

Projects contribute to corporate success in the areas of corporate strategy, business operations, research and development, information technology/information systems, and facilities provision and management. Changes in the area of corporate strategy that offer the firm success are the reengineering of business processes, corporate restructuring, mergers and acquisitions. Success in business operations projects for a project-based company translates directly to the bottom line. For operations-based firms, success is based on projects that support operations and improve the bottom line. Research and development success is based on a maximization of returns on R&D

spending, improved time to market, enhanced competitive position, improved product sales, and improved product margins (Cooke-Davies & Dinsmore, 2006).

Research Questions

This section contains the research questions that will be used to address the research problem. The answers to the questions will assist the reader in understanding or solving the research problem. There are eight research questions:

1. Is there a relationship between the use of project management while implementing company objectives and strategic project portfolio performance?

2. Is there a relationship between an organization that utilizes knowledge management during the implementation process and strategic project portfolio performance?

3. What is the moderating effect of strategy on project management and strategic project portfolio performance?

4. What is the moderating effect of strategy on knowledge management and strategic project portfolio performance?

5. What is the moderating effect of structure on project management and strategic project portfolio performance?

6. What is the moderating effect of structure on knowledge management and strategic project portfolio performance?

7. Is there a relationship between planned emergence and strategic project portfolio performance?

8. Is there a relationship between leadership provided by upper management during the strategy implementation process and strategic project portfolio performance?

Research Hypotheses

The following hypotheses were derived from the research questions and models.

H1. There is a relationship between project management and strategic project portfolio performance.

H2. There is a relationship between knowledge management and strategic project portfolio performance.

H3. The strategy pursued by the firm positively moderates the relationship between the use of project management and strategic project portfolio performance.

H4. The strategy pursued by the firm positively moderates the relationship between the use of knowledge management and strategic project portfolio performance.

H5. Structure positively moderates the relationship between the use of project management and strategic project portfolio performance.

H6. Structure positively moderates the relationship between the use of knowledge management and strategic project portfolio performance.

H7. There is a relationship between planned emergence and strategic project portfolio performance.

H8. There is a relationship between leadership provided by upper management during the strategy implementation process and strategic project portfolio performance.

Chapter Summary

Strategy process papers provide good definitions of what the strategy implementation process looks like. There were 10 issues identified that negatively impact strategy implementation. Project management and knowledge management were evaluated against these 10 issues to understand which variables would affect

performance. The research questions are based on the use of project management and knowledge management during the implementation process and their effect on project performance.

The hypotheses were developed using the 10 strategy implementation issues and data from strategic management, project management, and knowledge management research. Since most strategies fail, businesses would benefit if they understood the problems with implementation and how project management and knowledge management impact performance in those same areas.

Chapter 3
RESEARCH METHODOLGY

This chapter describes the research methodology used in this study. The study utilized a questionnaire to study the effects that project management and knowledge management have on strategic project portfolio performance during the strategy implementation process. The research methodology is defined as: (a) research design, (b) research questions, (c) research hypotheses (independent, dependent, and moderator variables), (d) data collection and procedures, and (e) analysis of data.

The Research Design

The hypotheses in this study were tested using primary data collected via a questionnaire that was sent to aerospace and defense businesses across the United States. The researcher used an instrument that was derived from various studies (Acur & Englyst, 2006; Alexander, 1985; Al-Ghamdi, 1998; Hrebiniak, 2005; Morris & Jamieson, 2004; Program Management Institute, 2004). .

The unit of analysis for this study was project management and knowledge management and their effect on strategic project portfolio performance. The study focused on six variables for project management: objectives, leadership and planning, resource allocation, competence, feedback and controls, and rewards and incentives. Knowledge management has subcomponents that will be evaluated: repository, business processes, ERP system and culture. A linkage between strategy, project management, knowledge management, and project performance has not been made and this is the first study to link the three areas together with performance.

Research Questions

Eight research questions were developed for this study. These research questions were designed to investigate the relationships between project management, knowledge management, strategy, structure, planned emergence, upper management leadership and strategic project portfolio performance.

1. Is there a relationship between the use of project management while implementing company objectives and strategic project portfolio performance?
2. Is there a relationship between an organization that utilizes knowledge management during the implementation process and strategic project portfolio performance?
3. What is the moderating effect of strategy on project management and strategic project portfolio performance?
4. What is the moderating effect of strategy on knowledge management and strategic project portfolio performance?
5. What is the moderating effect of structure on project management and strategic project portfolio performance?
6. What is the moderating effect of structure on knowledge management and strategic project portfolio performance?
7. Is there a relationship between planned emergence and strategic project portfolio performance?
8. Is there a relationship between leadership provided by upper management during the strategy implementation process and strategic project portfolio performance?

Research Hypotheses

The following hypotheses were derived from the research questions and models.

H1. There is a relationship between the project management and strategic project portfolio performance.

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H5. Structure positively moderates the relationship between the use of project management and strategic project portfolio performance.

H6. Structure positively moderates the relationship between the use of knowledge management and strategic project portfolio performance.

H7. There is a relationship between planned emergence and strategic project portfolio performance.

H8. There is a relationship between leadership provided by upper management during the strategy implementation process and strategic project portfolio performance.

Dependent Variables

There was one dependent variable in this study: strategic project portfolio performance. The conceptual and operational definition of the dependent variable is presented as well as the variables used to describe it.

Strategic Project Portfolio Performance

Conceptual definition. This variable measures the level of project performance that an organization had on a portfolio of projects. This includes how well the firm did with respect to meeting the objectives and project measures for cost, time, quality, and scope.

Operational definition. Strategic project portfolio performance was measured using five variables that measure a project team's ability to accomplish the objectives and meet the project requirements for cost, time, quality, and scope. The five variables are measured using scales. These items were measured on a 5-point Likert-type scale (1 = *poor* to 5 = *outstanding*), where respondents were asked to rate portfolio performance for each of the five questions.

The first variable is *accomplishing the objective,* which refers to how well the project team did in achieving the project objectives. The second variable measures how well the project team achieved the *cost requirements* of the project. The third variable measures how well the project team achieved the *time requirements* of the project. The fourth variable measures how well the project team did in achieving the *quality requirements* for the project. The fifth variable measures how well the project team did in achieving the *scope requirements* of the project.

The five questions are:

A. How would you rate company project performance with respect to achieving the project objective(s)?

B. How would you rate company project performance with respect to achieving the project cost targets?

C. How would you rate company project performance with respect to achieving the project time targets?

D. How would you rate company project performance with respect to achieving the project quality targets?

E. How would you rate company project performance with respect to achieving the project scope targets?

Independent Variables

There were four independent variables in this study: project management, knowledge management, planned emergence, and leadership (upper management). There were also two moderating variables: strategy and structure. Project management is made up of objectives, leadership and planning, resource allocation, competence, feedback and controls, rewards and incentives. Knowledge management is made up of repository, business processes, ERP, culture, and knowledge transfer. The conceptual and operational definitions of each variable are presented, and any corresponding variables are described.

Project Management

Conceptual definition. This variable measures the importance of project management during strategy implementation and is made up of six sub-variables: objectives, leadership and planning, resource allocation, competence, feedback and controls, and rewards and incentives. Project management is used to open, plan, execute, monitor and report, and close a project.

Operational definition. Project Management is the arithmetic mean of six sub-variables: objectives, leadership and planning, resource allocation, competence, feedback and controls, and rewards and incentives.

Objectives

Conceptual definition. This variable measures the importance of identifying clear, achievable, measurable objectives that are communicated to the project team implementing the strategy. Short-term objectives are derived from long-term objectives and are used to drive action in the organization. Short-term objectives are the starting point for creating a project.

Operational definition. Objectives is measured as the arithmetic mean of the responses of each individual participant to the following six statements. The value of each response is rated on a scale of 1 to 5. The respondents were asked to rate each of the statements using a 5-point Likert-type scale (1 = *strongly disagree* to 5 = *strongly agree*).

The six statements are:

A. The company does not have the ability to clearly communicate company objectives.

B. The company has the ability to consistently create achievable objectives.

C. The company has the ability to generate action plans from long-term objectives/strategies.

D. The company has the ability to link short-term objectives to long-term objectives.

E. The company does not have the ability to link personal objectives to project objectives.

F. The company has the ability to create measurements that can be used for monitoring objectives.

Leadership and Planning

Conceptual definition. Leadership is the responsibility of the project manager or leader. This includes leading the project team in the planning of the project as well as the execution of the plans. The project may require planning in any or all of the following areas: project scope management, project time management, project cost management, project quality management, project human resource management, project communications management, project risk management and project procurement management.

Operational definition. Leadership and planning is measured as the arithmetic mean of the responses of each individual participant to the following 13 statements. The value of each response is rated on a scale of 1 to 5. The respondents were asked to rate each statement using a 5-point Likert-type scale (1 = *strongly disagree* to 5 = *strongly agree*).

The 13 statements are:

A. The company does not use project managers or project leaders during implementation of company objectives.

B. The company makes use of projects to implement change.

C. The company has the ability to create project plans.

D. The company does not have the ability to define and manage project requirements.

F. The company has the ability to define roles and responsibilities for those implementing the strategy.

G. The company has the ability to manage risk.

H. The company does not optimize value on projects.

I. The company has the ability to manage time on projects.

J. The company has the ability to manage quality on projects.

K. The company has the ability to manage cost on projects.

L. The company has the ability to plan for human resources on projects.

M. The company has the ability to manage procurement activities on projects. Activities can be mergers and acquisitions or outsourcing.

N. The company has the ability to manage communication on projects.

Resource Allocation

Conceptual definition. This variable measures the importance of having the required resources when implementing strategy. The areas that will be assessed are for budgeting, people, materials, information, and facilities/workspace/equipment.

Operational definition. Resource allocation is measured as the arithmetic mean of the responses of each individual participant to the following five statements. The value of each response is rated on a scale of 1 to 5. The respondents were asked to rate each statement using a 5-point Likert-type scale (1 = *strongly disagree* to 5 = *strongly agree*).

The five statements are:

A. The company provides the projects with the necessary financial resources needed.

B. The company provides the projects with the necessary people needed.

C. The company provides the projects with the necessary materials needed.

D. The company does not provide the projects with the information needed.

E. The company provides the projects with the facilities/workspace/equipment needed.

Competence

Conceptual definition. This variable measures the importance of selecting a project team, including the leader, with the correct knowledge and skills for the implementation project that needs to be executed.

Operational definition. Competence is measured as the arithmetic mean of the responses of each individual participant to the following three statements. The value of each statement is rated on a scale of 1 to 5. The respondents were asked to rate each of the statements using a 5-point Likert-type scale (1 = *strongly disagree* to 5 = *strongly agree*).

The three statements are:

A. The company has the ability to define skills and knowledge competencies for those implementing the strategy.

B. The company has the ability to select a project team with the required skills and competencies necessary to execute projects.

C. The company has the ability to provide necessary training to those on the project that need it.

Feedback and Controls

Conceptual definition. This variable measures the importance of having feedback and controls for the strategy implementation process. Feedback is how project

information is provided to management and the strategy formulators. Controls are put on projects to ensure they will meet cost, time, scope, and quality restrictions, and achieve the objectives.

Operational definition. Feedback and controls is measured as the arithmetic mean of the responses of each individual participant to the following three statements. The value of each response is rated on a scale of 1 to 5. The respondents were asked to rate each statement using a 5-point Likert-type scale (1 = *strongly disagree* to 5 = *strongly agree*).

The three statements are:

A. The company has the ability to monitor projects.

B. The company has the ability to obtain strategic feedback from the project team.

C. The company has the ability to provide feedback to the project team with respect to any strategy/objectives changes.

Rewards and Incentives

Conceptual definition. This variable measures the importance of having rewards and incentives when implementing strategy. Rewards are provided to team members when a project meets/exceeds the expected outcomes for cost, time, scope, quality, and objectives. Incentives can be provided to encourage team members to provide extra effort in order for the project to typically meet/exceed the time requirement.

Operational definition. Rewards and incentives is measured as the arithmetic mean of the responses of each individual participant to the following three statements. The value of each response is rated on a scale of 1 to 5. The respondents were asked to

rate each statement using a 5-point Likert-type scale (1 = *strongly disagree* to 5 = *strongly agree*).

The three statements are:

A. The company provides rewards to project team members that contribute to project success.

B. The company provides incentives to project team members that are willing to go beyond what is required to complete tasks and help to ensure project success.

C. The company provides incentives or rewards for innovative ideas that enhance project performance.

Knowledge Management

Conceptual definition. This variable measures the importance of knowledge management during the strategy implementation process. It is made up of five sub-variables: repository, business processes, ERP, culture, and knowledge transfer.

Operational definition. Knowledge management is measured as the arithmetic mean of the five sub-variables: repository, business processes, ERP, culture, and knowledge transfer.

Repository

Conceptual definition. This variable measures the importance of a repository during the implementation process and for future use. A repository can be a library that is or is not electronic. There should be a mechanism so that the library can be searched, thus making information available to those that need it when they need it.

Operational definition. Repository is measured as the arithmetic mean of the responses of each individual participant to the following three statements. The value of

each response is rated on a scale of 1 to 5. The respondents were asked to rate each statement using a 5-point Likert-type scale *(1 = strongly disagree to 5 = strongly agree).*

A. The company has the ability to capture project data for use during conduct of the project and after the project has been completed.

B. Information such as project/subordinate plans and project results that goes into the repository is standardized so that project data needed on future projects can be easily retrieved by those that need it.

C. Those that need information from the repository have access to that data and there is a method for them to search for the data they need.

Business Processes

Conceptual definition. This variable measures the importance of business processes during the strategy implementation process. The processes can be built around any of the following standards: ISO9000, AS9100, or CMMI. Business processes include procedures and practices that cover all areas of the business: finance, contracts, project management, human resources, engineering, manufacturing, service, purchasing, quality, and distribution.

Operational definition. Business processes is measured as the arithmetic mean of the responses of each individual participant to the following three statements. The value of each response is rated on a scale of 1 to 5. The respondents were asked to rate each statement using a 5-point Likert-type scale *(1 = strongly disagree to 5 = strongly agree).*

The three statements are:

A. Business processes are in place that document how the company processes work in the areas of finance, contracts, project management, human resources, engineering, manufacturing, service, purchasing, quality, and distribution.

B. Business processes are looked at continually and improvements are made where the company can perform more effectively or efficiently.

C. The standardization of business processes is flexible enough that it does not impede project success.

Enterprise Resource Planning (ERP)

Conceptual definition. This variable measures the importance of an ERP system during the implementation process and the use of the information in the future. An ERP system can be used for manufacturing, supply chain management, financials, projects, human resources, customer resources and marketing, and data warehouse.

Operational definition. ERP is measured as the arithmetic mean of the responses of each individual participant to the following three statements. The value of each response is rated on a scale of 1 to 5. The respondents were asked to rate each statement using a 5-point Likert-type scale *(1 = strongly disagree to 5 = strongly agree).*

The three statements are:

A. The company makes use of an ERP system during the conduct of projects to control items such as: project status (open/closed), materials by project including status, project budget, human resources planning, customer contract information, bill of materials, scheduling, and cost management.

B. The company has an ERP system that has been adapted to meet the organizational needs including project reporting.

C. Information in the ERP system is made available to those that need it and there is a method for them to search for the data they need.

Culture

Conceptual definition. This variable measures the importance of culture during the strategy implementation process. It looks at how well the company culture allows for collaboration, how well implicit knowledge is converted to explicit knowledge, and how well those in the organization work with the external environment.

Operational definition. Culture is measured as the arithmetic mean of the responses of each individual participant to the following three statements. The value of each response is rated on a scale of 1 to 5. The respondents were asked to rate each statement using a 5-point Likert-type scale *(1 = strongly disagree to 5 = strongly agree).*

The three statements are:

A. The company culture is such that those that work on strategy implementation projects transfer implicit knowledge to explicit knowledge during the conduct of projects.

B. The company provides project teams with time so that information can be shared that was gained during project execution. Technical reviews, peer reviews, customer reviews, preliminary design reviews, program reviews, program meetings, etc…

C. The company does not encourage project team involvement with the external environment. This includes meeting with regulators, customers, suppliers, partners, etc…

Knowledge Transfer

Conceptual definition. This variable measures the importance of knowledge transfer during the implementation process so that it can be used in the future.

Knowledge transfer requires that those on the project team create knowledge that the company can use in the future. This means that those things learned on the project need to be codified so that the information can be stored in a repository.

Operational definition. Knowledge transfer is measured as the arithmetic mean of the responses of each individual participant to the following three statements. The value of each response is rated on a scale of 1 to 5. The respondents were asked to rate each statement using a 5-point Likert-type scale *(1 = strongly disagree to 5 = strongly agree).*

The questions are:

A. Project teams create deliverables, including any new information learned on the project, which can be used by the firm in the future.

B. Knowledge is transferred between people on the project team and management.

C. Knowledge is transferred between people on the project team and people outside the company, including customers, suppliers, regulators, etc…

Planned Emergence

Conceptual definition. Planned emergence is how well the organization does in planning and evolving its strategy and the impact of this on the strategy implementation process. Strength in this area allows the company to make fast decisions and react quickly to the changing environment while maintaining strategic processes for more alternatives, more information, and more integration.

Operational definition. Strategy formulation is measured as the arithmetic mean of the responses of each individual participant to the following eight statements. The value of each response is rated on a scale of 1 to 5. The respondents were asked rate the

statements using a 5-point Likert-type scale *(1 = strongly disagree to 5 = strongly agree).*

The eight statements are:

A. The company requires that the external environment be monitored and that changes that affect the organization are reflected in the company's strategy.

B. The outcomes of the strategic thinking process include: business opportunities and company strengths and weaknesses so that managers can apply internal competencies to the external environment.

C. The strategic planning documents produced by the company are clear and contain sufficient detail including delegation authority for any action described.

D. The company achieves acceptance and commitment of the strategies proposed.

E. The company formalizes strategy by requiring that the organization create written action plans, objectives, and procedures.

F. The company embeds strategy by requiring that key actors act as team and that they are prepared, committed, and motivated to implement the new strategy.

G. The company uses change management to oversee employees, resources, and capabilities for planning strategies and changes.

H. Change management is responsible for ensuring that any conflicts between the company's objectives and business performance are resolved.

Leadership (upper management)

Conceptual definition. Leadership is defined as the need for upper management involvement during the strategy implementation process. The need for upper

management involvement during implementation ensures that politics do not stop project progress and that those in the organization understand the commitment of upper management to the success of the projects undertaken.

Operational definition. Leadership is measured as the arithmetic mean of the responses of each individual participant to the following three statements. The value of each response is rated on a scale of 1 to 5. The respondents were asked to rate the statements using a 5-point Likert-type scale *(1 = strongly disagree to 5 = strongly agree).*

The four statements are:

A. The company's upper management demonstrates their commitment to the strategy implementation process.

B. The company's upper management does not get involved when politics impede project progress.

C. The company's upper management clearly communicates company objectives to employees so that they understand the importance of the strategic projects undertaken.

D. The company's upper management is involved in the strategy implementation process so new strategies that emerge can be discovered or changes to existing strategies can be made based on improved information.

Strategy

Conceptual definition. The three generic strategies are cost leadership, differentiation, and focus (Porter, 1980). Companies that have the highest profitability usually possess a combination of cost leadership and differentiation to create a competitive advantage. The combination of cost leadership and differentiation is a best-

cost strategy. Cost leadership has to do with being able to offer products or services at a cost below what competitors can achieve. Differentiation requires that businesses have a sustainable advantage that allows it to provide buyers with something uniquely valuable to them (Pearce & Robinson, 2005).

Operational definition. Strategy is measured as the arithmetic mean of the responses of each individual participant to the following three statements. The respondents were asked to rate the three statements using a 5-point Likert-type scale *(1 = strongly disagree to 5 =strongly agree).*

The three statements are:

A. The company pursues a cost leadership strategy.

B. The company pursues a differentiation strategy.

C. The company pursues a strategy that combines cost leadership and differentiation.

Structure

Conceptual definition. The organizational structure is defined as functional, weak matrix, balanced matrix, strong matrix, or projectized (Project Management Institute (2004).

Operational definition. Structure is measured as the arithmetic mean of the responses of each individual participant to the following three statements. Functional structure has a 20% weight. Weak matrix, balanced matrix, strong matrix, and projectized have a 40% weight. The respondents were asked to rate three statements using a 5-point Likert-type scale *(1 = strongly disagree to 5 =strongly agree).*

The statements are:

A. The company's structure is functional and there is no reporting into projects.

B. The company's structure is weak matrix or a balanced matrix where there is some functional reporting and some reporting into projects.

C. The company's structure is strong matrix or projectized. People report to project teams and there may be some administrative support provided through functional reporting. Employee's performance is based contribution to project and project performance.

Research Strategy

This strategy implementation research study examined the relationships among project management, knowledge management, and strategic project portfolio performance. The study utilized correlation measurements (regression analysis) to assess these relationships in aerospace and defense businesses in the United States. The framework was developed as an extension of the strategy implementation framework (Okumus, 2001) and includes knowledge management and project management whereas the original framework called for subcomponents of these rather than these areas in their entirety. Data will be evaluated to determine whether the data support the use of structural equation modeling; it will also be used to verify the goodness of fit for the model. This includes running Cronbach alpha to measure how well the independent variables fit the model. Pearson's r was run to measure the relationship between IVs and DV. Multiple regression was run to see how well the dependent variable can be predicted by the independent variables.

The principle component analysis (PCA) and factor analysis (FA) were used to evaluate a single set of variables and determine what subsets could be formed that were

independent of each other. Exploratory factor analysis (EFA) will be performed if the confirmatory factor analysis (CFA) method does not yield the appropriate results (Tabachnick & Fidell, 2007).

Factor analysis was performed and the appropriate analysis was selected based on the questionnaire data received. Confirmatory factor analysis (CFA) was performed through structural equation modeling and a model created for that purpose. AMOS software was used and the model was run to verify results without errors. Once the errors had been cleared the model was run again yielding the Chi-square information. The model will be verified to see that it is not over- or under-identified.

Since no structural equation modeling results have been found for this model and its variables, a single factor analysis will be performed first as it makes no sense to run a two or three factor analysis if the single factor analysis is not successful. A maximum likelihood estimate will be run because it is believed that estimates are the one with the maximum likelihood that the data were drawn from the population. The Goodness of Fit Index (GFI) will be looked at to determine whether the data does or does not fit the model. A GFI that is equal to 1 is a perfect fit and a GFI greater than .90 indicates a good fit (Kline, 2005).

Demographic information will be gathered for organization size, age of respondent, duration of employment of respondent, organization level of respondent, and educational level of respondent. Additional information will be gathered on the types of strategic decisions implemented (introducing a new product or service, opening and starting a new plant or facility, expanding operations to enter a new market, discontinuing

a product or withdrawing from a market, acquiring or merging with another firm, changing the strategy in functional departments, and others).

Data Sources

The data were collected in the United States from aerospace and defense businesses that had 50 or more employees. A list of 3,360 businesses was generated by a mailing list firm. The web page for this company is www.USADATA.com. The businesses were designated by the following SIC codes: 3663, 3669, 3721, 3724, 3728, 3761, 3764, 3769, 3812 and 3829 (see table 5 for a description of these codes). Primary data were collected through questionnaires sent to the companies under study.

Table 5

SIC codes for aerospace and defense businesses.

Item Number	SIC Code	Description
1	3663	Radio and TV Communications Equipment
2	3669	Communications Equipment Nec
3	3721	Aircraft
4	3724	Aircraft Engine and Engine Parts
5	3728	Aircraft Parts and Equipment Nec
6	3761	Guided Missiles and Space Vehicles
7	3764	Space Propulsion Units and Parts
8	3769	Space Vehicle Equipment Nec
9	3812	Search and Navigational Equipment
10	3829	Measuring and Controlling Devices Nec

Data Collection

All companies from the database list were selected to receive a questionnaire. The questionnaire was sent to the contact provided with the list; where no contact existed, it was sent to the company with the request that it be forwarded to the most senior person at that location. Each questionnaire was accompanied by an introduction letter that

explained the purpose of the study. Included was a return-addressed prepaid envelope to mail the completed surveys to the researcher.

Data Analysis

Correlation analysis was used to test for the relationships among the variables. The Pearson's *r* test, standard deviations, and arithmetic mean were the statistical methods used in the study. The type of data collected included nominal and interval data. The interval data were measured on 5-point Likert-type scales. Descriptive statistics were utilized for reporting frequencies, means and standard deviations. The following statistical measures were used in the study: Pearson's correlation coefficient *r* and multiple regression. Pearson's correlation coefficient was used to determine relationships among variables. Multiple regression was used to determine the predictive power of a set of independent variables on a dependent variable. Relationships between variables were tested at the .05 statistical significance level.

Chapter Summary

This chapter covered the research design, the research questions and hypotheses, the research variables and their conceptual and operational definitions, the research strategy, data sources, data collection, and data analysis procedures.

Chapter 4
RESEARCH FINDINGS

Chapter 4 presents the results of the data analysis of the study. The purpose of this study was to investigate the role that project management, knowledge management, upper management leadership, and planned emergence have on a company's strategic portfolio performance, as well as the moderating effects of strategy and structure. AMOS software was used to run a path analysis and confirmatory factor analysis (CFA). Also used in this study was SPSS software to run statistical tests for Pearson's correlation coefficient, multiple regression, Cronbach Alpha, and exploratory factor analysis (EFA). The significance level was set at .05. The research findings are presented and analyzed based on the research questions and the data are presented in tabular form followed by a brief description of the findings. A summary of the results is presented at the end of the chapter.

Survey Demographics

For this study, 3,360 questionnaires were distributed by U.S. Postal Service mail to aerospace and defense companies in the United States. A total of 561 were returned as they could not be forwarded or the person they were addressed to no longer worked for the company. There were a total of 137 responses, but only 130 responses were used in data analysis as there was information missing in the excluded 7 responses. Thus, the response rate was 4.89%.

Table 6 contains the demographic information for the companies that responded. The average company size was 2,435 employees with the average age of the respondent

being 54.48 years old; the average number of years they had held the position at the company was 11.55 years.

Table 6

Demographic Data (N=130).

Variable					
Average company size (# employees)	2,435				
Average age of respondent	54.48				
Average years in position	11.55				
Education	High School	Some College	College Grad	Post Grad	
% of respondents	.77%	9.23%	37.69%	52.31%	
Position	Owner	CEO	Senior Mgt	Middle Mgt	Other
% of respondents	21.54%	26.92%	45.38%	4.62%	1.54%

The breakdown for the respondents' educational level is as follows: High School: 1 respondent (.77%); Some College: 12 respondents (9.23%); College Graduate: 49 respondents (37.69%); and Post Graduate: 68 respondents (52.31%).

The breakdown for the position held is: owner: 28 respondents (21.54%); CEO: 35 respondents (26.92%); senior management: 59 respondents (45.38%); middle management: 6 respondents (4.62%); and other: 2 respondents (1.54%).

The average project portfolio can be broken down as follows: introducing a new product or service, 33.17%; opening and starting a new plant or facility, 8.73%; expanding operations to enter a new market, 18.43%; discontinuing a product or

withdrawing from a market, 5.43%; acquiring or merging with another firm, 10.25%; changing the strategy in functional departments, 16.25%; and other, 7.13%. See table 7 for a listing of the project portfolio breakdown.

Table 7

Project Portfolio Data (N=130).

Variable	
Introducing a new product or service	33.17%
Opening and starting a new plant or facility	8.73%
Expanding operations to enter a new market	18.43%
Discontinuing a product or withdrawing from a market	5.43%
Acquiring or merging with another firm	10.25%
Changing the strategy in functional departments	16.25%
Other	7.13%

Table 8 lists the descriptive statistics of the variables used in the study. This includes the dependent variable for Strategic Project Portfolio Performance and each of the independent variables for project management and knowledge management, planned emergence, and leadership (upper management). Also included are the two moderating variables for strategy and structure. The descriptive statistics are listed for minimum, maximum, mean, and standard deviation.

Table 8

Means and Standard Deviations of Variables (N = 130).

Variable	Min	Max	Mean	*SD*
Performance	1.40	5.00	3.55	0.614
PM	2.39	4.94	3.76	0.506
KM	1.20	5.00	3.50	0.687
PE	1.38	5.00	3.56	0.700
LUM	2.00	5.00	3.91	0.668
Strategy	2.00	5.00	3.81	0.694
Structure	1.00	4.20	3.01	0.577

Note. PM = project management, KM = knowledge management, PE = planned emergence, LUM= Leadership (upper management).

Table 9 contains the information for the objectives variable and each of the questions asked for that variable. Each of the means for objectives is above a neutral measure and is more towards the measure for agreement. The only variable that is below 3.5 is rc4E, which is considered below the threshold for agreement. So there is a moderate level of agreement for the other questions, resulting in a moderate measure for the independent variable objectives.

It should also be noted that the variance for the reverse coded questions is greater than that for the other questions asked in this section. This indicates that something systematic is happening with the reverse coded questions. Histograms were created for each of the questions and variables and can be seen in Appendix C.

Table 9

Objectives Variable and Questions (N=130).

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
rc4A	130	4	1	5	3.85	1.103	1.216
4B	130	4	1	5	3.71	.919	.844
4C	130	4	1	5	3.78	.940	.883
4D	130	4	1	5	3.68	.854	.729
rc4E	130	4	1	5	3.47	.998	.995
4F	130	4	1	5	3.75	.909	.827
Objectives	130	3.67	1.33	5.00	3.7064	.63653	.405
Valid N (listwise)	130						

The means for leadership and each of the corresponding questions are given in table 10. As can be seen, the means exceed the measure 3, which is neutral and are at 4 or near 4, which represents agreement with the statement. For the leadership variable, there is agreement with each of the statements given except for rc5E, which measures 3.47 and is considered below the needed measure for agreement.

Once again, it should be noted that the variance for the reverse coded questions is greater than for the other questions asked in this section. This indicates that something systematic is happening with the reverse coded questions. Histograms were created for each of the questions and variables and can be seen in Appendix C.

Table 10

Leadership Variable and Questions (N=130).

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
rc5A	130	4	1	5	4.05	.963	.928
5B	130	4	1	5	3.86	.765	.585
5C	130	4	1	5	4.05	.761	.578
rc5D	130	4	1	5	3.78	1.049	1.101
5E	130	4	1	5	3.79	.775	.600
5F	130	4	1	5	3.83	.759	.576
rc5G	130	4	1	5	3.40	1.001	1.002
5H	130	4	1	5	3.51	.974	.950
5I	130	4	1	5	4.03	.806	.650
5J	130	4	1	5	3.70	.860	.739
5K	130	4	1	5	3.64	.835	.698
5L	130	4	1	5	3.72	.758	.574
5M	130	4	1	5	3.79	.785	.615
Leadership	130	3.23	1.77	5.00	3.7817	.54044	.292
Valid N (listwise)	130						

See table 11 for the means for resource allocation and the corresponding questions asked in the survey. As can be seen, the means exceed the measure 3, which is neutral, and are at 4 or near 4, which represents agreement with the statement. Resource allocation scored high and all statements were agreed with.

In this case, the reverse coded question did not have the highest variance. Histograms were created for each of the questions and variables and can be seen in Appendix C.

Table 11

Resource Allocation Variable and Questions (N=130).

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
6A	130	4	1	5	4.00	.757	.574
6B	130	4	1	5	3.58	.930	.865
6C	130	3	2	5	3.98	.647	.418
rc6D	130	4	1	5	4.02	.844	.713
6E	130	3	2	5	4.05	.651	.423
Resources	130	2.40	2.60	5.00	3.9277	.57601	.332
Valid N (listwise)	130						

The means for competence and each of the corresponding questions are given in table 12. As can be seen, the means exceed the measure 3.5 and approach 4, which means that they agree with the statements given. Histograms were created for each of the questions and variables and can be seen in Appendix C.

Table 12

Competence Variable and Questions (N=130).

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
7A	130	3	2	5	3.84	.735	.540
7B	130	3	2	5	3.90	.714	.509
7C	130	3	2	5	3.68	.874	.763
Competence	130	3.00	2.00	5.00	3.8051	.65202	.425
Valid N (listwise)	130						

The means for feedback and controls and each of the corresponding questions are given in table 13. As can be seen, all the means exceed the measure 3.5 and are approaching or are at 4, which meant that they agreed with the statements given. Histograms were created for each of the questions and variables and can be seen in Appendix C.

Table 13

Feedback and Controls Variable and Questions (N=130).

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
8A	130	4	1	5	4.04	.751	.564
8B	130	4	1	5	3.76	.805	.648
8C	130	4	1	5	3.81	.788	.622
Feedback	130	3.33	1.67	5.00	3.8692	.66731	.445
Valid N (listwise)	130						

The means for rewards and incentives and each of the corresponding questions are given in table 14. As can be seen, the mean for question 9A is less than 3.5 and the means for questions 9B and 9C are 3.5 or higher and indicate that the respondents agree with the statements given. The result is that rewards and incentives fall below the cutoff for agreement. Histograms were created for each of the questions and variables and can be seen in Appendix C.

The means for repository and each of the corresponding questions are given in table 15. As can be seen, the means for 10B and 10C are below 3.5, indicating that the respondents do not agree with the statements given. The mean for 10A was above 3.5, indicating that the respondents agreed with the statement given. Overall, the repository

mean is below 3.5, which is below the threshold for agreement. Histograms were created for each of the questions and variables and can be seen in Appendix C.

Table 14

Rewards and Incentives Variable and Questions (N=130).

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
9A	130	4	1	5	3.44	.988	.977
9B	130	4	1	5	3.52	1.006	1.011
9C	130	4	1	5	3.50	.982	.965
Rewards	130	4.00	1.00	5.00	3.4846	.88446	.782
Valid N (listwise)	130						

Table 15

Repository Variable and Questions (N=130).

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
10A	130	4	1	5	3.65	.963	.928
10B	130	4	1	5	2.99	1.000	1.000
10C	130	4	1	5	3.12	.920	.847
Repository	130	4.00	1.00	5.00	3.2513	.83327	.694
Valid N (listwise)	130						

The means for business processes and each of the corresponding questions are given in table 16. As can be seen, the means for business processes exceed 3.5, which means that the respondents agreed with the statements given. The respondents agreed with the business process questions and therefore agree with the business processes index. Histograms were created for each of the questions and variables and can be seen in Appendix C.

Table 16

Business Processes Variable and Questions (N=130).

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
11A	130	4	1	5	3.86	.963	.926
11B	130	4	1	5	3.74	.936	.877
11C	130	4	1	5	3.84	.824	.679
Processes	130	4.00	1.00	5.00	3.8128	.78641	.618
Valid N (listwise)	130						

The means for enterprise resource planning and each of the corresponding questions are given in table 17. As can be seen, the means are less than 3.5, indicating that the respondents did not agree with the statements given or the ERP index. Histograms were created for each of the questions and variables and can be seen in Appendix C.

The means for culture and each of the corresponding questions are given in table 18. As can be seen, the mean for rc13C exceeds 3. 5, indicating that the respondents agreed with the statement given; questions 13A and 13B were less than 3.5, indicating that the respondents did not agree with the statements given. The culture index measured above 3.5, indicating that the respondents agreed with the index. Histograms were created for each of the questions and variables and can be seen in Appendix C.

Table 17

Enterprise Resource Planning Variable and Questions (N=130).

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
12A	130	4	1	5	3.28	1.259	1.585
12B	130	4	1	5	3.21	1.280	1.639
12C	130	4	1	5	3.33	1.284	1.649
ERP	130	4.00	1.00	5.00	3.2744	1.22314	1.496
Valid N (listwise)	130						

Table 18

Culture Variable and Questions (N=130).

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
13A	130	4	1	5	3.28	1.042	1.086
13B	130	4	1	5	3.42	.994	.989
rc13C	130	4	1	5	3.92	1.016	1.033
Culture	130	3.67	1.33	5.00	3.5385	.77913	.607
Valid N (listwise)	130						

The means for knowledge transfer and each of the corresponding questions are given in table 19. As can be seen, the means for question 14A and 14B exceed 3.5, indicating that the respondents agreed with the statements given, and the mean for question 14C was below 3.5, indicating that the respondents did not agree with the

statement given. Histograms were created for each of the questions and variables and can be seen in Appendix C.

Table 19

Knowledge Transfer Variable and Questions (N=130).

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
14A	130	4	1	5	3.69	.834	.695
14B	130	4	1	5	3.86	.679	.461
14C	130	4	1	5	3.28	.958	.918
Knowledge Transfer	130	4.00	1.00	5.00	3.6128	.67412	.454
Valid N (listwise)	130						

The means for strategy and each of the corresponding questions can be seen in table 20. The means for project management and the moderating effect will also be presented. As can be seen, the means for the three questions exceed 3.5, indicating that the respondents agreed with the statements given. The index for strategy and for project management exceeds 3.5 as well. Histograms were created for each of the questions and variables and can be seen in Appendix C.

Table 21 contains the information for strategy and the supporting questions and knowledge management. Histograms were created for each of the questions and variables and can be seen in Appendix C. The index for knowledge management at the threshold for agreement and strategy is above 3.5, which indicates agreement with strategy.

Table 20

*Strategy Variable and Questions Including Project Management and the Moderating effect PM*Strategy (N=130).*

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
V103	130	4	1	5	3.68	1.021	1.042
V104	130	3	2	5	3.97	.787	.619
V105	130	4	1	5	3.78	.856	.733
Strategy	130	3.00	2.00	5.00	3.8077	.69434	.482
Project Management	130	2.56	2.39	4.94	3.7625	.50647	.257
PM*Strat	130	18.19	6.53	24.72	14.4710	3.91819	15.352
Valid N (listwise)	130						

Table 21

*Strategy Variable and Questions Including Knowledge Management and Moderating Effect KM*Strategy (N=130).*

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
V103	130	4	1	5	3.68	1.021	1.042
V104	130	3	2	5	3.97	.787	.619
V105	130	4	1	5	3.78	.856	.733
Strategy	130	3.00	2.00	5.00	3.8077	.69434	.482
Knowledge Management	130	3.80	1.20	5.00	3.4979	.68664	.471
KM*Strat	130	20.73	4.27	25.00	13.5094	4.33256	18.771
Valid N (listwise)	130						

The means for structure and each of the corresponding questions can be seen in table 22. The means for project management and the moderating effect will also be

presented. As can be seen, the means for the three questions are below 3.5, indicating that the respondents did not agree with the statements given. The project management index exceeds 3.5, indicating that the respondents agreed with the statements given. Histograms were created for each of the questions and variables and can be seen in Appendix C.

Table 22

Moderating Effect for Project Management, Structure Variable and Questions (N=130).

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
V107	130	4	1	5	2.67	1.177	1.386
V108	130	4	1	5	3.22	1.073	1.151
V109	130	4	1	5	2.97	1.154	1.332
Structure	130	3.20	1.00	4.20	3.0108	.57671	.333
Project Management	130	2.56	2.39	4.94	3.7625	.50647	.257
PM*Struc	130	16.72	3.35	20.07	11.3698	2.82741	7.994
Valid N (listwise)	130						

The means for structure and each of the corresponding questions can be seen in table 23. The means for knowledge management and the moderating effect will also be presented. As can be seen, the means for the three questions is below 3.5, indicating that the respondents did not agree with the statements given. Knowledge management was at 3.5, indicating agreement, and the structure index was below the threshold for agreement. Histograms were created for each of the questions and variables and can be seen in Appendix C.

Table 23

Moderating Effect for Knowledge Management, Structure Variable and Questions (N=130).

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
V107	130	4	1	5	2.67	1.177	1.386
V108	130	4	1	5	3.22	1.073	1.151
V109	130	4	1	5	2.97	1.154	1.332
Structure	130	3.20	1.00	4.20	3.0108	.57671	.333
Knowledge Management	130	3.80	1.20	5.00	3.4979	.68664	.471
KM*Struc	130	17.72	2.16	19.88	10.6078	3.08799	9.536
Valid N (listwise)	130						

The means for planned emergence and each of the corresponding questions are given in table 24. As can be seen, the means for questions 15C, 15G and 15H were below 3.5, indicating that the respondents did not agree with the statements given; for all other questions, the means exceed 3.5, indicating agreement. Histograms were created for each of the questions and variables and can be seen in Appendix C.

The means for upper management leadership and each of the corresponding questions are given in table 25. As can be seen, the means for all questions were above 3.5, indicating that the respondents agreed with the statements given. Histograms were created for each of the questions and variables and can be seen in Appendix C.

Table 24

Planned Emergence Variable and Questions (N=130).

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
15A	130	4	1	5	3.75	.845	.714
15B	130	3	2	5	3.89	.750	.562
15C	130	4	1	5	3.45	.957	.916
15D	130	4	1	5	3.68	.882	.779
15E	130	4	1	5	3.53	1.028	1.057
15F	130	4	1	5	3.59	.895	.801
15G	130	4	1	5	3.39	.928	.860
15H	130	4	1	5	3.20	.935	.874
Planned Emergence	130	3.63	1.38	5.00	3.5615	.69888	.488
Valid N (listwise)	130						

Table 25

Upper Management Leadership Variable and Questions (N=130).

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
16A	130	4	1	5	4.03	.835	.697
rc16B	130	4	1	5	3.80	1.095	1.200
16C	130	4	1	5	3.75	.845	.714
16D	130	4	1	5	4.05	.781	.609
Upper Management	130	3.50	1.50	5.00	3.9096	.66836	.447
Valid N (listwise)	130						

The confirmatory factor analysis (CFA) was completed and the results are presented next. All the analysis performed will be generalized least squares and will be conducted using AMOS 6.0. The model presented first is for the independent and dependent variables. Indexes were created for objectives, leadership, resources, competence, feedback, rewards, repository, processes, ERP, culture, and knowledge transfer. See figure 10 for the CFA model analyzed.

The comparative fit index (CFI) number run was .897 with a root mean square error of approximation (RMSEA) value of .070. This indicates a poor fit and the modification indices were then reviewed to look for factor cross-loadings, meaning that there is loading on more than one factor. The results of the first model analyzed will be briefly discussed and then the modified model will be discussed in more detail.

The equation for calculating the comparative fit index is $CFI := 1 - \frac{(\delta - \text{hat})_M}{(\delta - \text{hat})_B}$.

The variable (δ -hat) is the measure for reflecting the degree of misspecification of the researcher's model and is estimated as the difference between chi-square and the degrees of freedom or zero, whichever is greater (Kline, 2005). $(\delta - \text{hat})_M$ and $(\delta - \text{hat})_B$ estimate the noncentrality parameter of a noncentral chi-square for the researcher's model and the baseline model, respectively.

The RMSEA is measured as $RMSEA := \frac{\sqrt{(\delta - \text{hat})_M}}{df_M x(N-1)}$. RMSEA estimates the amount of error of approximation per model degrees of freedom and takes into account sample size (Kline, 2005).

There were 434 distinct sample moments and 94 parameters estimated. The degrees of freedom are calculated by subtracting the number of distinct moments from the distinct parameters estimated. The degrees of freedom were calculated as 340. This information was generated from the model using AMOS software. Additional information generated from the model will be discussed next. The chi-square for this model equals 554.027.

Chi-square (χ^2) is measured using the equation $\chi^2 = (N-1)\cdot F_{min}$. This is the sample size minus 1 multiplied by the minimum fit function. This measure is better as the number approaches zero. The probability is associated with the null hypothesis that the data matches the model. This means that if the probability is less then .05, then the null hypothesis would be rejected. Thus, values above .05 are required.

The indices for goodness of fit for the model do not indicate a good fit. Modifications will be made based on the modification indices provided in the AMOS text output. The model will also be split into each of the dependent variables measured with the dependent variable. This will be done to increase the goodness of fit measure, as RMSEA favors more variables, while GFI worsens as model size increases (Breivik & Olsson, 2001).

The model shown in figure 10 will be split so that each of the independent variables will be measured with respect to performance. The modification indices will be used to establish the correct covariance and to help eliminate variables. This, by definition, means that the model has been changed based on information learned and now becomes an exploratory factor analysis (EFA).

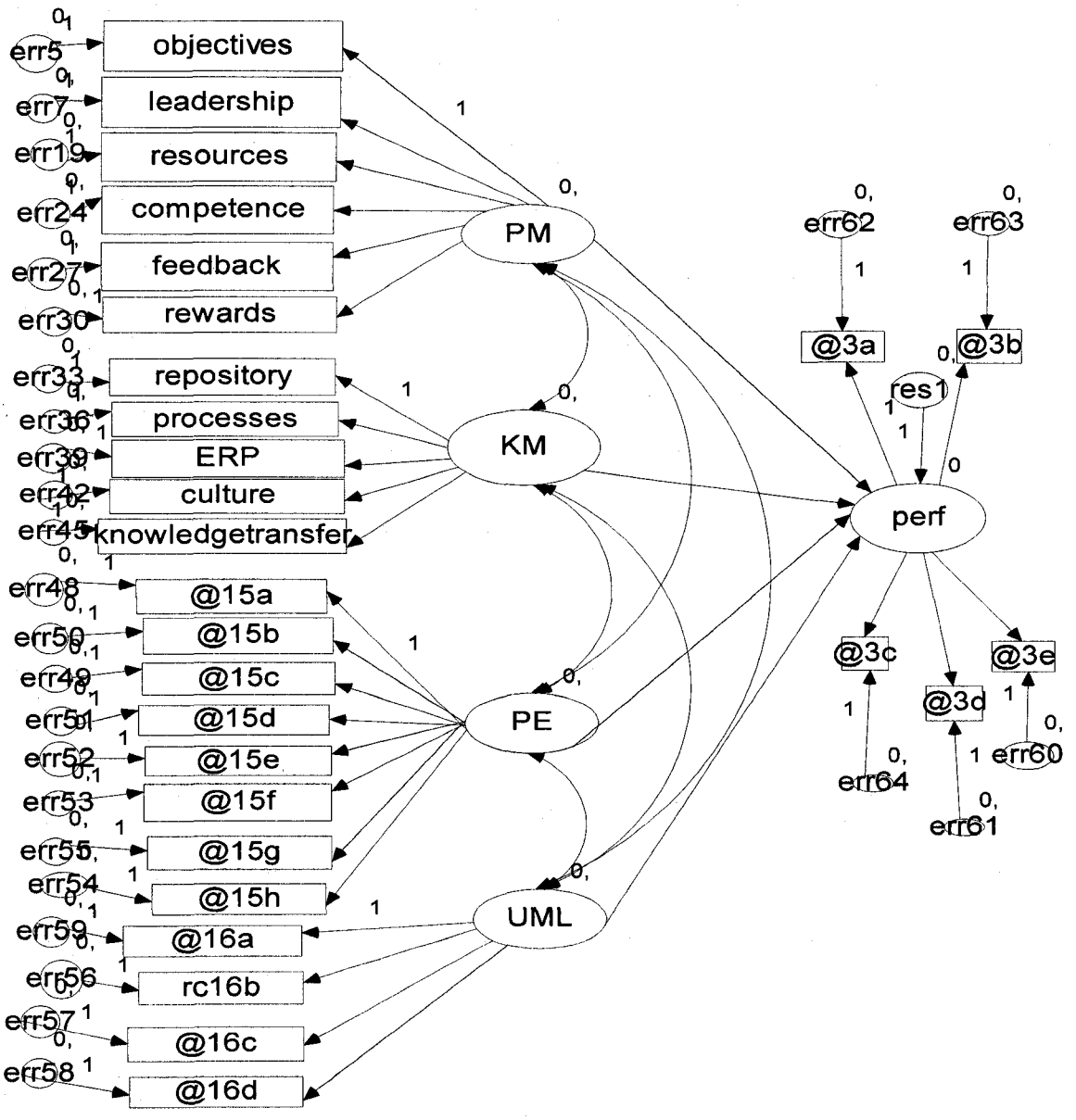

Figure 10. CFA model for the independent variables and dependent variable.

Figure 11 contains the model for project management and performance. The results for that model will be discussed next. This will include the need for creating covariance based on information provided in the modification indices.

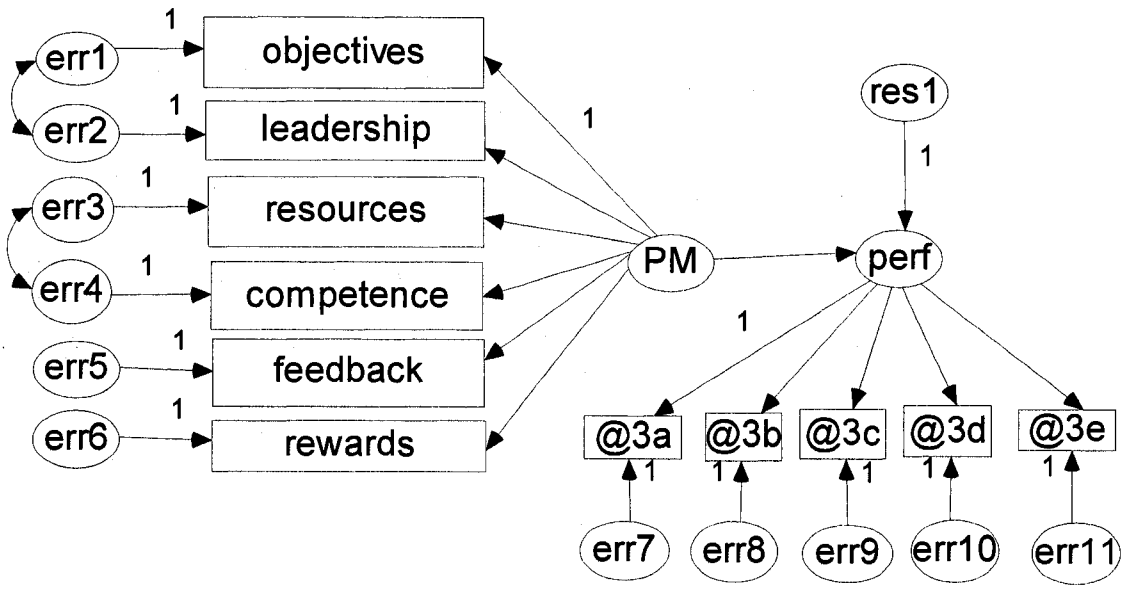

Figure 11. Factor analysis model for project management and performance.

After removing all the questions that had reverse coding and creating covariance between errors 1 and 2 and errors 3 and 4, the project management independent variable was analyzed with respect to performance. The model can be seen in figure 11. The results were greatly improved and will be discussed next. The value for CFI of .973 and the GFI of .927 indicate a good fit. A rule of thumb is that CFI and other incremental indexes with values greater than .90 may indicate a reasonably good fit of the researcher's model (Hu & Bentler, 1999). GFI is an absolute index and requires values to be above .90 as well.

In support of figure 11, the indexes were also evaluated; those models can be seen in Appendix D. The results for the objectives index are Chi-square = 3.570, Degrees of freedom = 2, Probability level = .168, CMIN/DF =1.785, RMR= 020, GFI = .987, NFI = .980, CFI = .991, and RMSEA = .078. This information gives support to the validity of

the indexes created. The results for the leadership and planning index are Chi-square = 42.254, Degrees of freedom = 33, Probability level = .130, CMIN/DF =1.280, RMR= 030, GFI = .938, NFI = .924, CFI = .982, and RMSEA = .047. The results for resources, competence, feedback, and rewards and incentives are Chi-square = 55.746, Degrees of freedom = 48, Probability level = .206, CMIN/DF =1.161, RMR= 034, GFI = .936, NFI = .932, CFI = .990, and RMSEA = .035.

The goodness of fit (GFI) measure is calculated as 1- F_{ML} / F_0. This is where F_{ML} is equal to the value of the fit function for the researcher's model. The F_0 variable is the value of the fit function when all model parameters are zero. The measure is analogous to a squared multiple correlation (R^2) except that GFI is a kind of matrix proportion of explained variance.

The RMSEA is a badness of fit index where a value of zero indicates the best fit and higher values indicate a worse fit. The RMSEA value improved to .053. A rule of thumb is that values less than .05 indicate a close approximate fit, values between .05 and .08 indicate reasonable error of approximation, and values greater than .10 indicate a poor fit (Browne & Cudeck, 1993). The RMR measure is .032.

The chi-square value for this model is 55.994 with a probability of .059 and the degrees of freedom are 41. The CMIN value shown in AMOS is equal to the chi-square value. Another important measure is the CMIN/DF, which is 55.994 divided by 41 to equal 1.366.

Figure 12 contains the model for the independent variable knowledge management with respect to performance. There was no need to make adjustments to the

model based on modification indices. The value for CFI of .997 and GFI of .949 indicate a good fit.

The RMSEA is a badness of fit index where a value of zero indicates the best fit and higher values indicate a worse fit. The RMSEA value improved to .016. A rule of thumb is that values less than .05 indicate a close approximate fit. The root mean residual RMR measure is .045. RMR is the square root of the mean of the squared discrepancies between all the elements of the predicted and observed matrices.

The chi-square value for this model is 35.186 with a probability of .412 and the degrees of freedom are 34. The CMIN value shown in AMOS is equal to the chi-square value. Another important measure is the CMIN/DF, which is 35.186 divided by 34 to equal 1.035.

In support of the model shown in figure 12, another analysis was performed for each of the knowledge management indexes and this can be seen in Appendix D. The model information Chi-square = 81.714, Degrees of freedom = 80, Probability level = .426, CMIN/DF =1.021, RMR= 037, GFI = .927, NFI = .937, CFI = .999, and RMSEA = .013. This information supports that the indexes created are valid.

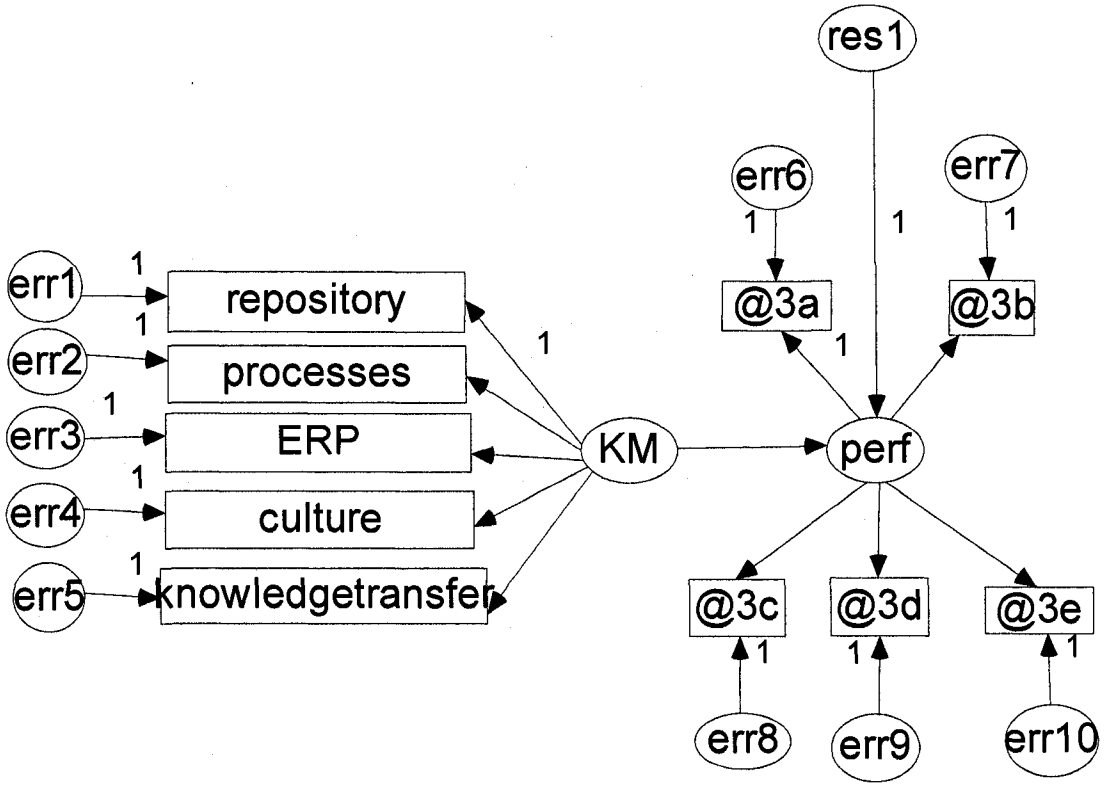

Figure 12. Factor analysis model for knowledge management and performance.

Figure 13 contains the model for the independent variable planned emergence with respect to performance. The covariance identified in the model was established using the modification indices as there was no need to remove any variables.

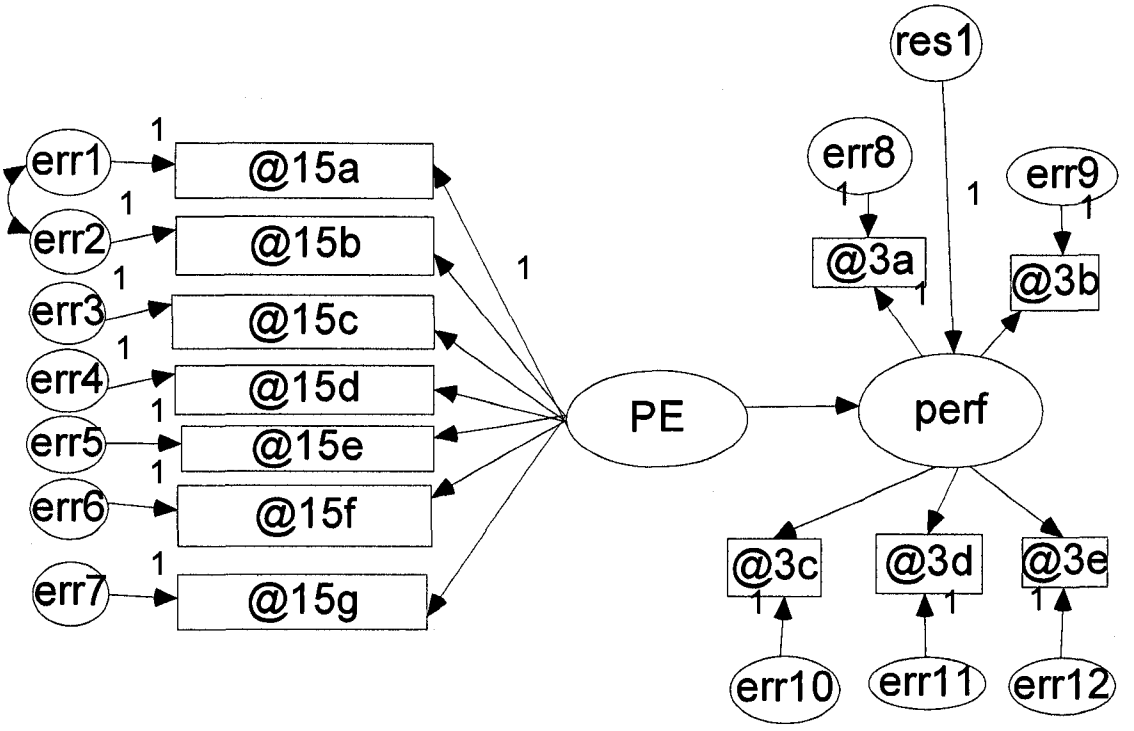

Figure 13. Factor analysis model for planned emergence and performance.

The value for CFI was .974 and for GFI was .917, indicating a good fit. The RMSEA is a badness of fit index where a value of zero indicates the best fit and higher values indicate a worse fit. The RMSEA value improved to .050. A rule of thumb is that values less than .05 indicate a close approximate fit, values between .05 and .08 indicate reasonable error of approximation, and values greater than .10 indicate a poor fit (Browne & Cudeck, 1993). The RMR measure is .032.

The chi-square value for this model is 68.652 with a probability of .061 and the degrees of freedom are 52. The CMIN value shown in AMOS is equal to the chi-square value. Another important measure is the CMIN/DF, which is 68.652 divided by 52 to equal 1.320.

Figure 14 shows the model for the independent variable upper management leadership with respect to performance. No covariance was identified in the model and there was a need for the removal of one reverse coded variable, identified as rc16b. The results for that model will be discussed next.

The value for CFI was .975 and for GFI was .951, indicating a good fit. A rule of thumb is that CFI and other incremental indexes with values greater than .90 may indicate reasonably good fit of the researcher's model (Hu & Bentler, 1999).

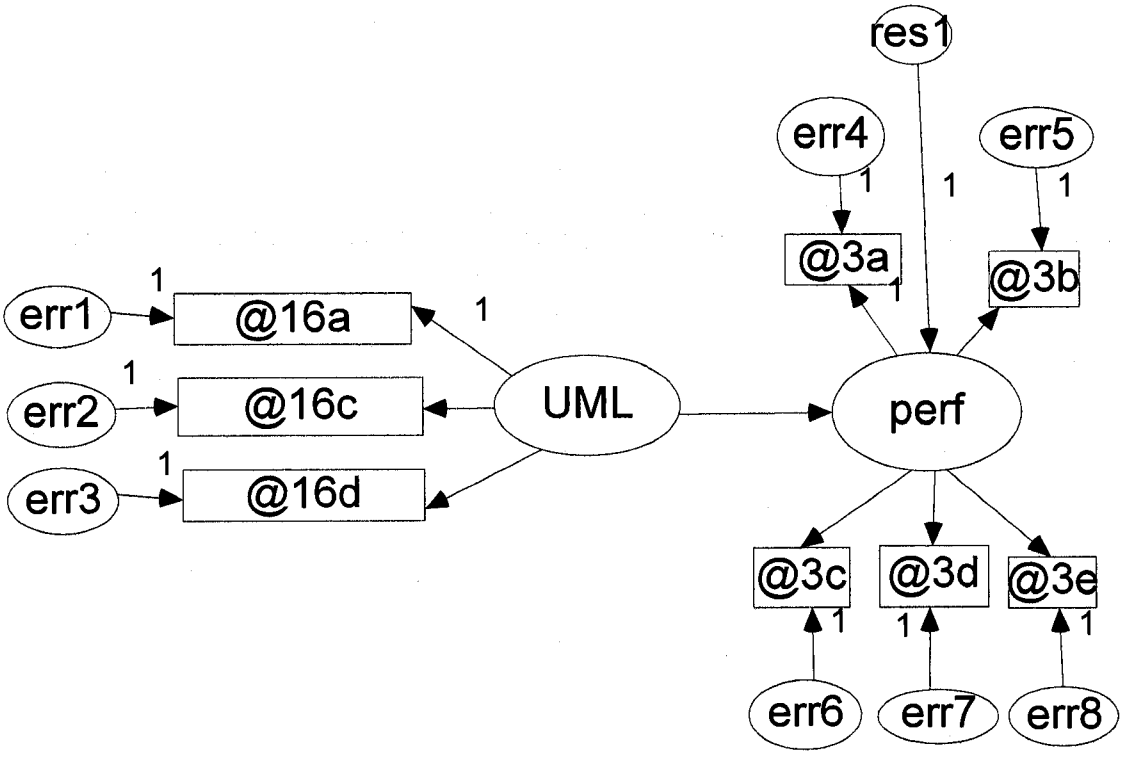

Figure 14. Factor analysis model for upper management leadership and performance.

The RMSEA is a badness of fit index where a value of zero indicates the best fit and higher values indicate a worse fit. The RMSEA value improved to .056. A rule of thumb is that values less than .05 indicate a close approximate fit, values between .05 and

.08 indicate reasonable error of approximation, and values greater than .10 indicate a poor fit (Browne & Cudeck, 1993). The RMR measure is .041.

The chi-square value for this model is 26.741 with a probability of .111 and the degrees of freedom are 19. The CMIN value shown in AMOS is equal to the chi-square value. Another important measure is the CMIN/DF, which is 26.741 divided by 19 to equal 1.407.

An observed variable path analysis was also conducted and the results are presented next. The diagram for the path analysis can be seen in figure 15. There were 28 distinct sample moments with 23 parameters estimated. The degrees of freedom are calculated by subtracting the parameters estimated from the distinct sample moments. In this case, that was 28 minus 23 which is equal to 5. The chi-square value is 3.884 with a probability of .572.

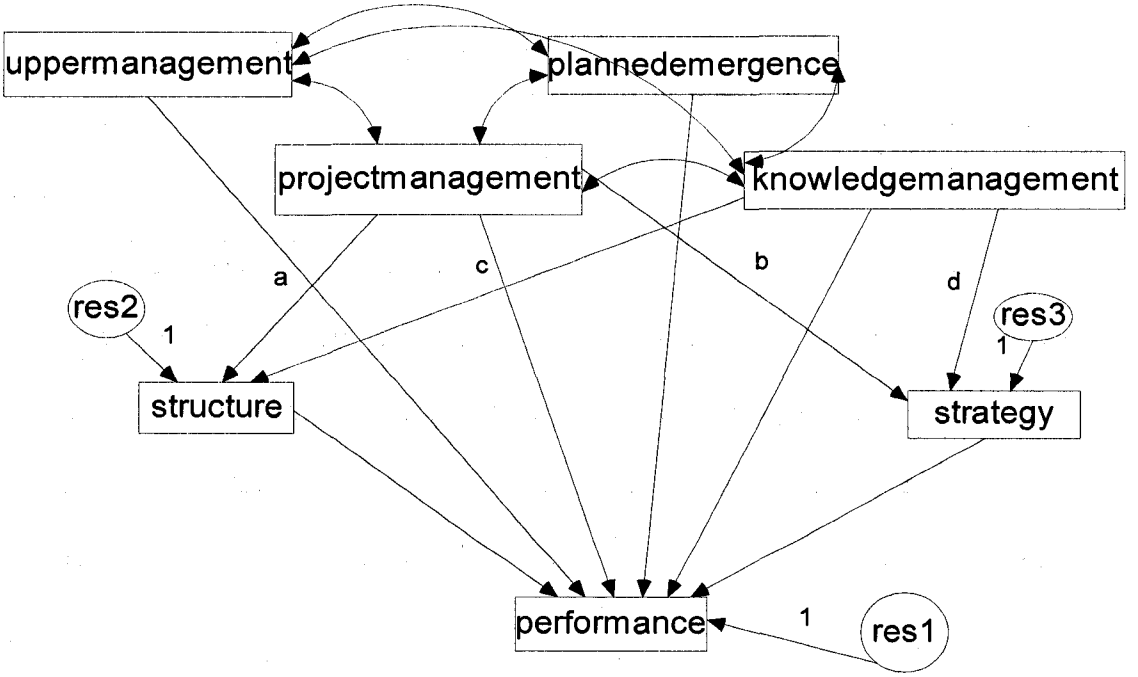

Figure 15. Observed variable path analysis.

The CMIN/DF is calculated by taking the chi-square value of 3.884 and dividing that by the degrees of freedom of 5, which is equal to .769. The RMR value is equal to .011. The goodness of fit index (GFI) is equal to .991 and the CFI is equal to 1. The indices indicate a good fit. The RMSEA is equal to 0, which indicates a close approximate fit.

Hypothesis Test Results

The research findings of the research questions and their corresponding hypotheses are presented and analyzed in this section. There were 8 research questions and hypotheses. This section presents the results of the analysis; discussion of these findings is presented in chapter 5.

Table 26 summarizes the correlation matrices of the variables. There is a positive correlation for all independent and moderating variables when measured against performance. The results in column 1 have a two-tailed significance value of .01. This means that there is less than a .01 probability that the correlation coefficients reported in column 1 occurred by chance.

Table 27 lists the results of the regression analysis for hypotheses 1, 2, 7 and 8. For convenience, each of the research questions and hypotheses will be listed together first before discussing the results for each of them.

Research question 1: Is there a relationship between the use of project management while implementing company objectives and strategic project portfolio performance?

Hypothesis 1: There is a relationship between project management and strategic project portfolio performance.

It can be seen from Table 27 that, at a .01 significance level, there is a positive relationship between performance and project management where R^2 = .274 and Beta = .524. Therefore, hypothesis 1 was supported.

Table 26

Correlation Matrix of Variables (N = 130).

Variable	1	2	3	4	5	6	7
1 Performance	1						
2 PM	.524**	1					
3 KM	.492**	.805**	1				
4 PE	.432**	.734**	.720**	1			
5 LUM	.269**	.663**	.598**	.700**	1		
6 Strategy	.301**	.415**	. 402**	.385**	.307**	1	
7 Structure	.262**	.144	.194*	.156	.051	.169	1

Note. PM = project management, KM = knowledge management, PE = planned emergence, LUM= Leadership (upper management).
*$p < .05$. **$p < .01$.

Research question 2: Is there a relationship between an organization that utilizes knowledge management during the implementation process and strategic project portfolio performance?

Hypothesis 2: There is a relationship between knowledge management and strategic project portfolio performance.

The results in table 27 show a positive relationship between performance and knowledge management. Hypothesis 2 was supported at $p < .01$ where R^2 = .242 and Beta = .492.

Table 27

Results of Regression Analysis for Performance, Project Management, Knowledge Management, Planned emergence, and Leadership (Upper Management): Hypotheses 1, 2, 7, and 8.

Variable	PM	KM	PE	LUM
Performance	.524**	.492**	.432**	.269**
R^2	.274	.242	.186	.072
Adjusted R^2	.269	.236	.180	.065
R^2 change	.274	.242	.186	.072
F	48.41***	40.82***	29.30***	9.953**
Hypothesis tested	1	2	7	8

Note. PM = project management, KM = knowledge management, PE = planned emergence, LUM= Leadership (upper management).
*$p < .05$, **$p < .01$, ***$p < .001$.

Research question 3: What is the moderating effect of strategy on project management and strategic project portfolio performance?

Hypothesis 3: The strategy pursued by the firm positively moderates the relationship between the use of project management and strategic project portfolio performance.

The results in table 12 show a positive relationship between project management, strategy and performance. $R^2 = .219$ and beta = .467. Hypothesis 3 is supported at $p < .01$.

Table 28 presents the results of the regression analysis of hypotheses 3, 4, 5 and 6.

Research question 4: What is the moderating effect of strategy on knowledge management and strategic project portfolio performance?

Hypothesis 4: The strategy pursued by the firm positively moderates the relationship between the use of knowledge management and strategic project portfolio performance.

The results in table 11 show a positive relationship between knowledge management, strategy and performance. $R^2 = .226$ and beta = .475. Hypothesis 4 was supported at $p < .01$.

Table 28

Results of regression analysis for performance and the moderating effect of strategy on project management and knowledge management. Performance and the moderating effect of structure on project management and knowledge management.: Hypotheses 3, 4, 5, and 6.

Variable	PM*Strat	KM*Strat	PM*Struc	KM*Struc
Performance	.467**	.475**	.477**	.488**
R^2	.219	.226	.228	.238
Adjusted R^2	.212	.220	.222	.232
R^2 change	.219	.226	.228	.238
F	35.79**	37.34**	37.74**	39.96**
Hypothesis tested	3	4	5	6

Note. PM*Strat = project management and strategy, KM*Strat = knowledge management and strategy, PM*Struc = project management and structure, KM*Struc= knowledge management and structure.
*$p < .05$. **$p < .01$.

Research question 5: What is the moderating effect of structure on project management and strategic project portfolio performance?

Hypothesis 5: Structure positively moderates the relationship between the use of project management and strategic project portfolio performance.

The results in table 28 show a positive relationship between structure, project management and performance, $R^2 = .228$ and beta = .477. Hypothesis 5 was supported at $p < .01$.

Research question 6: What is the moderating effect of structure on knowledge management and strategic project portfolio performance?

Hypothesis 6: Structure positively moderates the relationship between the use of knowledge management and strategic project portfolio performance.

The results in table 28 show a positive relationship between structure, knowledge management and performance, $R^2 = .238$ and beta = .488. Hypothesis 6 was supported at $p < .01$.

Research question 7: Is there a relationship between planned emergence and strategic project portfolio performance?

Hypothesis 7: There is a relationship between planned emergence and strategic project portfolio performance.

The results in table 27 show a significant positive relationship between performance and planned emergence. Hypothesis 7 was supported at $p < .01$ where $R^2 = .186$ and beta = .432.

Research question 8: Is there a relationship between leadership provided by upper management during the strategy implementation process and strategic project portfolio performance?

Hypothesis 8: There is a relationship between leadership provided by upper management during the strategy implementation process and strategic project portfolio performance.

The results in table 27 show a positive relationship between performance and leadership provided by upper management. Hypothesis 8 was supported at $p < .01$ where $R^2 = .072$ and beta = .269.

The reliability of the scale will be measured using SPSS and by performing a Cronbach Alpha test. The results can be seen in table 29 for the independent and dependent variables. The results indicate a reliable scale for performance, project management, knowledge management, planned emergence and upper management leadership. Cronbach alpha values of .70 and higher are considered to be reliable (Kline, 1999). Because of the complexity of the measures for strategy and structure, these were excluded from this test.

Table 29

Cronbach alpha independent and dependent variables.

Performance	Project Management	Knowledge Management	Planned Emergence	Upper Management Leadership
0.751	0.935	0.917	0.903	0.733

Additional Findings

This section presents additional findings from the statistical analysis. The information presented supports that stronger correlations were discovered and appear to between other variables than those analyzed in this study. Table 30 shows the strongest correlations discovered in this study.

There was a .805 correlation between project management and knowledge management with a significance of $p < .01$. It is also interesting to note that planned

emergence is strongly correlated to project management and knowledge management and measures .734 and .720 respectively at a significance level of p<.01. Also important is that leadership from upper management is strongly correlated to project management, knowledge management, and planned emergence. They measure .663, .598, and .700, respectively, at a significance level of p<.01. There is no issue with multicollinearity or singularity as the correlation measures are below .90.

Table 30

Correlation matrix for highest correlations (N = 130).

Variable	1	2	3	4
1 PM	1			
2 KM	.805**	1		
3 PE	.734**	.720**	1	
4 LUM	.663**	.598**	.700**	1

Note. PM = project management, KM = knowledge management, PE = planned emergence, LUM= Leadership (upper management).
*$p < .05$. **$p < .01$.

Table 31 contains the multiple regression results with the overall regression information for the model and all variables. The Pearson's r is equal to .585. The R square is .342 and the R square change value is .342. All measures have a significance level of p<.01. Next, the model will be evaluated for improvements.

Table 31

Model summary for all variables (N=130).

Model	R	R Square	Adjusted R Square	Std Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig F Change	
1	.585[a]	0.342	0.299	0.5141	0.342	7.878	8	121	0	1.949

a. Predictors: (Constant), KM*Struc, Upper Management, PM*Strat, Planned Emergence, Project Management, Knowledge Management, PM*Struc, KM*Struc
b. Dependent Variable: Performance

As entries were loaded into the database, it was observed that some of the reverse coded answers did not correspond to those answers provided on all other questions. One of the respondents had highlighted all reverse coded questions and indicated that the questionnaire was confusing and that the reverse coding was the cause. The correlation and regression information minus reverse coding will be provided next. See table 32 for the correlation matrix with reverse coded questions eliminated.

Table 32

Correlation Matrix of Variables Minus Reverse Coded Questions (N = 130)

Variable	1	2	3	4	5
1 Performance	1				
2 PM	.534**	1			
3 KM	.502**	.812**	1		
4 PE	.432**	.722**	.717**	1	
5 LUM	.345*	.634**	.610**	.766**	1

Note. PM = project management, KM = knowledge management, PE = planned emergence, LUM= Leadership (upper management).
*$p < .05$. **$p < .01$.

The difference between the measurements with reverse coded variables and without reverse coded variables can be seen in table 33. The correlations either stayed the same or became stronger. The differences between the variable data with and without the reverse coded questions are: project management increase of 0.01, knowledge management increase of 0.01, planned emergence no change 0, and leadership provided my upper management increase of 0.076.

Table 33

Correlation Matrix of Delta without Reverse Coded and With Reverse Coded (N = 130).

Variable		1	2	3	4	5
1	Performance	1				
2	PM	0.01	1			
3	KM	0.01	0.007	1		
4	PE	0	0.012	0.003	1	
5	LUM	0.076	0.029	0.012	0.066	1

Note. PM = project management, KM = knowledge management, PE = planned emergence, LUM= Leadership (upper management).

See table 34 for a copy of the regression information for the dependent variable and independent variables minus reverse coded questions. The R square measure for project management is .285 where beta is equal to .534 and $p < .01$. The R square measure for knowledge management is .252 where beta is equal to .502 and $p < .01$. The R square measure for planned emergence is .186 where beta is equal to .432 and $p < .01$. The R square measure for upper management leadership is .119 where beta is equal to .345 and $p < .01$.

Table 34

Results of regression analysis minus reverse coded questions for performance, project management, knowledge management, planned emergence, and leadership (upper management): Hypotheses 1, 2, 7, and 8.

Variable	PM	KM	PE	LUM
Performance	.534**	.502**	.432**	.345**
R^2	.285	.252	.186	.119
Adjusted R^2	.279	.246	.180	.112
R^2 change	.285	.252	.186	.119
F	50.98***	43.01***	29.30***	17.32**
Hypothesis tested	1	2	7	8

Note. PM = project management, KM = knowledge management, PE = planned emergence, LUM= Leadership (upper management).
*$p < .05$, **$p < .01$, ***$p < .001$.

Table 35 contains the regression information for the moderating effects of performance and the following variables: project management and strategy, knowledge management and strategy, project management and structure, and knowledge management and structure.

The R square measure for the moderating effects of performance on project management and strategy is .227 where beta is equal to .476 and p <.01. The R square measure for the moderating effects of performance on knowledge management and strategy is .235 where beta is equal to .485 and p <.01. The R square measure for the moderating effects of performance on project management and structure is .232 where beta is equal to .482 and p <.01. The R square measure for the moderating effects of

performance on knowledge management and structure is .247 where beta is equal to .497 and p <.01.

Table 35

Results of regression analysis minus reverse coded questions for performance and the moderating effect of strategy on project management and knowledge management. Performance and the moderating effect of structure on project management and knowledge management: Hypotheses 3, 4, 5, and 6.

Variable	PM*Strat	KM*Strat	PM*Struc	KM*Struc
Performance	.476**	.485**	.482**	.497**
R^2	.227	.235	.232	.247
Adjusted R^2	.221	.229	.226	.242
R^2 change	.227	.235	.232	.247
F	37.60**	39.39**	38.72**	42.08**
Hypothesis tested	3	4	5	6

Note. PM*Strat = project management and strategy, KM*Strat = knowledge management and strategy, PM*Struc = project management and structure, KM*Struc= knowledge management and structure.
*$p < .05$. **$p < .01$,

Additionally, if those respondents are excluded that have performance measures less than 3.0, then the correlation and regression information improves. The correlation information can be seen in table 36. The correlation information for performance and project management is equal to 0.551. The correlation information for performance and knowledge management is equal to 0.554. The correlation information for performance and planned emergence is equal to 0.423. The correlation information for performance and upper management leadership is equal to 0.365.

Table 36

Correlation matrix of variables minus reverse coded questions and performance below 3 (N = 115).

Variable		1	2	3	4	5
1	Performance	1				
2	PM	0.551	1			
3	KM	0.554	0.807	1		
4	PE	0.423	0.707	0.707	1	
5	LUM	0.365	0.653	0.651	0.777	1

Note. PM = project management, KM = knowledge management, PE = planned emergence, LUM= Leadership (upper management).

By removing the reverse coded questions and subtracting the original correlation data, the delta between table 36 and table 26 can be calculated and can be seen in table 37. The correlation increase information for performance and project management is equal to 0.027. The correlation increase information for performance and knowledge management is equal to 0.062. The correlation decrease information for performance and planned emergence is equal to -0.01. The correlation increase information for performance and upper management leadership is equal to 0.096.

The regression information minus the reverse coded questions and for respondents that had performance less than 3 will be discussed next. The data for: the dependent variable performance; the independent variables project management, knowledge management, planned emergence, and upper management leadership; and the moderating variables project management and strategy, knowledge management and strategy, project management and structure, and knowledge management and structure are provided in table 38.

Table 37

Correlation matrix of delta: table 36 and table 26.

Variable		1	2	3	4	5
1	Performance	1				
2	PM	0.027	1			
3	KM	0.062	0.002	1		
4	PE	-0.01	0.027	0.013	1	
5	LUM	0.096	-0.01	0.053	0.077	1

Note. PM = project management, KM = knowledge management, PE = planned emergence, LUM= Leadership (upper management).

The Pearson's r is now .600, which is an increase from .585 and a difference of .015. The R square is .360, which is an increase from 342 and a difference of .018. All measures have a significance level of $p<.01$.

Table 38

Model summary variables minus reverse coded and performance below 3 (N=115) (b).

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.600(a)	.360	.312	.40418	.360	7.455	8	106	.000	1.648

a Predictors: (Constant), KMStruc, Upper Management, PMStrat, Planned Emergence, Project Management, Knowledge Management, PMStruc, KMStrat
b Dependent Variable: performance

The data was also analyzed to see if there was a difference in performance for firms that agreed with the statements given and those that did not. The cutoff for

agreement was anyone who answered above 3.5; below 3.5 was considered disagreement. An independent t-test was run to see if there was a difference in means.

When evaluating performance based on a 3.5 value for above average performance, it can be seen in Table 39 that there were 58 respondents that had performance that was considered average or below average. It can also be seen that there were 72 firms that reported that they had above average to excellent performance. The low performers' mean was at average performance and the high performers were at above average performance.

Table 39

Performance variable split into high and low performers (N=130).

Group Statistics

	coded	N	Mean	Std. Deviation	Std. Error Mean
performance	.00	58	3.014	.3980	.0523
	1.00	72	3.983	.3642	.0429

When the project management data was split into two groups, the results were that 36 respondents gave neutral responses or disagreed with the statements given, while 94 respondents at the least agreed with the statements given. See Table 40 for the results. The respondents that were neutral or disagreed with the statements given had means that were average for performance and the respondents that agreed or strongly agreed had above average performance.

Table 40

Performance variable means with project management split into 2 groups (N=130).

Group Statistics

	PM	N	Mean	Std. Deviation	Std. Error Mean
performance	.00	36	3.256	.5906	.0984
	1.00	94	3.664	.5875	.0606

The independent t-test results can be seen in table 41. The Levene's Test for Equality of Variances has an F value of .129 and significance of .729. The t value is negative 3.541 with degrees of freedom at 128 and $p < .05$. This means that there is a significant difference between means.

The calculation for effect size is measured as r equals the square root of the t statistic squared divided by the t statistic squared plus the degrees of freedom. The calculation is $r = \sqrt{\frac{(-3.541^2)}{(-3.541^2 + 128)}} = .30$. This is a medium effect that accounts for nine percent of the total variance.

When the knowledge management data was split into two groups, the results were that 66 respondents gave neutral responses or disagreed with the statements given, while 64 respondents at the least agreed with the statements given. See table 42 for results. The respondents that were neutral or disagreed with the statements given had means that were average for performance and the respondents that agreed or strongly agreed had above average performance.

Table 41

T-test measures for performance with project management split into 2 groups (N=130).

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
performance	Equal variances assumed	.129	.720	-3.541	128	.001	-.4083	.1153	-.6364	-.1801
	Equal variances not assumed			-3.532	63.14	.001	-.4083	.1156	-.6393	-.1773

Table 42

Performance variable means with knowledge management split into 2 groups (N=130).

Group Statistics

	KM	N	Mean	Std. Deviation	Std. Error Mean
performance	.00	66	3.327	.5187	.0639
	1.00	64	3.781	.6231	.0779

The independent t-test results can be seen in table 43. The Levene's Test for Equality of Variances has an F value of 3.07 and a significance of .082. The t value is negative 4.520 with degrees of freedom at 128 and $p < .001$. This means that there is a significant difference between means.

The calculation for effect size is measured as r equals the square root of the t statistic squared divided by the t statistic squared plus the degrees of freedom. The calculation is $r = \sqrt{\frac{20.43}{148.43}} = 0.371$. This is a medium effect that accounts for 13.76 percent of the total variance.

Table 43

T-test measures for performance with knowledge management split into 2 groups (N=130).

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
performance	Equal variances assumed	3.07	.082	-4.520	128	.000	-.4540	.1004	-.6527	-.2553
	Equal variances not assumed			-4.508	123	.000	-.4540	.1007	-.6533	-.2546

When the planned emergence data was split into two groups, the results were that 50 respondents gave neutral responses or disagreed with the statements given, while 80 respondents at the least agreed with the statements given. See table 44 for results. The respondents that were neutral or disagreed with the statements given had means that were average for performance and the respondents that agreed or strongly agreed had above average performance.

Table 44

Performance variable means with planned emergence split into 2 groups (N=130).

Group Statistics

	PE	N	Mean	Std. Deviation	Std. Error Mean
performance	.00	50	3.276	.6032	.0853
	1.00	80	3.723	.5589	.0625

The independent t-test results can be seen in table 45. The Levene's Test for Equality of Variances has an F value of .013 and significance of .908. The t value is negative 4.298 with degrees of freedom at 128 and $p < .001$. This means that there is a significant difference between means.

The calculation for effect size is measured as r equals the square root of the t statistic squared divided by the t statistic squared plus the degrees of freedom. The calculation is $r=\sqrt{\frac{18.472}{146.472}} = 0.355$. This is a medium effect that accounts for 12.66% of the total variance.

Table 45

T-test measures for performance with planned emergence split into 2 groups (N=130).

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
performance	Equal variances assumed	.013	.908	-4.298	128	.000	-.4465	.1039	-.6521	-.2409
	Equal variances not assumed			-4.222	98	.000	-.4465	.1057	-.6564	-.2366

When the upper management leadership data was split into two groups, the results were that 19 respondents gave neutral responses or disagreed with the statements given, while 111 respondents at the least agreed with the statements given. See table 46 for results. The respondents that were neutral or disagreed with the statements had means that were average for performance and the respondents that agreed or strongly agreed had above average performance.

Table 46

Performance variable means with upper management leadership split into 2 groups (N=130).

Group Statistics

	UML	N	Mean	Std. Deviation	Std. Error Mean
performance	.00	19	3.316	.4776	.1096
	1.00	111	3.591	.6275	.0596

The independent t-test results can be seen in table 47. The Levene's Test for Equality of Variances has an F value of 1.284 and significance of .259. The t value is negative 1.821 with degrees of freedom at 128 and $p > .05$. This means that there is not a significant difference between means.

The calculation for effect size is measured as r equals the square root of the t statistic squared divided by the t statistic squared plus the degrees of freedom. The calculation is $r= \sqrt{\frac{3.32}{131.32}} = 0.159$. This is a small effect that explains 2.53% of the total variance.

Table 47

T-test measures for performance with upper management leadership split into 2 groups (N=130).

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
performance	Equal variances assumed	1.284	.259	-1.821	128	.071	-.2752	.1511	-.5742	.0238
	Equal variances not assumed			-2.207	29.78	.035	-.2752	.1247	-.5300	-.0204

When the strategy data were split into two groups, the results were that 39 respondents gave neutral responses or disagreed with the statements given, while 191 respondents at the least agreed with the statements given. See table 48 for results. The respondents that were neutral or disagreed with the statements had means that were average for performance and the respondents that agreed or strongly agreed had above average performance.

Table 48

Performance variable means with strategy split into 2 groups (N=130).

Group Statistics

	Strat	N	Mean	Std. Deviation	Std. Error Mean
performance	.00	39	3.405	.6198	.0993
	1.00	91	3.613	.6043	.0633

The independent t-test results can be seen in table 49. The Levene's Test for Equality of Variances has an F value of .046 and significance of .831. The t value is negative 1.785 with degrees of freedom at 128 and $p > .05$. This means that there is no significant difference between means.

The calculation for effect size is measured as r equals the square root of the t statistic squared divided by the t statistic squared plus the degrees of freedom. The calculation is $r = \sqrt{\frac{3.19}{131.19}} = 0.156$. This is a small effect that explains 2.43% of the total variance.

Table 49

T-test measures for performance with strategy split into 2 groups (N=130).

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
performance	Equal variances assumed	.046	.831	-1.785	128	.077	-.2081	.1165	-.4387	.0225
	Equal variances not assumed			-1.767	70.336	.082	-.2081	.1177	-.4429	.0268

When the structure data were split into two groups, the results were that 103 respondents gave neutral responses or disagreed with the statements given, while 27 respondents at the least agreed with the statements given. See table 50 for results. The respondents that were neutral or disagreed with the statements given had means that were

average for performance and the respondents that agreed or strongly agreed had above average performance.

Table 50

Performance variable means with structure split into 2 groups (N=130).

Group Statistics

	Struc	N	Mean	Std. Deviation	Std. Error Mean
performance	.00	103	3.501	.6230	.0614
	1.00	27	3.741	.5486	.1056

The independent t-test results can be seen in table 51. The Levene's Test for Equality of Variances has an F value of .244 and significance of .622. The t value is negative 1.822 with degrees of freedom at 128 and $p > .05$. This means that there is no significant difference between means.

Table 51

T-test measures for performance with structure split into 2 groups (N=130).

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
performance	Equal variances assumed	.244	.622	-1.822	128	.071	-.2398	.1316	-.5001	.0206
	Equal variances not assumed			-1.963	46.233	.056	-.2398	.1221	-.4857	.0062

The calculation for effect size is measured as r equals the square root of the t statistic squared divided by the t statistic squared plus the degrees of freedom. The

calculation is $r=\sqrt{\frac{3.32}{131.32}}=0.159$. This is a small effect that explains 2.53% of the total variance.

Chapter Summary

This chapter presented the findings of the study. Hypotheses 1, 2, 3, 4, 5, 6, 7, and 8 were supported. These findings indicate positive relationships among the independent and moderating variables and performance. The results also indicate that the modified confirmatory factor analysis models have a good fit, as does the observed variable path analysis

The results for correlation and regression were slightly improved when the reverse coded questions were removed and only respondents who reported that they had performance results greater than or equal to 3 were included.

The means were evaluated and it was discovered that several mean values for questions asked were below the threshold determined to equal agreement. The moderating variable for strategy had means that measured more towards agreement for all questions, whereas the moderating variable for structure had no means that indicated that the respondents agreed with the statements given.

Additionally, t-tests were run and all independent variables except for upper management leadership had a significant difference in performance means when the variable data were split between those that agreed with the statements and those that were neutral or disagreed. The moderating variables also showed no difference between means for performance when comparing those that agreed with the statements with those that did not agree. A discussion of findings and conclusions are presented in the next chapter.

Chapter 5

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

This chapter summarizes the first four chapters of the study. It also discusses the implications of this research, the conclusions reached, and the recommendations made based on the results of the study.

Summary of Chapters 1 Through 4

This is a strategic management research study of strategy implementation and the effects of program management, knowledge management, planned emergence, and upper management leadership on performance. The study also looks at the moderating effects of strategy and structure on performance. Past studies have concentrated on strategy implementation issues, defining the process, and action categories for strategy implementation. This study takes theoretical studies and provides empirical data that project management and knowledge management affect strategic project portfolio performance.

This research is expected to extend the understanding of strategy implementation success factors that play a role in whether a firm executes its strategy. Such an understanding would improve the organization's knowledge of what works and what does not work when strategy is being implemented. The study also addresses the evolving strategy of the firm and the need for upper management leadership in the process. The moderating effects of strategy and structure have an impact on project management and knowledge management, as a strategy is necessary and the appropriate structure is

required to support that strategy so that project management and knowledge management will be effective.

Chapter 1 introduced the research problem, the background to the research problem, the purpose of the study, and the definitions of terms used in this study. This research is based on the premise that there is a lack of empirical data for strategy implementation and the use of project management and knowledge management during the process. It is also important to understand how these two factors impact performance. It does not matter how good the strategy being developed is if it cannot be successfully implemented.

The study of strategy implementation, project management, and knowledge management is unique, as there are studies linking strategy and project management, knowledge management and strategy, and project management and knowledge management but none where found linking all three. The use of projects for implementing change is not new, but by combining this with an information system that aids the process, and by providing the leadership, including the resources, needed, an organization can drive change.

This study will make five major contributions:

1. It examines project management and the effect on strategic project portfolio performance. Project management in this case is responsible for providing leadership as well as providing communication to all levels of the organization and the external environment. Project management may provide a competitive advantage for the firm. It also defines the project and the time, cost, and requirements to complete the project,

enabling the organization to resource the project correctly with respect to the entire portfolio.

2. This study also examines knowledge management and its effect on strategic project portfolio performance. Knowledge management is evaluated for the potential benefits it can provide the organization, such as the use of an Enterprise Resource Planning (ERP) System to control manufacturing, supply chain management, financials, projects, human resources, customer resources and marketing, and data warehouse. Additionally, the need for a repository exists and past project data can be provided to those who need it for future needs. Business processes can be used as well to process project tasks, report on project status and results, provide for corrective action, request additional resources, and open and close projects.

3. Strategy is examined to determine whether the cost leadership or differentiation impacts project management, knowledge management, or strategic project portfolio performance. The standardization of processes can be of great benefit to organizations who want to establish highly effective and efficient project teams. For a cost leadership strategy, which may be slower evolving than a differentiation strategy, it may not be a problem of how fast the process moves, and then standardization is not an issue. This may be true for certain industries this may be true, particularly if product development cycles are longer and allow for slower moving processes. Flexibility may be required for a firm to employ a differentiation strategy.

4. The formulation process is examined to determine its impact on strategy implementation and the outcomes of the entire process. The expectation is that poor strategy formulation will result in poor performance. Successful implementation will

require that the strategy formulation and implementation both be successful. The formulation process is also impacted by change or by the receipt of better information. The feedback and controls that project management has utilized will be the mechanism for changing the strategy and the creation of new strategies.

5. Leadership is examined to assess the impact of having upper management involvement through the implementation process. Historically, upper management has been involved in strategy formulation, but turned over implementation to lower level management. This has been due to the perception that formulation was more difficult and important than implementation.

Chapter 2 reviewed the literature that influenced the development of the research model, research questions, and hypotheses. It looked at strategy implementation as it relates to project management, knowledge management, planned emergence, and the role of upper management leadership in terms of the strategic project portfolio performance. The study also looked at strategy and structure and the effect of project management as it relates to performance, and strategy and structure and the effect of knowledge management as it relates to performance.

The research model contains the dependent variable strategic project portfolio performance and four independent variables: (1) project management, (2) knowledge management, (3) planned emergence, and (4) upper management leadership. There are also two moderating variables: (1) strategy, and (2) structure. The model can be seen in figure 9.

The research questions and hypotheses were developed as issues were raised with the strategy implementation process and are backed by the relevant literature.

Research question 1 addresses the relationship between the use of project management while implementing company objectives and strategic project portfolio performance. Research question 2 addresses the relationship between an organization that utilizes knowledge management during the implementation process and strategic project portfolio performance. Research question 3 addresses the moderating effect of strategy on project management and strategic project portfolio performance. Research question 4 addresses the moderating effect of strategy on knowledge management and strategic project portfolio performance. Research question 5 addresses the relationship between the moderating effect of structure on project management and strategic project portfolio performance. Research question 6 addresses the moderating effect of structure on knowledge management and strategic project portfolio performance. Research question 7 addresses the relationship between planned emergence and strategic project portfolio performance. Research question 8 addresses the relationship between leadership provided by upper management during the strategy implementation process and strategic project portfolio performance. Hypotheses were formulated from these research questions and used to guide the inquiry.

Chapter 3 described the research methodology, including the research design, research strategy, variables in the study, and the procedure for data collection and analysis. The dependent variable in the study is strategic project portfolio performance. The independent variables are project management, knowledge management, planned emergence, and upper management leadership. The moderating variables are strategy and structure. Each of the moderating variables was analyzed with respect to project

management and performance and knowledge management and performance. Each of these variables was conceptually and operationally defined.

The data were collected in the United States from aerospace and defense businesses that had 50 or more employees. A list of 3,360 businesses was generated from a mailing list firm. The web page for the company is www.USADATA.com. The businesses were designated by the following SIC codes: 3663, 3669, 3721, 3724, 3728, 3761, 3764, 3769, 3812 & 3829, see table 5 for a description of these codes. Primary data were collected through questionnaires sent to the companies under study.

All companies from the database list were selected to receive a questionnaire. The questionnaire was sent to the contact provided with the list and, where no contact existed, was sent to the company with the request that it be forwarded to the most senior person at that location. Each questionnaire was accompanied by an introduction letter that explained the purpose of the study. Included was a return-addressed prepaid envelope to mail the completed surveys to the researcher.

Chapter 4 presented a statistical analysis of the research questions and their related hypotheses. The model was analyzed using structural equation modeling and each independent variable was analyzed with respect to the dependent variable. The results for each model were given for Chi-square, GFI, CFI, RMR, and RMSEA. The Chi-square measure was not significant at .05. To test the relationships among variables, the following statistical methods were used: correlation analysis, Pearson's *R* test, standard deviation, and mean. Cronbach Alpha was used to verify the scale for variables measured.

The findings in this chapter indicated that each of the models had a good fit with the data. Also, the hypotheses tested were supported. The key findings of this study are presented in Tables 10, 11, and 12. Each of the hypotheses will be discussed below.

In support of hypothesis 1, it was discovered that the relationship between project management and strategic project portfolio performance was significant and positive. This may be attributed to the fact that most of the strategic project portfolio comprises the introduction of a new product to the market. New product introduction lends itself to project management in these types of companies, which would likely have program or project managers to run those projects.

In support of hypothesis 2, it was discovered that the relationship between knowledge management and strategic project portfolio performance was significant and positive. Knowledge management systems such as enterprise resource planning are commonplace, and most organizations manage information in some fashion out of necessity. Additional knowledge sources exist in the aerospace and defense industries, as they commonly write project plans and other subordinate plans needed to execute projects.

In support of hypothesis 3, it was discovered that the moderating effect between strategy and project management and strategic project portfolio performance was significant with a positive relationship. Aerospace and defense companies typically form a strategy, as most companies do, and it makes sense that there will be a positive effect on the relationship between project management and strategic project portfolio performance.

In support of hypothesis 4, it was discovered that the moderating effect between strategy and knowledge management and strategic project portfolio performance was significant with a positive relationship. Most companies have a strategy they use for establishing or incorporating their knowledge management system. The system also helps achieve the company strategy, so it is logical that there would be a positive moderating effect on the relationship between knowledge management and strategic project portfolio performance.

In support of hypothesis 5, it was discovered that the moderating effect between structure and project management and strategic project portfolio performance was also significant with a positive relationship. The structure of an organization that executes projects should support the management of projects. This was proven and structure did positively moderate the relationship between project management and strategic project portfolio performance.

In support of hypothesis 6, it was discovered that the moderating effect between structure and knowledge management and strategic project portfolio performance was significant with a positive relationship. The transfer of information across functional departments is important to project success. This was proven, as structure did positively moderate knowledge management and strategic project portfolio performance.

In support of hypothesis 7, it was discovered that there was a significant and positive relationship between planned emergence and strategic project portfolio performance. The strategy of the firm should evolve as conditions warrant change. The positive relationship reported in this study is evidence that planned emergence affects strategic project portfolio performance.

In support of hypothesis 8, it was discovered that there was a significant and positive relationship between upper management leadership and strategic project portfolio performance. Although the weakest correlation of the independent variables, it was proven that upper management leadership increases performance. The measure increased to a better correlation after the reverse coded questions were removed.

Conclusions Based on the Findings

This section discusses the decisions regarding the research hypotheses based on the findings. The hypotheses and research questions are listed for convenience to connect the two with the discussion. To aid in the discussion, table 52 was created to illustrate the magnitude of the hypothesis results

Table 52

Hypotheses results ranked from highest to lowest including effect size.

Rank	Variable	Effect Size	% Total Variance
1	PM	Large Effect	27.44
2	KM	Large Effect	24.18
3	KM*Structure	Large Effect	23.80
4	PM*Structure	Large Effect	22.80
5	KM*Strategy	Large Effect	22.60
6	PM*Strategy	Large Effect	21.90
3	PE	Medium Effect	18.63
4	Strategy	Medium Effect	9.07
5	LUM	Medium Effect	7.22
6	Structure	Medium Effect	6.89

Note. PM = project management, KM = knowledge management, PE = planned emergence, LUM= Leadership (upper management).

Each of the independent variables and moderating variables was measured with respect to the dependent variable. The effect of an independent variable on the dependent variable is calculated as the percentage of variance; the effect size is determined based on those results. The more variation that is accounted for by the independent variable, the better the results and the higher the ranking in the table.

Research question 1: Is there a relationship between the use of project management while implementing company objectives and strategic project portfolio performance?

Hypothesis 1: There is a relationship between the project management and strategic project portfolio performance.

This hypothesis was supported and it was concluded that there was a significant and positive relationship between project management and strategic project portfolio performance. It can be seen from Table 27 that, at a .01 significance level, there is a positive relationship between performance and project management where $R^2 = .274$ and Beta = .524. Something systematic happens such that when the level of project management increases, the level of strategic project portfolio performance also increases.

The results in table 40 show that 94 respondents agreed with the project management questions asked and 36 did not agree with the statements given in the project management section of the survey. Companies surveyed reported that there was also a significant difference in performance between firms that agreed with the statements given in the project management portion of the survey and those that did not agree with the statements given.

If we look at project management as a portion of the change management process for a company, we can start to build a framework for strategy implementation. The

framework proposed as result of this study can be seen in figure 16. Many of the elements of change management are included in the variables studied in the project management portion of the survey.

The projects that were formulated to create the project portfolio are used to drive organizational change. This change may take the form of introducing a new product or service, opening and starting a new plant or facility, expanding operations to enter a new market, discontinuing a product or withdrawing from a market, acquiring or merging with another firm, and changing the strategy in functional departments.

The planning process portion of change management exists in more than one independent variable studied but, for project management, there is a planning element for each of the projects undertaken. Change agents are project management and upper management who seek to "reconfigure the organizations roles, responsibilities, structure, outputs, processes, systems, technology, or other resources" (Buchanan & Badham, 1999).

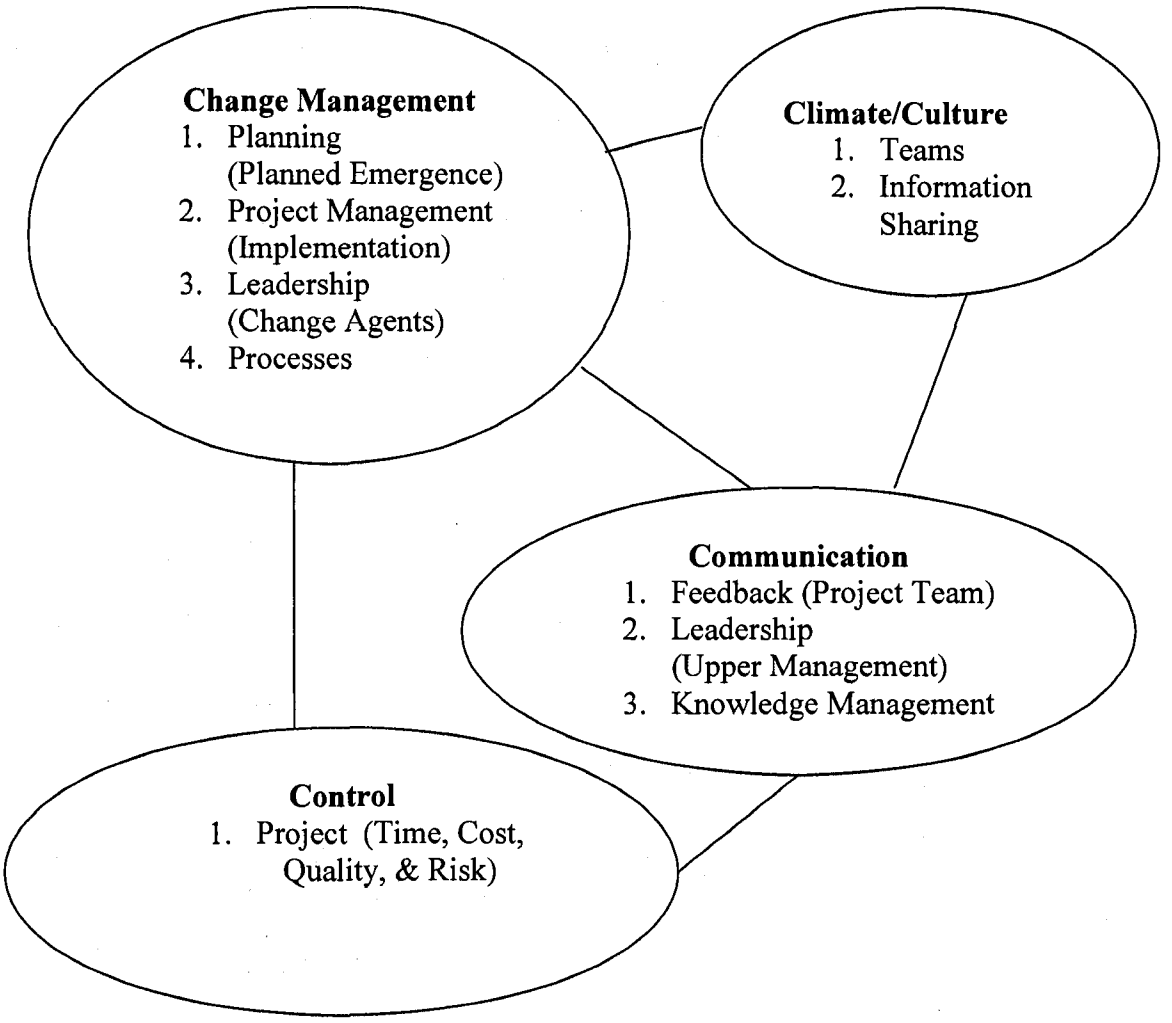

Figure 16. 4-Cs framework.

For each question, the means are provided so that the individual measures for each question can be used to draw conclusions. For objectives, the results can be seen in table 9. The calculated mean values indicate that respondents agreed with all of the objective questions except for the question coded as rc4E. Information learned from those questions will be discussed next.

Project management provides the organization with tools that are important to the business. When there is a lack of clarity in objectives, there can be improvement if there are clear directives as opposed to small fragmented initiatives (Saka, 2003). Organizations that have realistic and achievable objectives give the organization direction. This study provides evidence that communication is required such that the entire company understands the objectives, so that the organization is aligned and moving in the same direction. During a period of change, it is necessary to communicate company policies after careful deliberation by upper management (De Feo & Janssen, 2001). Since the company is always transforming itself, the company must have the ability to consistently create achievable objectives.

The company needs the ability to generate action plans from long-term objectives/strategies. The action plan consists of breaking down and explaining the overall strategy down to the operational team level (Savall, 2003). This encourages the creation of tactics that ensure that the long-term objectives or strategies are achieved

As action plans turn into projects, it becomes important to make people responsible for their roles on the project and to ensure that they understand their personal objectives and how these relate to project objectives. During this study, however, it was discovered that companies did not have the ability to link personal objectives to project objectives.

Change management, as inferred by its name, means to manage change. But managing also has to do with control and containment, as well as maintaining continuity throughout change (Collins, 2000). Once objectives are established, the need to determine

a method for measuring performance emerges. Then the company has the ability to create measurements that can be used for monitoring objectives.

The means for leadership and planning and each of the corresponding questions can be seen in table 10. All questions asked regarding leadership and planning had means that were above 3.5, except for rc5G, which measured 3.4 and is considered to be below the needed measure for agreement. The histograms for leadership and planning can be found in Appendix C. Information gained from those questions will be discussed below.

Project managers and their teams are agents of change and are critical to the organization as global competition increases, and as the pace of technological change and reengineering increases (Leintz & Rea, 1995). Those project managers are required to implement the company objectives and are measured on their ability to succeed. The company makes use of projects to implement change and to create the appropriate project plans. These plans contain the needed project requirements and require someone to manage them. Within the project plan, there needs to be a definition of roles and responsibilities for those implementing the strategy, as well as a way to manage risk.

The companies responded that they do not use project management to allow them to optimize value on projects. It is important, though, that projects simultaneously focus on the "triple constraints" of performance specification, time schedules, and cost budget (Rosenau, 1998). This study provides empirical evidence that companies that use project management are able to manage: time on projects, quality on projects, cost on projects, human resources on projects, procurement activities on projects, and communication on projects.

See table 11 for the means for resource allocation and the corresponding questions asked during the survey. As can be seen, the means exceed 3.5, which means that the respondents agreed with the resource allocation questions asked. In this case, the reverse coded question did not have the highest variance. Histograms were created for each of the questions and variables and can be found in Appendix C. Information obtained from those questions will now be discussed.

Problems occur with project portfolios because of the following 3 issues: (1) projects have interfaces with other projects and day to day operations, sharing common deliverables, resources, information, or technology across those interfaces, (2) projects must negotiate priority for resources on almost a daily basis, with other projects and with day to day operations, (3) projects deliver related objectives, which contribute to overall development objectives of the parent organization (Turner & Speiser, 1992). This study gives information that proves that companies should provide the projects with: the necessary financial resources, the necessary people, the necessary materials, the information needed, and the facilities/workspace/equipment needed.

The means for competence and each of the corresponding questions are given in table 12. As can be seen, the means exceed the measure of 3.5 and approach 4, which means that they agreed with the statements given. Histograms were created for each of the questions and variables and can be found in Appendix C. Information obtained from those questions will be discussed next.

Competence was also analyzed and determined to be necessary for firms that want to successfully implement their strategies. The firms studied have the ability to define skills and knowledge competencies for those implementing the strategy. It is important

to select team members with the desired skills or to select those with the desired attitude and then train them (Laszlo, 1999). The firms also have the ability to select a project team with the required skills and competencies necessary to execute projects. If the project team does not have the required skills, then the firm should provide necessary training to those on the project.

The means for feedback and controls and each of the corresponding questions can be found in table 13. As can be seen, all the means exceed the measure 3.5 and are approaching or are at 4, which means that the respondents agreed with the statements given. Histograms were created for each of the questions and variables and can be found in Appendix C. Information gained from those questions will be discussed next.

Firms that use feedback on projects and measure performance can control performance on the project. The firms surveyed indicated that it is important that feedback and controls are in place. They also indicated that the company has the ability to monitor projects and to obtain strategic feedback from the project team. This is because it is important for the strategic planning process to be simple and for formulation to be linked with implementation (Sokol, 1992) .Where objectives are changed, the company also has the ability to provide feedback to the project team with respect to any strategy/objectives that change.

The means for rewards and incentives and each of the corresponding questions can be found in table 14. As can be seen, the mean for question 9A is less than 3.5 and the means for questions 9B and 9C are 3.5 or higher, indicating that the respondents agreed with the statements given. The result is that rewards and incentives fell below the cutoff for agreement. Histograms were created for each of the questions and variables and

can be found in Appendix C. Information gained from those questions will be discussed next.

It is interesting that the companies surveyed reported that they do not provide rewards to project team members that contribute to project success. This could be because in companies with a matrix organization project members get conflicting orders, have conflicting priorities, and reward systems do not match the stated organizational goals (Graham & Englund, 1997; Kuprenas, 2003). The companies surveyed did, however, report that incentives are used for project team members that are willing to go beyond what is required to complete tasks and help to ensure project success, and that they provided incentives or rewards for innovative ideas that enhance project performance.

Research question 2: Is there a relationship between an organization that utilizes knowledge management during the implementation process and strategic project portfolio performance?

Hypothesis 2: There is a relationship between knowledge management and strategic project portfolio performance.

This hypothesis was supported and it was concluded that there was a significant and positive relationship between knowledge management and strategic project portfolio performance. It can be seen from Table 27 that, at a .01 significance level, there is a positive relationship between performance and knowledge management where $R^2 = .242$ and Beta = .492. Something systematic happens such that when the level of knowledge management increases, the level of strategic project portfolio performance also increases.

See table 42 for mean data for knowledge management data that was split into two categories (1) for those that agreed with the statements given and (2) those that answered with a neutral response or disagreed with the statements given. The quantity of respondents that agreed with the statements given was 64 and the quantity that disagreed was 66. Even though the number of respondents that agreed and disagreed was about the same, the t-test data in table 43 shows that there was a significant difference in performance means.

The means for repository and each of the corresponding questions can be seen in table 15. As can be seen, the means for 10B and 10C are below 3.5, indicating that the respondents did not agree with the statements given; the mean for 10A was above 3.5, indicating that the respondents agreed. Overall, the repository mean is below 3.5, which is below the threshold for agreement. Histograms were created for each of the questions and variables and can be found in Appendix C. Information gained from those questions will be discussed next.

The companies surveyed reported that they make use of repositories for project data for use during the project and after the project has been completed. The firms surveyed did not typically store information such as project/subordinate plans and project results so that project data needed on future projects could be easily retrieved. The information learned from the responses also indicated that those that needed information from the repository would most likely not have access to that data, and that there was no method for them to search for the data they needed. This could be a problem for the industry studied, as global companies move to third generation knowledge management

systems and there is a need for those in the organization to have access to the data they need and to have the ability to apply that data (Snowden, 2002).

The means for business processes and each of the corresponding questions can be found in table 16. As can be seen, the means for business processes exceed 3.5, which means that the respondents agreed with the statements given. The respondents agreed with the business process questions and therefore agreed with the business processes index. Histograms were created for each of the questions and variables and can be found in Appendix C.

The companies surveyed reported that they had business processes in place that document how the company processes work in the areas of finance, contracts, project management, human resources, engineering, manufacturing, service, purchasing, quality, and distribution. This may have to do with the fact that companies realize that superior performance does not originate from strategies that have worked in the past. This is reflected in the amount of research on the importance of redesigning business processes in the context of strategic change (Hammer & Champy, 1993). Also in support of this is that this study showed that business processes are looked at continually and improvements are made where the company can perform more effectively or efficiently. The standardization of business processes is flexible enough that it does not impede project success.

The means for enterprise resource planning and each of the corresponding questions can be found in table 17. As can be seen, the means are less than 3.5, indicating that the respondents did not agree with the statements given and the ERP index.

Histograms were created for each of the questions and variables and can be found in Appendix C. Information gained from those questions will be discussed next.

The companies surveyed responded that they did not make use of Enterprise Resource Planning (ERP) during projects to control items such as: project status (open/closed), or materials by project including status, project budget, human resources planning, customer contract information, bill of materials, scheduling, and cost management. Since the ERP system is not used, the companies surveyed could not adapt the system to meet the organizational needs including project reporting, or make information available to those that need it by providing a method for them to search for data.

The means for culture and each of the corresponding questions can be found in table 18. As can be seen, the means for rc13C exceeds 3.5, indicating that the respondents agreed with the statements given; the means questions 13A and 13B were less than 3.5, indicating that the respondents did not agree with the statements given. The culture index measured above 3.5, indicating that the respondents agreed with the index. Histograms were created for each of the questions and variables and can be found in Appendix C. Information gained from those questions will be discussed next.

The company culture does not allow for work on strategy implementation projects to transfer implicit knowledge to explicit knowledge during projects. The company does not typically provide project teams with time necessary so that information that was gained during project execution can be shared. This includes technical reviews, peer reviews, customer reviews, preliminary design reviews, program reviews, program meetings, etc. The company does, however, encourage project team involvement with the

external environment. This includes meeting with regulators, customers, suppliers, partners, etc.

The means for knowledge transfer and each of the corresponding questions can be found in table 19. As can be seen, the means for question 14A and 14B exceed 3.5, indicating that the respondents agreed with the statements given and the mean for question 14C was below 3.5, indicating that the respondents did not agree. Histograms were created for each of the questions and variables and can be found in Appendix C. Information obtained from those questions will be discussed next.

The company uses knowledge transfer to its benefit as project teams create deliverables, including any new information learned on the project, which can be used by the firm in the future. Also, knowledge is transferred between people on the project team and management. However, knowledge is not typically transferred between people on the project team and people outside the company, including customers, suppliers, and regulators.

Research question 3: What is the moderating effect of strategy on project management and strategic project portfolio performance?

Hypothesis3: The strategy pursued by the firm positively moderates the relationship between the use of project management and strategic project portfolio performance.

The results in table 28 show a significant positive relationship between project management and strategy and performance. $R^2 = .219$ and beta = .467. Hypothesis 3 is supported at $p < .01$.

The means for strategy and each of the corresponding questions can be seen in table 20. The means for project management and the moderating effect means will also

be presented. As can be seen, the means for the three questions exceed 3.5, indicating that the respondents agreed with the statements given. The index for strategy and for project management exceeds 3.5 as well. Histograms were created for each of the questions and variables and can be found in Appendix C. Information obtained from those questions will be discussed next.

The companies surveyed are as likely to pursue a cost leadership strategy as they are to pursue a differentiation strategy. The measure for differentiation was slightly higher and this probably corresponds to the type of projects that the companies pursue, which is introducing a new product to market. They are also more likely to pursue a strategy that combines cost leadership and differentiation than they are to pursue only a cost leadership strategy.

It can be concluded that there is an impact on performance as companies communicate strategy and drive projects in the organization. It is not clear that any one strategy is much better than any other strategy, but the mean data would indicate that most companies in this sample had a differentiation strategy versus a cost leadership strategy. In conclusion, something systematic happens such that when the level of strategy and project management increases, the level of strategic project portfolio performance also increases.

Research question 4: What is the moderating effect of strategy on knowledge management and strategic project portfolio performance?

Hypothesis 4: The strategy pursued by the firm positively moderates the relationship between the use of knowledge management and strategic project portfolio performance.

The results in table 28 show a significant positive relationship between knowledge management and strategy and performance. $R^2 = .226$ and beta = .475. Hypothesis 4 was supported at $p < .01$.

Table 21contains the information for strategy and the supporting questions for knowledge management. Histograms were created for each of the questions and variables and can be found in Appendix C. The index for knowledge management at the threshold for agreement and strategy is above 3.5, which indicates agreement with strategy. The results will be discussed next.

It can be concluded that companies that pursue a strategy, whether it be cost leadership, differentiation, or a combination of the two strategies, require that knowledge management systems be in place to improve performance. Business processes can be used to standardize work, which can be beneficial to projects. There are also knowledge management tools that can prove beneficial to project teams, and that can be used to give them a head start in the product development process. Based on the information obtained, it can be determined that the combination of strategy and knowledge management has a positive effect on performance.

Research question 5: What is the moderating effect of structure on project management and strategic project portfolio performance?

Hypothesis 5: Structure positively moderates the relationship between the use of project management and strategic project portfolio performance.

The results in table 28 show a positive relationship between structure and project management and performance. $R^2 = .228$ and beta = .477. Hypothesis 5 was supported at $p < .01$.

The means for structure and each of the corresponding questions can be seen in table 22. The means for project management and the moderating effect means will also be presented. As can be seen, the means for the three questions are below 3.5, indicating that the respondents did not agree with the statements given. The project management index exceeds 3.5, indicating that the respondents agreed with the statements given. Histograms were created for each of the questions and variables and can be found in Appendix C. Information obtained from those questions will be discussed next.

The companies surveyed were not as likely to have a structure that is functional, where there is no reporting into projects. They were most likely to have a weak matrix or a balanced matrix structure, where there is some functional reporting and some reporting into projects. The response was neutral for a strong matrix or projectized structure, where people report to project teams and there may be some administrative support provided through functional reporting, and where the employee's performance is based on his or her contribution to project and project performance.

Since most companies surveyed have a differentiation strategy and are likely to introduce a new product into market as a strategy, it makes sense that those companies would have a matrix organization with some functional reporting and are not likely to have a functional reporting structure. In conclusion, there is something systematic happening such that when the level of project management increases, the level of performance increases. However, the combination of project management and structure reflect the same condition; this is mostly related to the performance variable rather than the structure variable.

Research question 6: What is the moderating effect of structure on knowledge management and strategic project portfolio performance?

Hypothesis 6: Structure positively moderates the relationship between the use of knowledge management and strategic project portfolio performance.

The results in table 28 show a significant positive relationship between structure and knowledge management and performance: $R^2 = .238$ and beta = .488. Hypothesis 6 was supported at $p < .01$.

The means for structure and each of the corresponding questions can be found in table 22. The means for project management and the moderating effect means will also be presented. As can be seen, the means for the three questions are below 3.5, indicating that the respondents did not agree with the statements given. The project management index exceeds 3.5, indicating that the respondents agreed with the statements given. Histograms were created for each of the questions and variables and can be found in Appendix C. Information obtained from those questions will be discussed next.

Where a functional department would have specialists that work within departmental boundaries, the matrix or projectized organization is geared towards projects requiring that team members be brought together to execute the project. Project teams are more likely to require the creation of plans and for functional areas to be represented and the creation of their corresponding plans.

The conclusion that can be drawn is that teams out perform individuals and the organizations that bring together project teams are more likely to execute projects successfully. The knowledge management environment that these team members create results in the sharing of information. This allows the members to determine how the

information impacts their function and make adjustments where necessary. This communication will lead the members to feel that they are a part of something bigger than themselves and may drive performance.

In conclusion, there is something systematic happening such that when the level of knowledge management increases, the level of performance also increases. The combination of knowledge management and structure reflects the same condition, but this is mostly related to the performance variable rather than the structure variable.

Research question 7: Is there a relationship between planned emergence and strategic project portfolio performance?

Hypothesis 7: There is a relationship between planned emergence and strategic project portfolio performance.

The results in table 27 show a significant positive relationship between performance and planned emergence. Hypothesis 7 was supported at $p < .01$ where $R^2 = .186$ and beta = .432. Something systematic happens such that when the level of planned emergence increases, the level of strategic project portfolio performance also increases.

When the planned emergence data was split into two groups, the results were that 50 respondents gave neutral responses or disagreed with the statements given, whereas 80 respondents at the least agreed with the statements given. See table 44 for results. This indicates that most of the respondents agreed that planned emergence is important and that there was a significant difference in performance means for those that agreed and those that did not agree.

The means for planned emergence and each of the corresponding questions can be found in table 24. As can be seen, the means for questions 15C, 15G and 15H were below

3.5, indicating that the respondents did not agree with the statements given; for all other questions, the means exceeded 3.5, indicating agreement. Histograms were created for each of the questions and variables and can be found in Appendix C. Information obtained from those questions will be discussed next.

The companies surveyed are likely to require that the external environment be monitored and that changes that affect the organization are reflected in the company's strategy. They are also likely to use the outcomes of the strategic thinking process, which include business opportunities, as well as company strengths and weaknesses, so that managers can apply internal competencies to the external environment. They are not likely to produce strategic planning documents that are clear and contain sufficient detail, including the delegation of authority for any action described. The companies are also likely to gain acceptance of and commitment to the strategies proposed. They also formalize the strategy by requiring that the organization create written action plans, objectives, and procedures. The companies embed strategy by requiring that key actors act as a team and that they are prepared, committed, and motivated to implement the new strategy. They do not use change management to oversee employees, resources, and capabilities for planning strategies and changes. They do not use change management to ensure that any conflicts between the company's objectives and business performance are resolved.

Research question 8: Is there a relationship between leadership provided by upper management during the strategy implementation process and strategic project portfolio performance?

Hypothesis 8: There is a relationship between leadership provided by upper management during the strategy implementation process and strategic project portfolio performance.

There is a positive relationship between leadership provided by upper management and strategic project portfolio performance. The results in table 27 show a significant positive relationship between performance and leadership provided by upper management. Hypothesis 8 was supported at $p < .01$ where R2 = .072 and beta = .269. Something systematic happens such that when the level of upper management leadership increases, the level of strategic project portfolio performance also increases.

When the upper management leadership data was split into two groups, the results were that 19 respondents gave neutral responses or disagreed with the statements given where 111 respondents at the least agreed with the statements given. See table 46 for results. This means that most companies believe that upper management leadership is critical to company success and this does not depend on whether the firm is a high performer or a low performer.

The means for upper management leadership and each of the corresponding questions can be found in table 25. As can be seen, the means for all questions were above 3.5, indicating that the respondents agreed with the statements given. Histograms were created for each of the questions and variables and can be found in Appendix C. Information obtained from those questions will be discussed next.

The companies surveyed agreed that upper management demonstrates its commitment to the strategy implementation process. Upper management ensures that it gets involved when politics impede project progress. Upper management also clearly communicates company objectives to employees so that they understand the importance

of the strategic projects undertaken. Finally, members of upper management are involved in the strategy implementation process so that new strategies can be discovered or changes to existing strategies can be made based on improved information.

The fact that all firms surveyed provide upper management leadership can be attributed to either the need for a turnaround in business performance or the need to maintain an improvement trend. The most important factor for a company to turn around has been found to be strong leadership (Bibeault, 1982). Additionally, firms need transactional or transformational leaders depending on their situation.

Firms that are already performing well may only need a transactional leader so that they can motivate subordinates to achieve goals (Bartol et al., 1995). In contrast, when a turnaround is required, a transformational leader would be needed to motivate subordinates to perform beyond normal expectations. For this reason, leadership would be required no matter the performance level.

Additional Findings

The discussion of additional findings will take place in this section. The areas that are discussed are program management, knowledge management, planned emergence, the effects of the reverse coded questions, and the impact of segregating low performance respondents from higher performance respondents.

Additional Findings on Project Management

1. Analysis of the results indicated a significant positive relationship between project management and knowledge management (Table 26). Something systematic happens such that, when the level of project management increases, the level of knowledge management also increases. Firms that make use of project management understand the

need for knowledge management and would be more likely to have an ERP system, understand the need for transferring information from the project the company, and create the plans needed to execute the project.

It is important to understand that successful firms make use of project management and knowledge management to drive performance. Research conducted would indicate these two variables provide companies with a competitive advantage. This study gives evidence that this is correct as well as linking performance, project management, and knowledge management. The evidence indicates that companies should incorporate project management processes and invest in knowledge management systems.

2. Analysis of the results indicated a significant positive relationship between project management and planned emergence (Table 26). Something systematic happens such that, when the level of project management increases, the level of planned emergence also increases. Firms that make use of project management understand the need to adjust their strategy and let it evolve as more accurate information is made available. The company also understands that those in the organization need to understand the external environment so that they can apply resources.

It is important to understand that successful firms make use of project management to implement their strategies, and they also let those strategies evolve during the execution of the project. This can be important, as successful companies that can create strategies and then modify their strategy as more information becomes available may have better performance and therefore have a competitive advantage over their competitors.

3. Analysis of the results indicated a significant positive relationship between project management and leadership provided by upper management (Table 26). Something systematic happens such that, when the level of project management increases, the level of upper management leadership also increases. The companies surveyed that make use of project management understand the need for upper management commitment during the implementation process. Upper management involvement ensures that the discovery of something impeding progress can be immediately addressed. Members of upper management can also communicate objectives to employees and are involved with adjusting their strategy as more accurate information is made available.

It is in upper management's interest to stay informed about project status and to make changes to the project portfolio as needed. It is also important for the company to be able to plan when products will be ready for market or if something is impeding progress and there is going to be a delay in product release. Companies that have a commitment from upper management are more likely to ensure that the correct projects are resourced and that priorities are understood. Since all companies have a limited amount of resources, it makes sense that the most important projects get adequately resourced and less important project be delayed or cancelled if needed.

Additional Findings on Knowledge Management

1. Analysis of the results indicated a significant positive relationship between knowledge management and planned emergence (Table 26). Something systematic happens such that, when the level of knowledge management increases, the level of planned emergence also increases. Companies use knowledge management systems to store data that can then be used to adjust their strategy and let it evolve as more accurate information is

made available. Some impacts that result from changes in the external environment can also be detected by the knowledge management system.

This is important in allowing companies to correctly apply resources where they are needed. Project status stored in the ERP system can be used to create meaningful reports that can signal change, either positive or negative, that is affecting projects.

2. Analysis of the results indicated a significant positive relationship between knowledge management and leadership provided by upper management (Table 26). Something systematic happens such that, when the level of knowledge management increases, the level of upper management leadership also increases. The companies surveyed that make use of knowledge management systems understand the need for upper management commitment during the project implementation process. Upper management involvement ensures that the information relating to issues that are impeding progress, learned from the knowledge management system, can be immediately addressed. Knowledge management systems can also be used to communicate objectives to employees. They can also provide information to management so that they can adjust their strategy as more accurate information is made available.

Knowledge management systems allow upper management to stay informed about project status and to make changes that affect the project portfolio. It is important for the company to manage its portfolio and any tool, such as knowledge management systems, that helps them succeed is vital to the organization.

Additional Findings on Planned Emergence

1. Analysis of the results indicated a significant positive relationship between planned emergence and leadership provided by upper management (Table 26). Something

systematic happens such that, when the level of planned emergence, the level of upper management leadership also increases. If upper management defines the strategy for the company then it makes sense that planned emergence and upper management commitment during the implementation process are linked. If upper management is committed to the strategy they created, then it makes sense that they would be involved in the evolution of the strategy as new information is discovered.

It is in upper management's interest to remain involved during the strategy implementation process in order to ensure success or, if need be, to terminate the project as information is made available that can be communicated to employees so that they understand the organization's commitment to accomplishing the project and the lengths that the company is prepared to go to in order to do so. Likewise, if there is a reversal, it is important for upper management to communicate why the company is changing directions and to assure employees that they are making the right decision for future success.

Additional Findings on Reverse Coded Questions

Reverse coded questions were reported as being confusing by some respondents. Additionally, some respondents' answers to reverse coded questions did not appear to be correct in terms of the other answers they provided. It was as though they maintained the pattern of marking to agree to the question even though they probably did not agree. As can be seen in table 32, there are modest increases for removing the reverse coded questions. It appears that reverse coding questions may lead to inaccurate measurement of the variable. In this case, removing reverse coded questions in the factor analysis and when evaluating correlations gave better results.

Additional Findings on High Performance Respondents

Data were also analyzed to remove low performers. The correlations showed modest gains for each of the independent variables except for planned emergence, which had a slight decrease. As information was being loaded into the database, it became clear that lower performers typically had erratic responses in different areas of the survey. This meant that the reasons that they were less successful were not understood, nor were the different reasons for firms' failure confirmed. Successful firms typically responded in a more predicable manner and their responses did not vary as greatly.

Practical Applications Suggested by the Findings

The present study provides empirical evidence that there is a link between project management, knowledge management, and performance during the strategy implementation process. Other studies have been conducted in the areas of strategy implementation, project management, and knowledge management but not all studies provided the empirical information needed to support their claims.

In the area of strategy implementation, this study reinforces work performed by Johnson and Scholes (1999), Shirvasta (1994), Higgins (1985), Hambrick and Cannella (1989), Peters and Waterman (1982), Pearce and Robinson (2005), Hrebiniak (1990), and Aaltonen (2003).

In the area of project management, the study reinforces work performed by Liberatore and Pollack-Johnson (2005), Bourne and Walker (2005), Leintz and Rea (1995), Turner and Speiser (1992), Kim and Mauborgne (2005), Jugdev and Mathur (2006), Alderman and Ivory (2005), Jamieson and Morris (2004), Ash and Smith-Daniels

(2004), Loo (2003), Cheung and Lloyd-Walker (1999), Sense (2005) and Woodhead (2000).

In the area of knowledge management, the study reinforces work performed by Nicolas (2004), Chua and Lam (2005), Bernus and Kalpic (2006), Brookes and Leseure (2004), Krajewski and Ritzman (2002), Holsapple and Joshi (2000), Goh (2002), Blackman and Henderson (2005), Gupta, Narain, Shankar, and Singh (2003), Aronsons, Halawi and McCarthy (2006), Ungan (2006), Lang (2001), Gray (2001) and Kruger and Snyman (2004).

From the findings of this study, it is clear that project management, knowledge management, planned emergence, and leadership provided by upper management are important to the success of aerospace and defense companies. These companies make use of projects when they implement their strategies, which consist of introducing new products, entering a new market, and changing the strategy in functional departments.

This study discovered that an emergent strategy, as measured by the variable planned emergence, is more important than choosing a type of strategy such as differentiation, low cost, or a combination of low cost and differentiation. The information in table 52 supports this claim and shows that planned emergence accounts for twice as much of the variance when compared to strategy.

The strategy of the firm is turned into action in the form of projects. Project scope can be adjusted as needed when newer and better information becomes available. The company's long-term objectives are viewed as the company strategy, whereas short-term objectives are typically associated with projects. Translating long-term objectives into short-term objectives is important if companies are going to succeed. The creation of

action plans within the project ensures that the company strategy is translated into action and that the team is responsible for embedding the strategy throughout the company.

This study also discovered that project teams make use of knowledge management systems and these systems add value to the process and drive performance. Likewise, knowledge management systems are a tool that upper management can use to get feedback from programs as well as to communicate with employees. With that information, project scopes can be modified as needed. Additionally, it is important that the organization have a strategy and that a structure be in place that allows the company to execute its strategy.

This study discovered that the majority of the firms surveyed had some sort of matrix organization where there was some functional reporting. The strategy reported as being used most was a differentiation strategy. More important was that firms were more successful if they had an emergent strategy versus selecting a low cost, differentiation, or a combination of low cost and differentiation strategy. The companies also reported that they may have a cost leadership or a combination of cost leadership and differentiation strategy.

Contributions to the Theory of Strategic Management and the Aerospace and Defense Industry

This study provided empirical evidence on the relationships among project management, knowledge management, planned emergence, leadership provided by upper management and firm performance in the aerospace and defense industry. The contributions are listed below. Empirical evidence was also provided concerning the moderating effects of: strategy on project management and performance, strategy on

knowledge management and performance, structure on project management and performance, and structure on knowledge management and performance.

1. This study discovered that the failure rate was less than that reported by Kaplan and Norton's study. The companies surveyed reported that for 44% of them, strategic project portfolio performance was average to below average, whereas implementation failure has been reported as between 60 and 90 percent (Kaplan & Norton 2005).

2. This study contributes to the area of strategy implementation by reporting on the positive effects of project management and knowledge management during the implementation process. It reduces the gap between strategy formulation literature and strategy implementation literature, which has been reported as lacking (Alexander, 1985; Al-Ghamdi, 1998).

3. This study provides evidence that project management and knowledge management are important and that they should be treated with as much consideration as strategy formulation. The information presented demonstrates that project teams can provide senior management with vital information that allows the strategy to be changed as better information becomes available. The data should encourage changes to the view that strategy implementation is not as important as strategy formulation (Al-Ghamdi, 1998), and that it should be treated with the same importance as strategy formulation.

4. This study discovered that in the aerospace and defense industry, emergent strategy was more important that the type of strategy selected. This supports the claim that strategy is both planned and emergent (Mintzberg, 1998).

5. Senior management should understand that strategy implementation is complicated and that it deserves the appropriate amount of support. This study supports the claim that

transforming strategy into action is much more difficult than allocating resources and changing the structure (Aaltonen & Ikavalko, 2002).

6. This study supports the claim that strategy is useless without execution and successful execution of the strategic plans is based on having the necessary skills and knowledge (Aaltonen, 2004). It also concludes that senior management should assure that the correct people are assigned and that they are encouraged to perform.

7. This study provides information that supports the 4-Cs conceptual model. There is a need for more conceptual models for strategy implementation (Alexander, 1991).

8. Project management and knowledge management were proven to be vital to the aerospace and defense industry. This study is important because, in today's fast-paced environment and knowledge-driven economy, projects are critical steps for organizational growth (Koshkinen, 2004).

9. The study reaffirms that upper management leadership is required when implementing strategy. Leadership is necessary whether there is a need for a turnaround in business performance or a need to maintain an improvement trend. This supports the claim that the most important factor for company turnaround is strong leadership (Bibeault, 1982). Firms that are already performing need a transactional leader so that they can motivate subordinates to achieve goals (Bartol et al., 1995). In contrast, when a turnaround is required, a transformational leader would be required to motivate subordinates to perform beyond normal expectations. For this reason, leadership is required no matter the performance level of the company.

Assumptions and Limitations

The following assumptions were made and were central to the design of this study.

1. The research methods and procedures used in this study were appropriate.
2. The respondents understood the questions in the questionnaire.
3. The answers to the questions were given truthfully and by the appropriate respondents.

The following limitations apply to the findings in this study.

1. The study focused on aerospace and defense companies that had 50 or more employees.
2. The study did not distinguish between product types offered by companies, such as complex or simple designs.
3. The study was conducted only on companies in the United States.
4. The study was conducted primarily at the senior management level.
5. The response rate was low, so it is possible that the responses were not representative of the population sampled.

Suggestions for Future Research

As the first empirical study linking project management, knowledge management, and performance during the strategy implementation process, the study opens many possible areas for future research. These suggestions were derived from the findings and conclusions of this study:

1. The study included only aerospace and defense companies and therefore there is a need to study other industries to see whether the findings of this study could also apply to those industries.

2. Further research could define whether the respondent has complex or simple products, to determine whether the findings in this study are more applicable to companies that produce complex products.

3. The study included only companies located in the United States and therefore there is a need to study companies in other countries to assess whether the findings of this study could also apply in those countries.

4. The study targeted senior management at aerospace and defense companies who rated their performance as successful or unsuccessful. They also identified what they thought was the correct rating for each of the questions asked based on their perceptions. Therefore, there is a need to study project team members that are responsible for executing projects, to compare the results and determine whether there is a difference in the variables that most determine success.

5. This study broke the project portfolio down into the following categories: introducing a new product or service, opening and starting a new plant or facility, expanding operations to enter a new market, discontinuing a product or withdrawing from a market, acquiring or merging with another firm, changing the strategy in functional departments, and other. Future research on the project categories as they relate to the independent variables studied may uncover valuable information such as the need for a different prioritization of the strategic implementation dimensions.

Chapter Summary

This chapter provided a summary of chapters 1 to 4 and presented conclusions based on the findings in this study. This research proves that project management can be used to implement company strategy and that successful firms are more likely to use

project management than unsuccessful firms. Less successful firms either did not use or only partially utilized project management to implement their strategies. Equally important is that the project management team and upper management realize improved performance from the use of a knowledge management system; less successful firms did not make use of a knowledge management system. Additional benefits come in the form of internal and external problem detection, which allows management to adjust their strategies in a more efficient manner.

This study discovered that upper management leadership was provided no matter how successful the performance. This can be attributed to the fact that aerospace and defense companies have historically had functional departments and several layers of management. Also important is that if company performance is cyclical as opposed to linear, then it is logical that during periods of poor performance, or rebuilding, the company would require leadership to drive change.

Change management requires processes for managing organizational change. It encompasses planning, leadership, project management, and implementation. It requires that the following steps take place: plan, initiate, realize, control, and stabilize change processes. Change should be viewed as a continuous adoption of corporate strategies and structures to changing external conditions. With the rapid changes in technology taking place today, organizations need a culture that fosters change. Change is not the exception to the rule but should be viewed as a part of the process.

Communication is vital from the top down as well as from the bottom up. The corporate culture should support this communication and support the project teams and information sharing. Controls should be put in place for quality, cost and schedule; these

are needed ensure success on projects. Controls should not be included that inhibit project success, but rather that provide data that can be used to modify plans and that flag realized risk. Finally, knowledge management is vital for projects. Upper management leadership should be aware of the need for such a system and the value it will add to the organization, as a good strategy requires successful implementation. This study therefore should be important to companies as, no matter how good the strategy, it is only effective if it is successfully implemented.

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APPENDICES

APPENDIX A

QUESTIONNAIRE

May 20, 2007

Alliant International University

Dear Executive

I need your help in completing the strategy implementation survey section of my study. This survey is a part of my doctoral dissertation research project to study strategy implementation and the influence that project management and knowledge management have on that process. The title of the research is *Strategy Implementation: The Relationship Between Integrated Project Management, Knowledge Management and Strategic Project Portfolio Performance.* I am conducting this research in conjunction with the Marshall Goldsmith School of Management at Alliant International University in San Diego, California. My Dissertation Committee members are Dr. Louise Kelly, Chair; Dr. David Felsen, and Dr. Steven Gabriel.

Project management and knowledge management have both been portrayed as an asset for companies such as yours as well as providing competitive advantage over rivals. A clear understanding of this environment helps the company to formulate strategies that address the needs of the marketplace. Project management can be important when implementing projects with strategic importance. For organizations such as your, it has become clear that knowledge management is critical and that organizations ensure a cultural climate that allows for information sharing. The organization also benefits when information is transferred from the people on the project team to the organization. This study will help us better understand these assets and the effect on project portfolio performance for the firm.

Your participation in this survey will be greatly appreciated by my dissertation committee and me. This is the culmination of my 3-year effort to complete my doctoral program and I hope you will agree to help me. The survey is short and should take approximately 20 minutes of your time. It is only through the participation of executives like yourself that we can generate enough knowledge to help those of us in academics to train the managers of tomorrow and to shed light into the new and modern ways of doing business in today's turbulent business environment. Your participation is therefore extremely valuable and enriching.

This survey is strictly confidential and no answers can be traced back to any particular company. No identifying information is requested and the publication of the research will present only aggregated results from many companies. Each survey is accompanied by a pre-paid self-addressed envelope and all you have to do is to fold the completed survey, put it in the envelope and drop it in the mail. My goal is to receive responses from at least 336 companies in order to ensure that the results are statistically significant. So I need your help.

In accordance with Alliant International University policy, the AIU's Institutional Review Board has approved this survey. The Institutional Review Board ensures that the rights of all research participants are protected. If you have any questions about the Institutional Review Board or the approval of the survey, please contact the Board at Alliant International University, 10455 Pomerado Road, San Diego, CA 92131.

Once again, thank you very much for your help and participation in this study. We are confident that the results of this study will benefit businesses and provide insights into ways of increasing organizational effectiveness.

If you wish to obtain a summary of the results of this study or have any questions about the study, please email me at rcholip@alliant.edu or call me at (760) 207-9912 (any time).

Sincerely

Robert Cholip
Doctoral Candidate
Marshall Goldsmith School of Management

Questionnaire – Please provide your view of your organization as it applies to the question being asked.

1. Background information
   (a) Size of organization ----------(number of employees)
   (b) What is your current age?----------(years)
   (c) How long have you had this job?--------years----------months
   (d) What is the highest level of your education? (check one)
   1. High School-------- 2. Some College----------3. College Graduate-------- 4.Post Graduate----------
   (e) Organization level (check one)
   Owner -------- CEO --------Senior Management --------Middle management -------- Other ---------

2. Types of strategic decisions implemented. Please assign a percentage value to each of the following categories as it relates to the portfolio of projects the company pursues. Total should be 100%
   (a) Introducing a new product or service----------
   (b) Opening and starting a new plant or facility----------
   (c) Expanding operations to enter a new market ----------
   (d) Discontinuing a product or withdrawing from a market----------
   (e) Acquiring or merging with another firm ----------
   (f) Changing the strategy in functional departments ----------
   (g) Other ----------

3. The following questions may characterize how well the company performs when executing its portfolio of projects. Please put an x in the box that best describes how you feel about the company's project portfolio performance over the past three years.
1=Poor 2=Below average 3=Average 4= Above average 5=Outstanding

Project Portfolio Performance	1	2	3	4	5
How would you rate company project performance with respect to achieving the project objective(s)?					
How would you rate company project performance with respect to achieving the project cost targets?					
How would you rate company project performance with respect to achieving the project time targets?					
How would you rate company project performance with respect to achieving the project quality targets?					
How would you rate company project performance with respect to achieving the project scope targets?					

4. Please use the scale given below to indicate the extent you agree or disagree with the questions below that address company objectives. Long-term objectives are derived from the strategy formulation process and short term objectives are used to create projects. (Projects can be introduction of a new product, entering a new market, etc.... see question 2 for a full list)
Strongly disagree Disagree Neutral Agree Strongly agree
1 2 3 4 5

Objectives	1	2	3	4	5
The company does not have the ability to clearly communicate company objectives.					
The company has the ability to consistently create achievable objectives.					
The company has the ability to generate action plans from long-term objectives/strategies.					
The company has the ability to link short-term objectives to long-term objectives.					
The company does not have the ability to link personal objectives to project objectives.					
The company has the ability to create measurements that can be used for monitoring objectives.					

5. Please use the scale given below to indicate the extent you agree or disagree with the questions below that address leadership and planning for the company's project management group.
Strongly disagree Disagree Neutral Agree Strongly agree
1 2 3 4 5

Leadership and Planning	1	2	3	4	5
The company does not use project managers or project leaders during implementation of company objectives.					
The company makes use of projects to implement change.					
The company has the ability to create project plans.					

The company does not have the ability to define and manage project requirements.					
The company has the ability to define roles and responsibilities for those implementing the strategy.					
The company has the ability to manage risk.					
The company does not optimize value on projects.					
The company has the ability to manage time on projects.					
The company has the ability to manage quality on projects.					
The company has the ability to manage cost on projects.					
The company has the ability to plan for human resources on projects.					
The company has the ability to manage procurement activities on projects. Activities can be mergers and acquisitions or outsourcing.					
The company has the ability to manage communication on projects.					

6. Please use the scale given below to indicate the extent you agree or disagree with the questions below that address resource allocation for the company's project portfolio.

Strongly disagree Disagree Neutral Agree Strongly agree
1 2 3 4 5

Resource Allocation	1	2	3	4	5
The company provides the projects with the necessary financial resources needed.					
The company provides the projects with the necessary people needed.					
The company provides the projects with the necessary materials they need for those projects to be successful.					
The company does not provide projects with the information needed.					
The company provides the projects with the necessary facilities/workspace/equipment needed.					

7. Please use the scale given below to indicate the extent you agree or disagree with the questions below that address project team competence and the affect on project portfolio.

Strongly disagree Disagree Neutral Agree Strongly agree
1 2 3 4 5

Competence	1	2	3	4	5
The company has the ability to define skills and knowledge needed by those implementing the strategy.					
The company has the ability to select a project team with the required skills and competencies necessary to execute projects.					
The company has the ability to provide necessary training to those on projects that need it.					

8. Please use the scale given below to indicate the extent you agree or disagree with the questions below that address the company's approach to communication and the controls used on projects.

Strongly disagree Disagree Neutral Agree Strongly agree
1 2 3 4 5

Feedback and Controls	1	2	3	4	5
The company has the ability to monitor projects.					
The company has the ability to obtain strategic feedback from the project team.					
The company has the ability to provide feedback to the project team with respect to any strategy/objective changes.					

9. Please use the scale given below to indicate the extent you agree or disagree with the questions below about the company's use of rewards and incentives.

Strongly disagree Disagree Neutral Agree Strongly agree
1 2 3 4 5

Rewards and Incentives	1	2	3	4	5
The company provides rewards to project team members that contribute to project success.					
The company provides incentives to project team members that are willing to go beyond what is required complete tasks and help to ensure project success.					
The company provides incentives or rewards for innovative ideas that enhance project performance.					

10. Please use the scale given below to indicate the extent you agree or disagree with the questions about the company's use of repositories.

Strongly disagree Disagree Neutral Agree Strongly agree
1 2 3 4 5

Repository	1	2	3	4	5
The company has the ability to capture project data for use during conduct of the project and after the project has been completed.					
Information such as project/subordinate plans and project results that goes into the repository is standardized so that project data needed on future projects can be easily retrieved by those that need it.					
Those that need information from the repository have access to that data and there is a method for them to search for the data they need.					

11. Please use the scale given below to indicate the extent you agree or disagree with the questions about the company's use of business processes.

Strongly disagree Disagree Neutral Agree Strongly agree
1 2 3 4 5

Business Processes	1	2	3	4	5
Business processes are in place that document how the company processes work in the areas of finance, contracts, project management, human resources, engineering, manufacturing, service, purchasing, quality, and distribution.					
Business processes are looked at continually and improvements are made where the company can perform more effectively or efficiently.					
The standardization of business processes is flexible enough that it does not impede project success.					

12. Please use the scale given below to indicate the extent you agree or disagree with the questions below that address resource allocation for the company's project portfolio.

Strongly disagree Disagree Neutral Agree Strongly agree
1 2 3 4 5

Enterprise Resource Planning	1	2	3	4	5
The company makes use of an ERP system during the conduct of projects to control items such as: project status (open/closed), materials by project including status, project budget, human resources planning, customer contract information, bill of materials, scheduling, and cost management.					
The company has an ERP system that has been adapted to meet the organizational needs including project reporting.					
Information in the ERP system is made available to those that need it and there is a method for them to search for the data they need.					

13. Please use the scale given below to indicate the extent you agree or disagree with the questions below that the company's culture.

Strongly disagree Disagree Neutral Agree Strongly agree
1 2 3 4 5

Culture	1	2	3	4	5
The company culture is such that those that work on strategy implementation projects transfer their (implicit) knowledge to documented company owned (explicit) knowledge.					
The company provides project teams with time so that information can be shared that was gained during project execution. Technical reviews, peer reviews, customer reviews, preliminary design reviews, program reviews, program meetings, etc…					
The company does not encourage project team involvement with the external environment. This includes meeting with regulators, customers, suppliers, partners, etc…					

14. Please use the scale given below to indicate the extent you agree or disagree with the questions below that address your company's ability to transfer knowledge throughout the company.

Strongly disagree Disagree Neutral Agree Strongly agree
1 2 3 4 5

Knowledge Transfer	1	2	3	4	5
Project teams create deliverables, including any new information learned on the project, which can be used by the firm in the future.					
Knowledge is transferred between people on the project team and management.					
Knowledge is transferred between people on the project team and people outside the company, including customers, suppliers, regulators, etc…					

15. Please use the scale given below to indicate the extent you agree or disagree with the questions below that address your company's ability to formulate strategy.

Strongly disagree Disagree Neutral Agree Strongly agree
1 2 3 4 5

Planned Emergence	1	2	3	4	5
The company requires that the external environment be monitored and that changes that affect the organization are reflected in the company's strategy.					
The outcomes of the strategic thinking process include: business opportunities and company strengths and weaknesses so that managers can apply internal competencies to the external environment.					
The strategic planning documents produced by the company are clear and contain sufficient detail including delegation authority for any action described.					
The company achieves acceptance and commitment of the strategies proposed.					
The company formalizes strategy by requiring that the organization create written action plans, objectives, and procedures.					
The company embeds strategy by requiring that key actors act as team and that they are prepared, committed, and motivated to implement the new strategy.					
The company uses change management to oversee employees, resources, and capabilities for planning strategies and changes.					
Change management is responsible for ensuring that any conflicts between the company's objectives and business performance are resolved.					

16. Please use the scale given below to indicate the extent you agree or disagree with the questions below that address your company's ability to provide leadership from upper management.

Strongly disagree Disagree Neutral Agree Strongly agree
1 2 3 4 5

Leadership (Upper Management)	1	2	3	4	5
The company's upper management demonstrates their commitment to the strategy implementation process.					
The company's upper management does not get involved when politics impede project progress.					
The company's upper management clearly communicates company objectives to employees so that they understand the importance of the strategic projects undertaken.					
The company's upper management is involved in the strategy implementation process so new strategies that emerge can be discovered or changes to existing strategies can be made based on improved information.					

17. Please use the scale given below to indicate the extent the organization attempts to pursue a cost-leadership strategy. An example is process improvement with the aim of improving quality and reducing cost (kaizen, lean, continuous improvement, standardized processes, CMMI, etc.).

Strongly disagree Disagree Neutral Agree Strongly agree
1 2 3 4 5

Strategy	1	2	3	4	5
The company pursues a cost leadership strategy.					

18. Please use the scale given below to indicate the extent the organization attempts pursue a differentiation strategy. Differentiation can be for price, image, support, quality, and design.

Strongly disagree Disagree Neutral Agree Strongly agree
1 2 3 4 5

Strategy	1	2	3	4	5
The company pursues a differentiation strategy.					

19. Please use the scale given below to indicate the extent the organization attempts to combine cost-leadership and differentiation. An example is process improvement with the aim of improving quality and reducing cost (kaizen, lean, continuous improvement, standardized processes, CMMI, etc.) and an overall differentiation strategy of providing different products/services. Differentiation can be for price, image, support, quality, and design.

Strongly disagree 1 Disagree 2 Neutral 3 Agree 4 Strongly agree 5

Strategy	1	2	3	4	5
The company pursues a strategy that combines cost leadership and differentiation.					

20. Please use the scale given below to describe the company's organizational structure and to what extent there is a functional reporting structure. That means that groups are departmentalized with respect to their job function i.e. production, sales, marketing, engineering, quality, etc...

Strongly disagree 1 Disagree 2 Neutral 3 Agree 4 Strongly agree 5

Structure	1	2	3	4	5
The company's structure is functional and there is no reporting into projects.					

21. Please use the scale given below to describe the company's organizational structure and to what extent there is a matrix organization with individuals also required to maintain strong functional reporting. That could mean that there are some projects where the company brings together cross functional teams. The power may reside with certain groups in the organization and these functional groups may lead the project.

Strongly disagree 1 Disagree 2 Neutral 3 Agree 4 Strongly agree 5

Structure	1	2	3	4	5
The company's structure is weak matrix or a balanced matrix where there is some functional reporting and some reporting into projects.					

22. Please use the scale given below to describe the company's organizational structure and to what extent there is a matrix organization with limited functional reporting or where individuals only report into teams. This means that there are projects that the company uses cross functional teams which provide deliverables to the project. The team is responsible for success which contributes to company success.

Strongly disagree 1 Disagree 2 Neutral 3 Agree 4 Strongly agree 5

Structure	1	2	3	4	5
The company's structure is strong matrix or projectized. People report to project teams and there may be some administrative support provided through functional reporting. Employee's performance is based contribution to project and project performance.					

APPENDIX B

PROGRAM MANAGEMENT TOOL AND TECHNIQUES

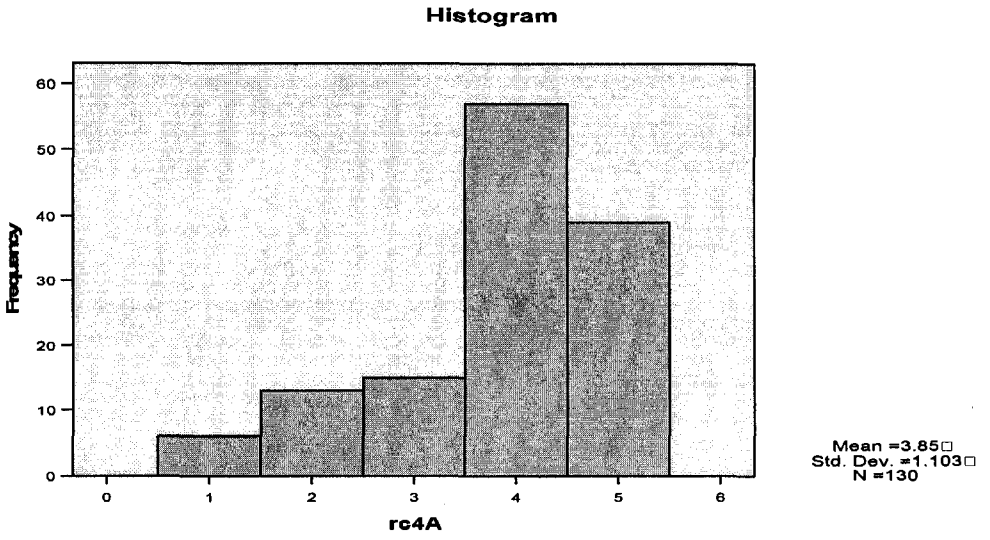
1) Project selection methods
2) Program management methodology
3) Project management information system
4) Expert judgment
5) Earned value technique
6) Templates, forms, standards
7) Product analysis
8) Alternatives identification
9) Stakeholder Analysis
10) Work breakdown structure templates
11) Decomposition
12) Inspection
13) Change control system
14) Variance analysis
15) Replanning
16) Configuration management system
17) Rolling wave planning
18) Planning component
19) Precedence diagramming method
20) Arrow diagramming method
21) Schedule network templates
22) Dependency determination
23) Applying leads and lags
24) Alternatives analysis
25) Published estimating data
26) Project management software
27) Bottom-up estimating
28) Analogous estimating
29) Parametric estimating
30) Three-point estimates
31) Reserve analysis
32) Critical path analysis
33) Schedule compression
34) What-if scenario analysis
35) Resource leveling
36) Critical chain method
37) Applying calendars
38) Schedule model
39) Progress reporting
40) Schedule change control system
41) Performance measurement
42) Schedule comparison bar charts
43) Determine resource cost rates
44) Vendor bid analysis
45) Cost of quality
46) Cost aggregation
47) Funding limit reconciliation
48) Cost change control system
49) Performance measurement analysis
50) Schedule performance index
51) Forecasting
52) Variance management
53) Cost benefit analysis
54) Benchmarking
55) Design of experiments
56) Additional quality planning tools
57) Quality planning tools and techniques
58) Quality audits
59) Process analysis
60) Quality control tools and techniques
61) Cause and effect diagram
62) Control charts
63) Flowcharting
64) Histogram
65) Pareto chart
66) Run Chart
67) Scatter diagram
68) Statistical sampling
69) Inspection
70) Defect repair review
71) Organizational charts and position descriptions
72) Networking
73) Organizational theory
74) Pre-assignment
75) Negotiation
76) Acquisition
77) Virtual teams
78) General management skills
79) Training
80) Team-building activities
81) Ground rules
82) Co-location
83) Recognition and rewards
84) Observation and conversation
85) Project performance appraisals
86) Conflict management
87) Issue log
88) Communications requirements analysis
89) Communication technology
90) Communication skills
91) Information gathering and retrieval systems
92) Information distribution methods
93) Lessons learned process
94) Information presentation tools
95) Performance information gathering and compilation
96) Status review meetings
97) Time reporting systems
98) Cost reporting systems
99) Communication methods
100) Planning meeting and analysis
101) Documentation reviews
102) Information gathering techniques
103) Checklist analysis
104) Assumption analysis
105) Diagramming techniques
106) Risk probability and impact assessment
107) Probability and impact matrix

108) Risk data quality assessment
109) Risk categorization
110) Risk urgency assessment
111) Data gathering and representation techniques
112) Quantitative risk analysis and modeling techniques
113) Strategies for negative risks or threats
114) Strategies for positive risks or opportunities
115) Strategy for both threats and opportunities
116) Contingent response strategy
117) Risk reassessment
118) Risk audits
119) Variance and trend analysis
120) Technical performance measurement
121) Status meetings
122) Make-or-buy analysis
123) Contract types
124) Standard forms
125) Bidder conferences
126) Advertising
127) Develop qualified sellers list
128) Weighting system
129) Independent estimates
130) Screening system
131) Contract negotiation
132) Seller rating systems
133) Proposal evaluation techniques
134) Contact change control system
135) Buyer-conducted performance review
136) Inspections and audits
137) Performance reporting
138) Payment system
139) Claims administration
140) Records management system
141) Information technology
142) Procurement audit

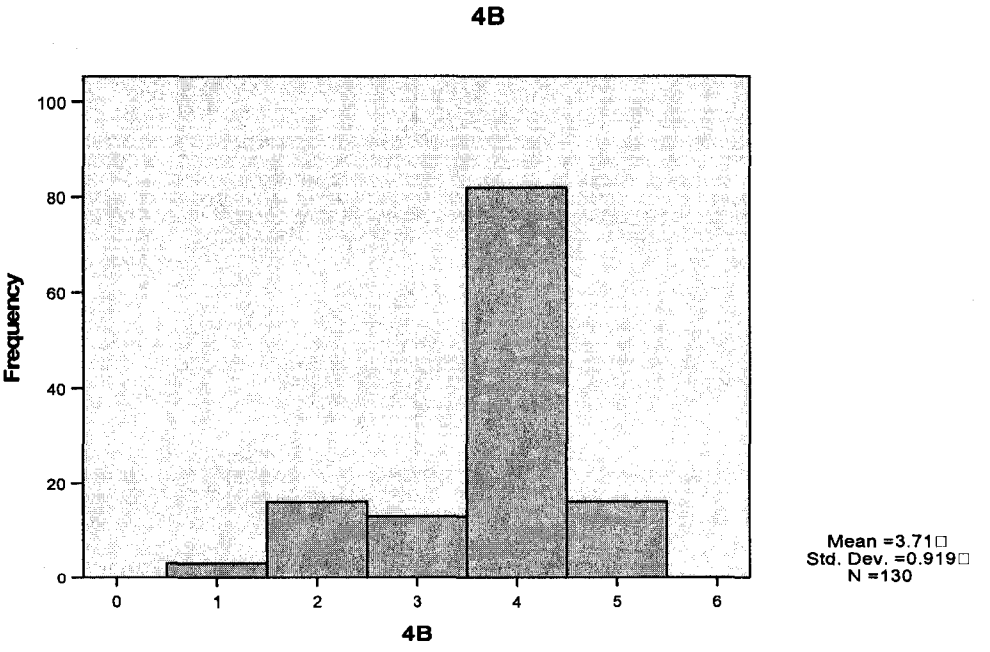
APPENDIX C

HISTOGRAMS FOR EACH SURVEY QUESTION

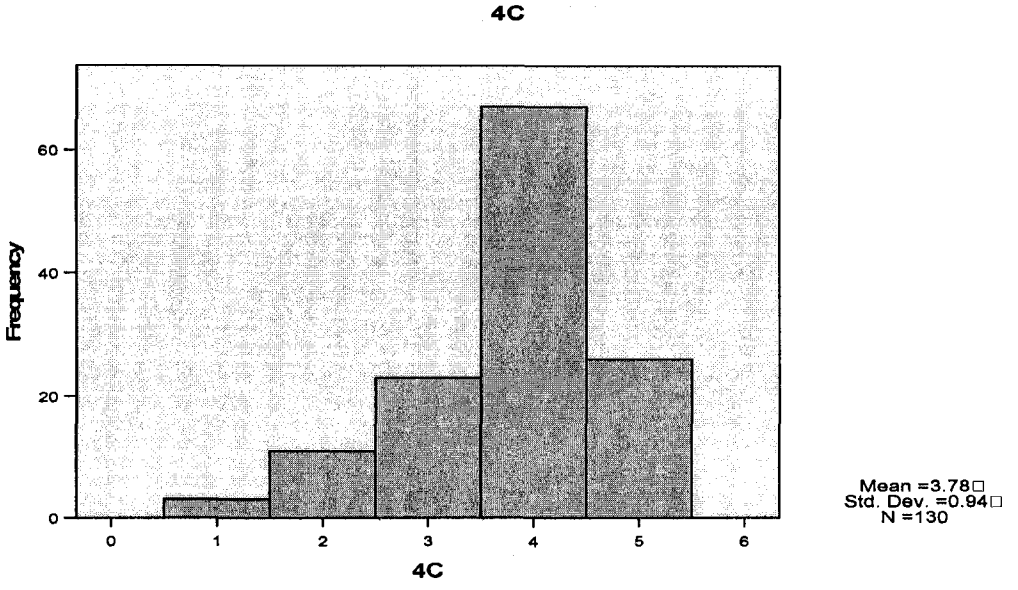
First question histogram for the objectives variable.



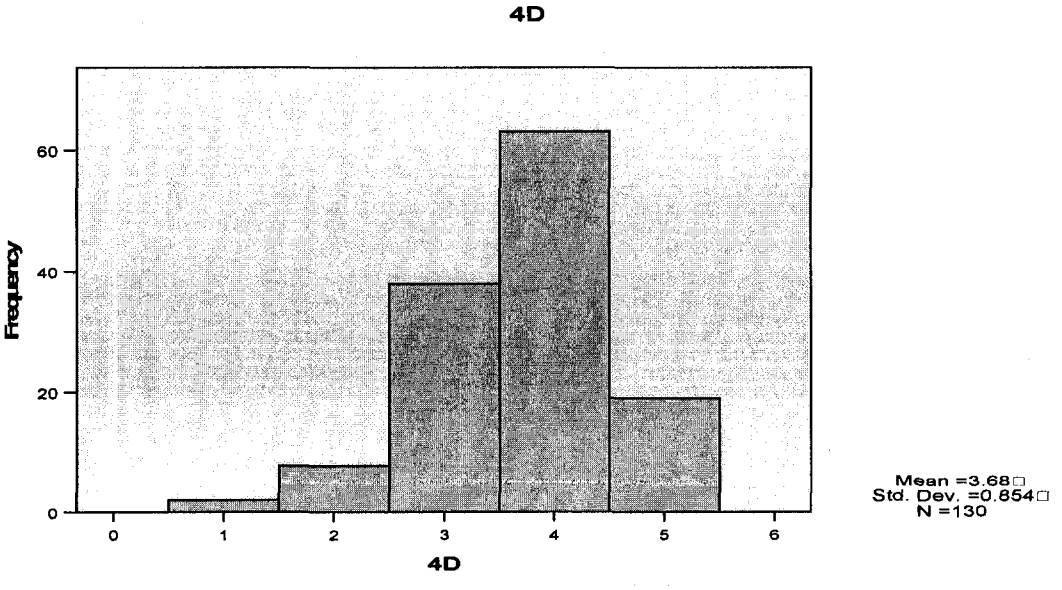
Second question histogram for the objectives variable.



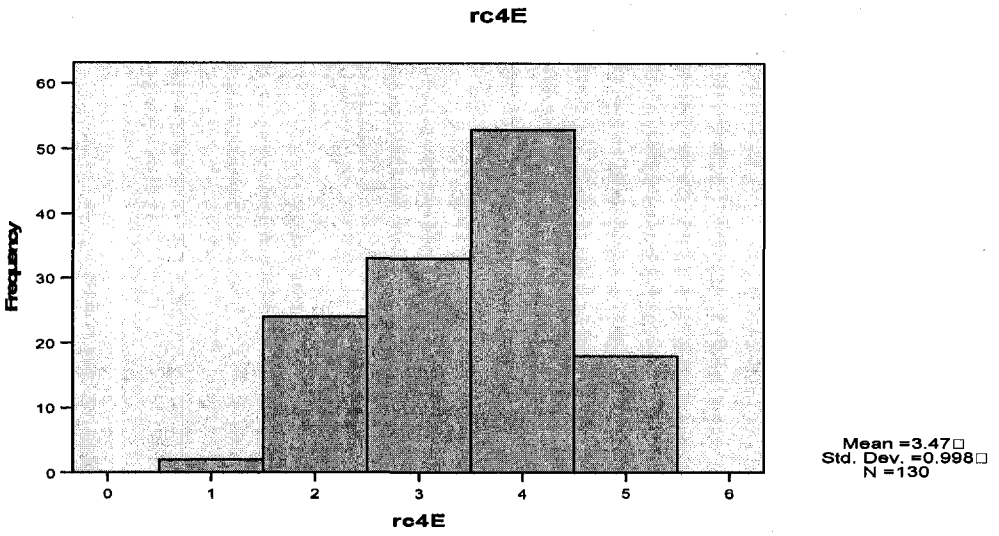
Third question histogram for the objectives variable.



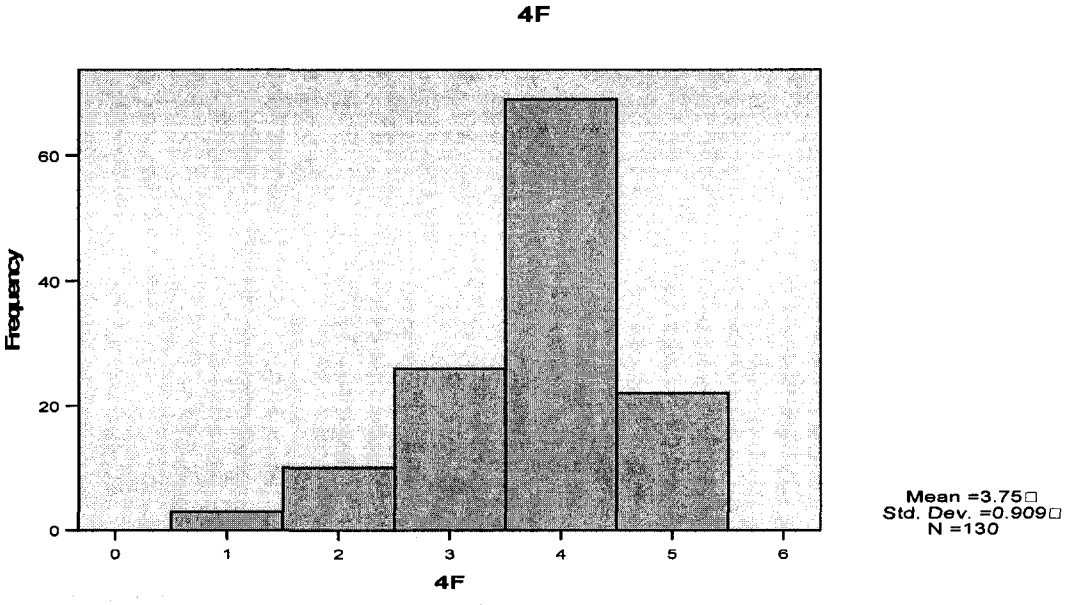
Fourth question histogram for the objectives variable.



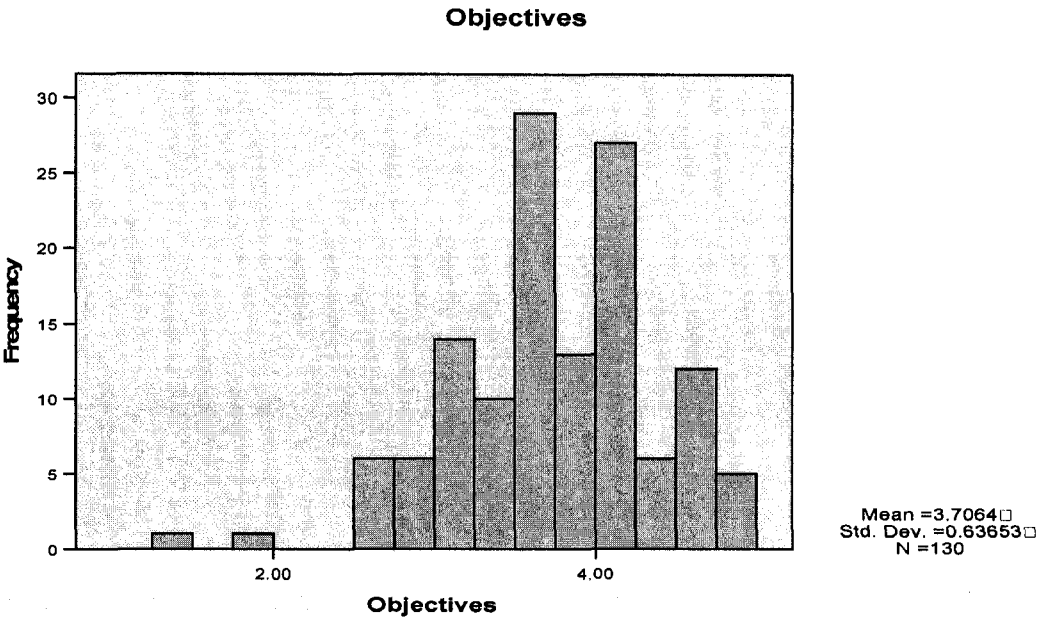
Fifth question histogram for the objectives variable.



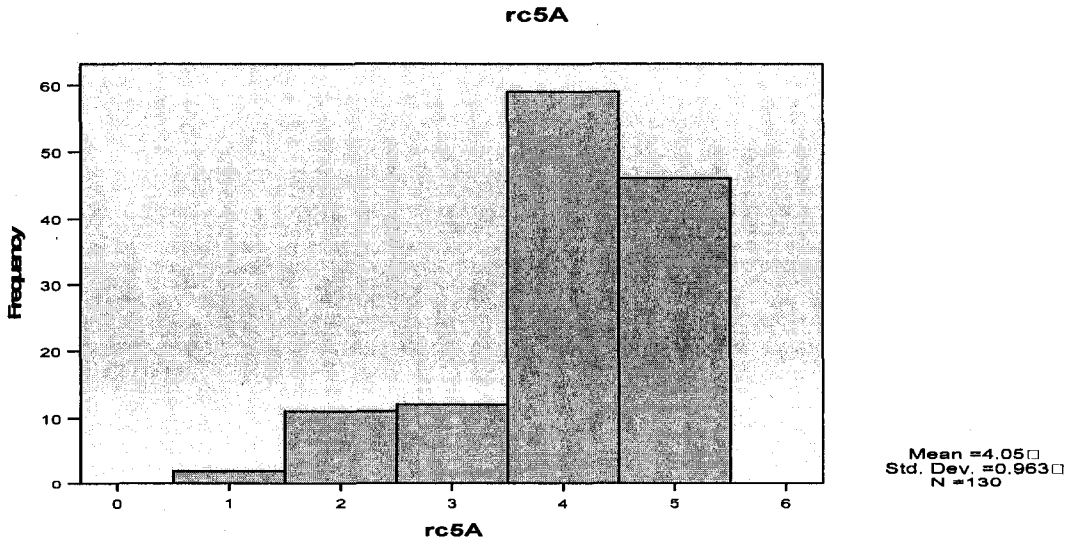
Sixth question histogram for the objectives variable.



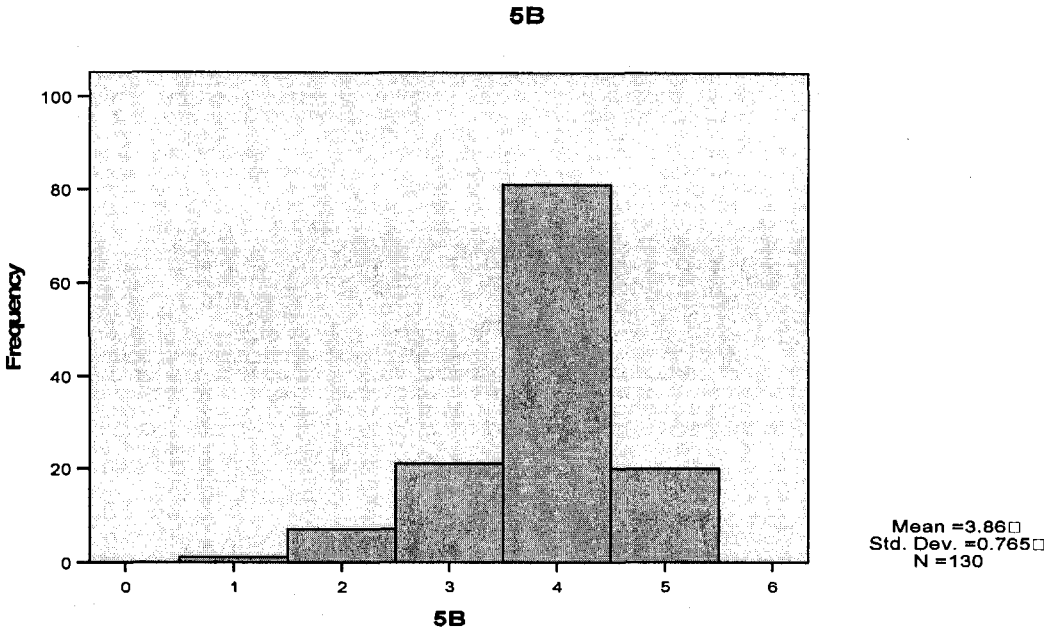
Objectives variable histogram



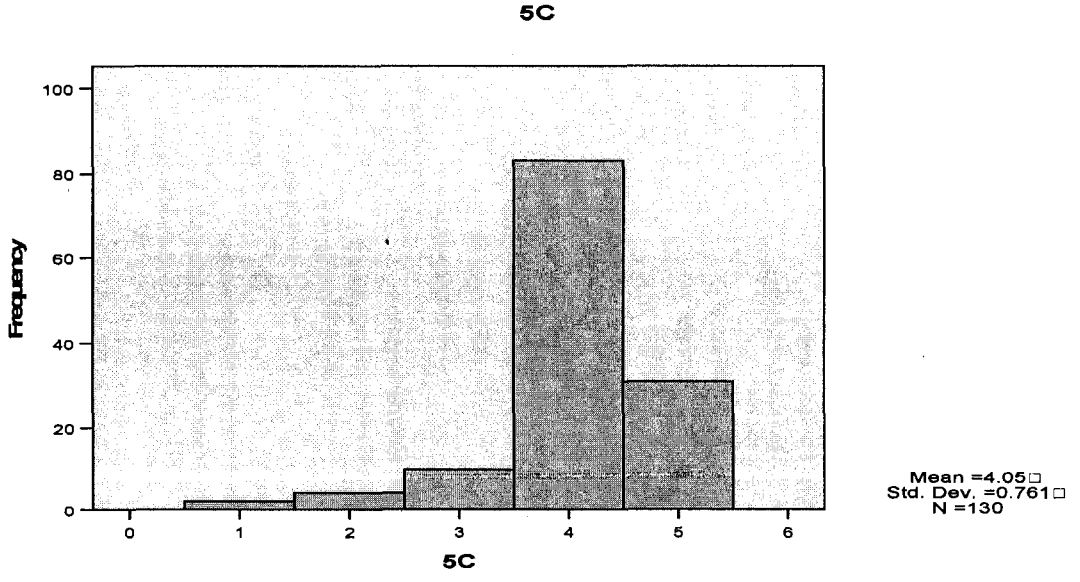
First question histogram for the leadership and planning variable.



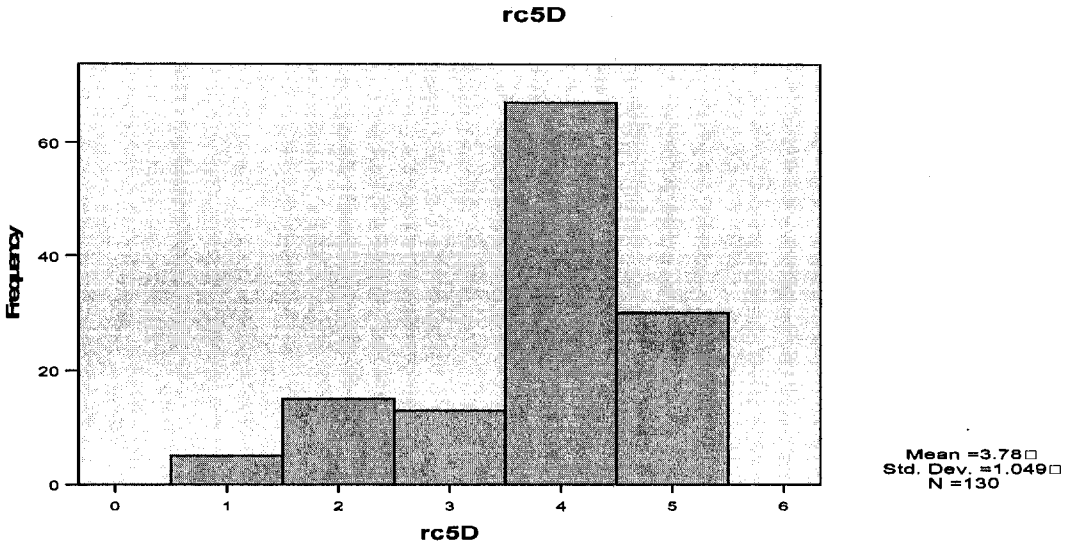
Second question histogram for the leadership and planning variable.



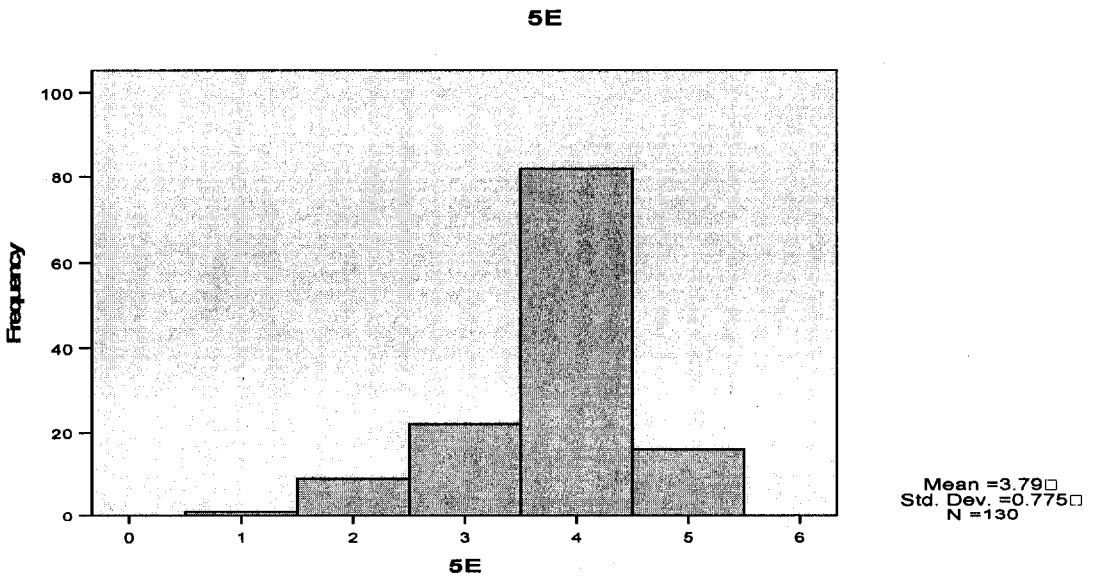
Third question histogram for the leadership and planning variable.



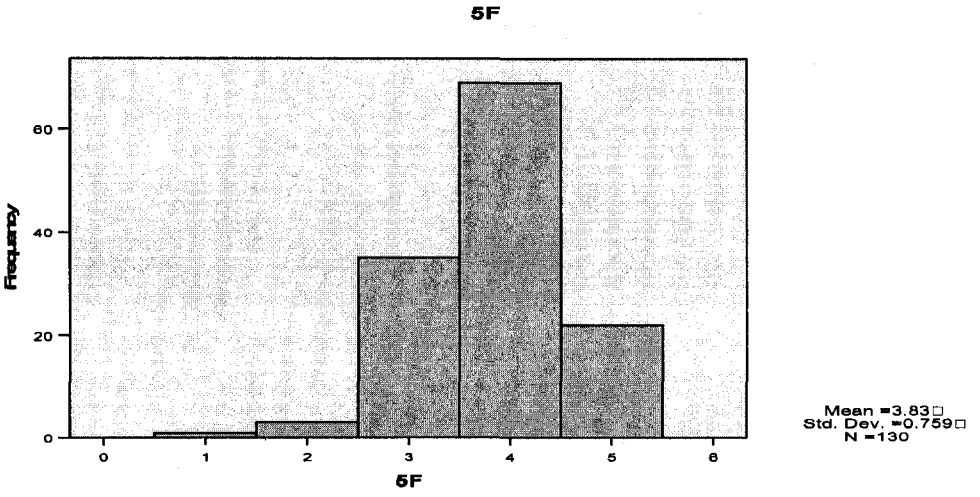
Fourth question histogram for the leadership and planning variable.



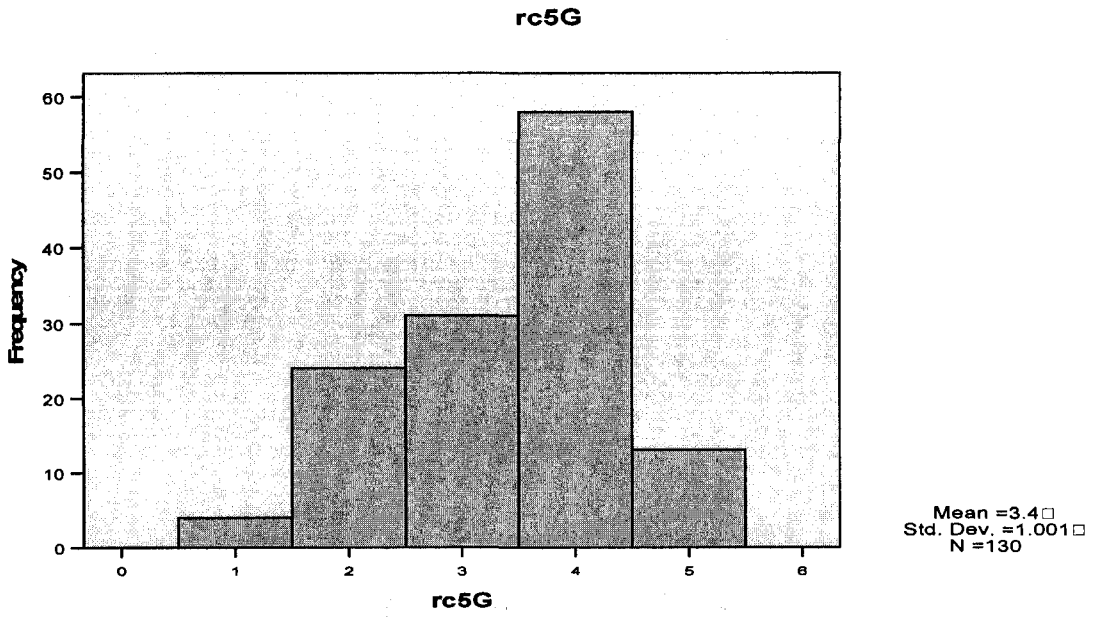
Fifth question histogram for the leadership and planning variable.



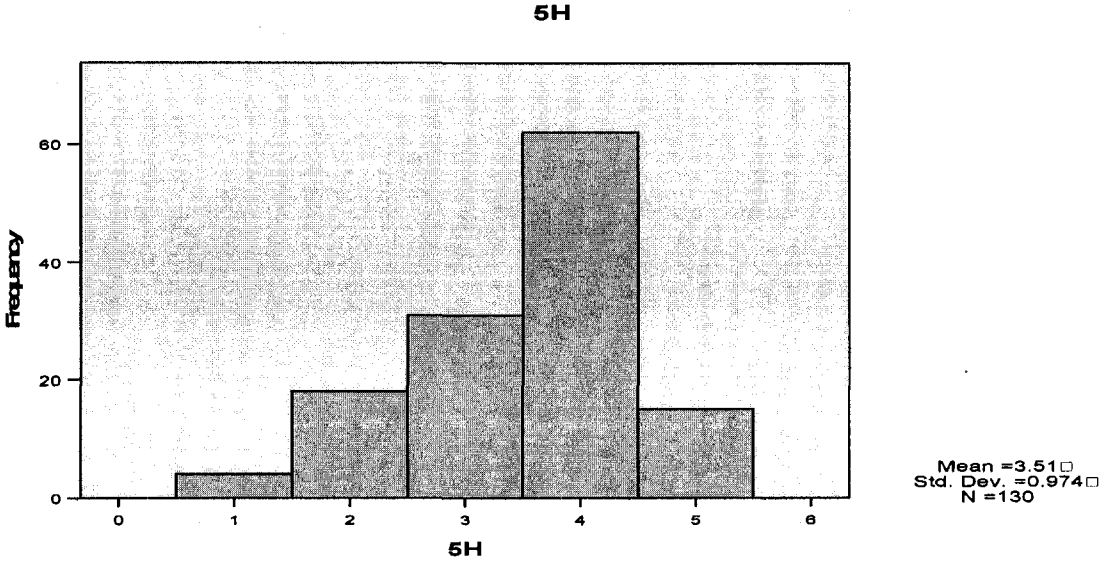
Sixth question histogram for the leadership and planning variable.



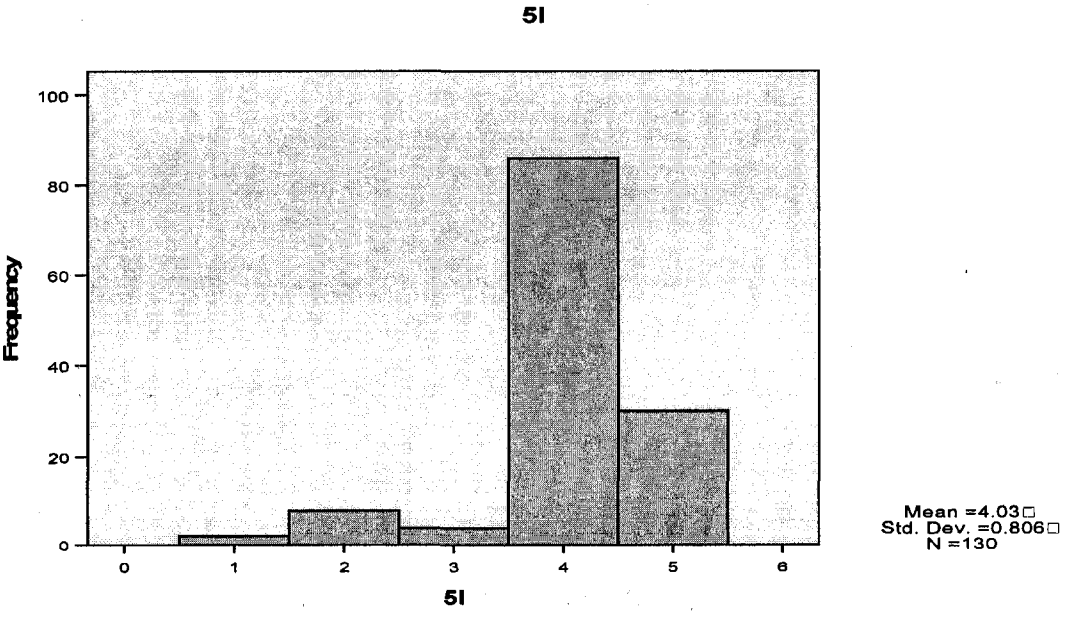
Seventh question histogram for the leadership and planning variable.



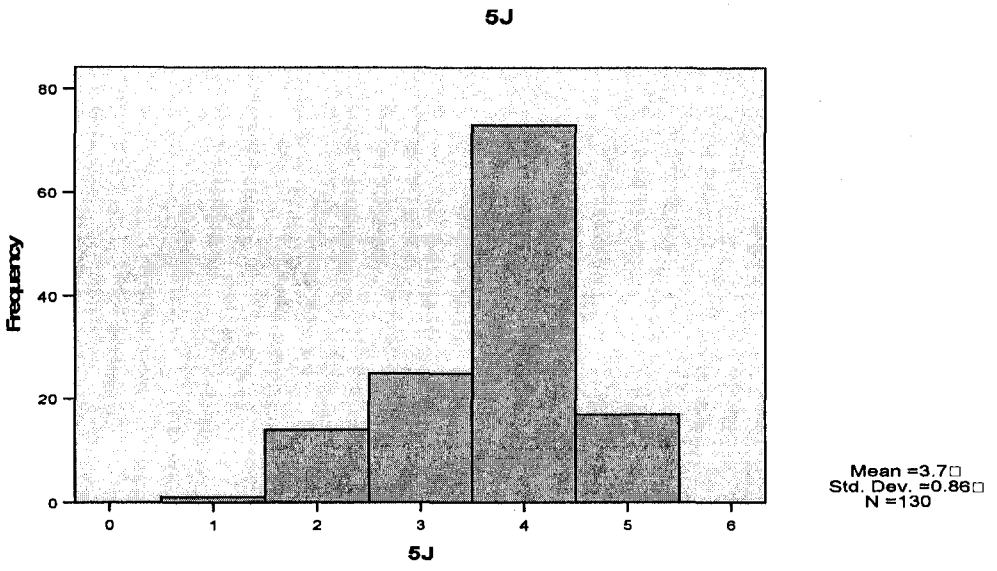
Eighth question histogram for the leadership and planning variable.



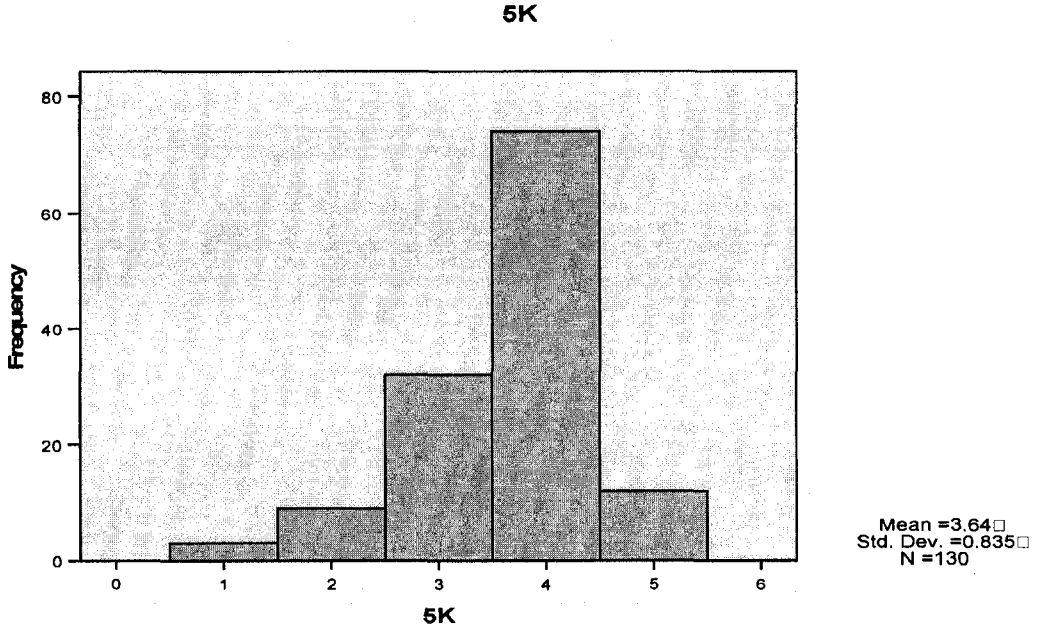
Ninth question histogram for the leadership and planning variable.



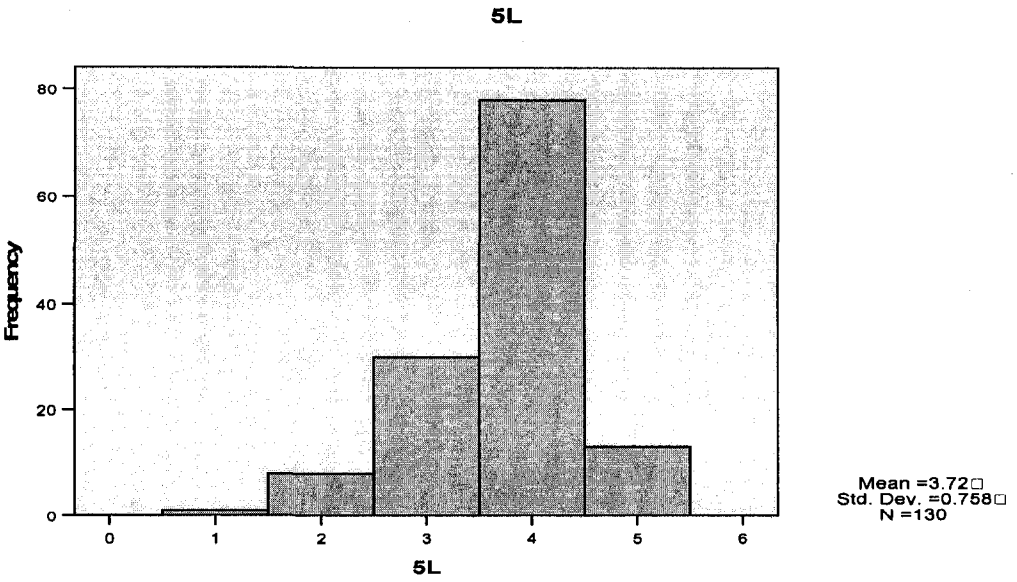
Tenth question histogram for the leadership and planning variable.



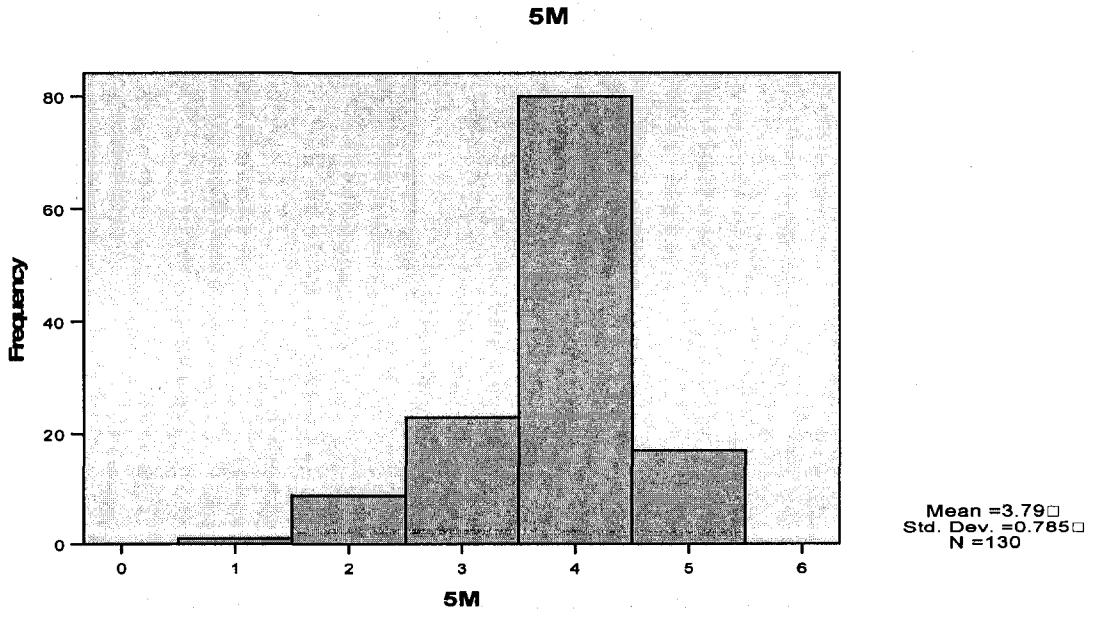
Eleventh question histogram for the leadership and planning variable.



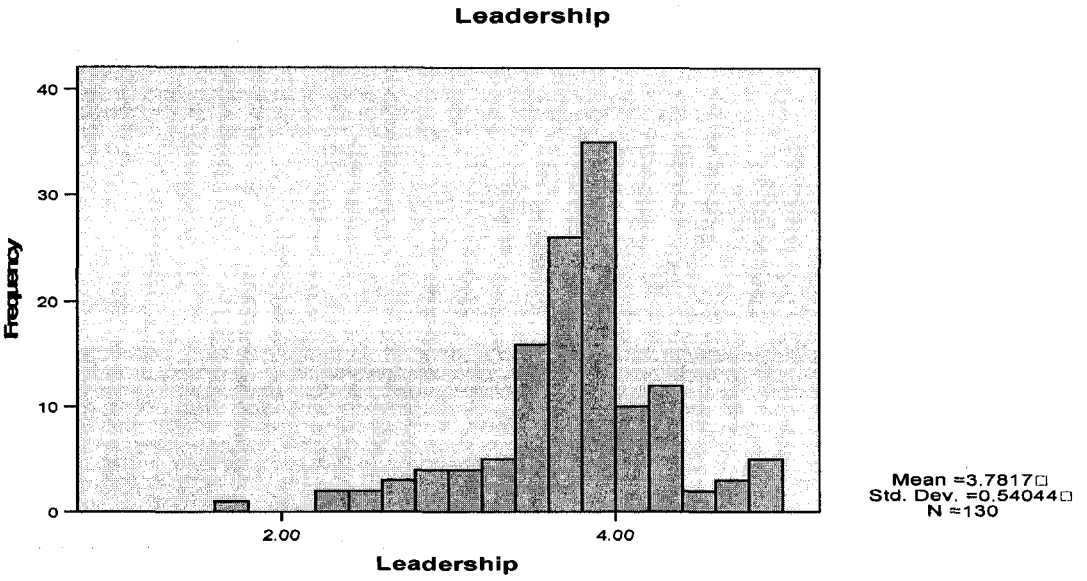
Twelfth question histogram for the leadership and planning variable.



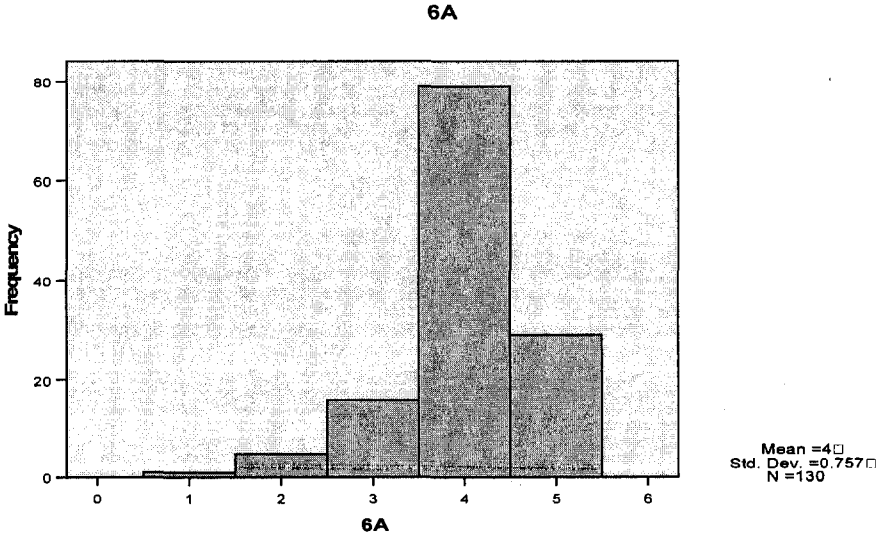
Thirteenth question histogram for the leadership and planning variable.



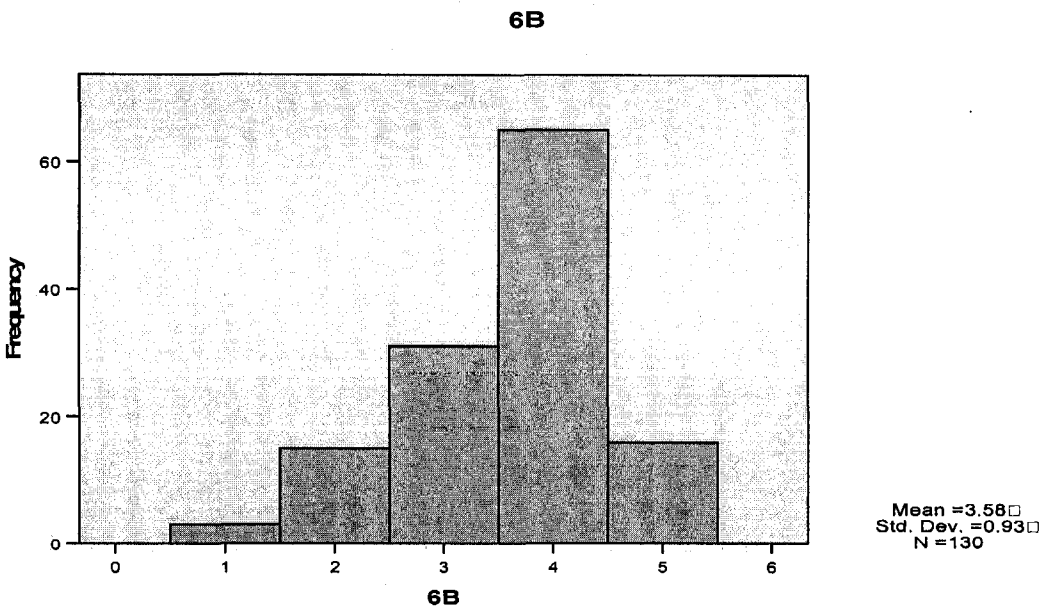
Leadership and planning variable histogram.



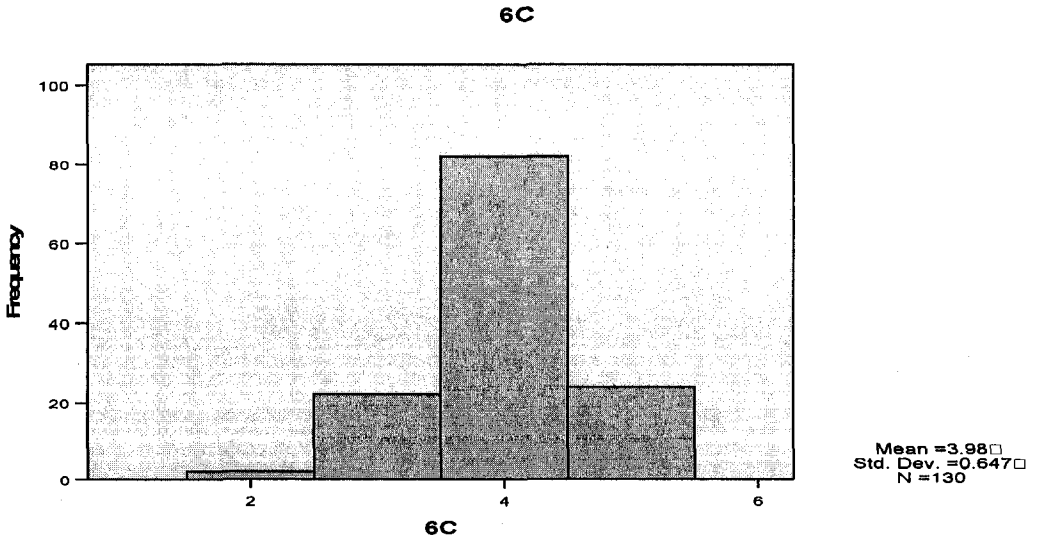
First question histogram for the resource allocation variable.



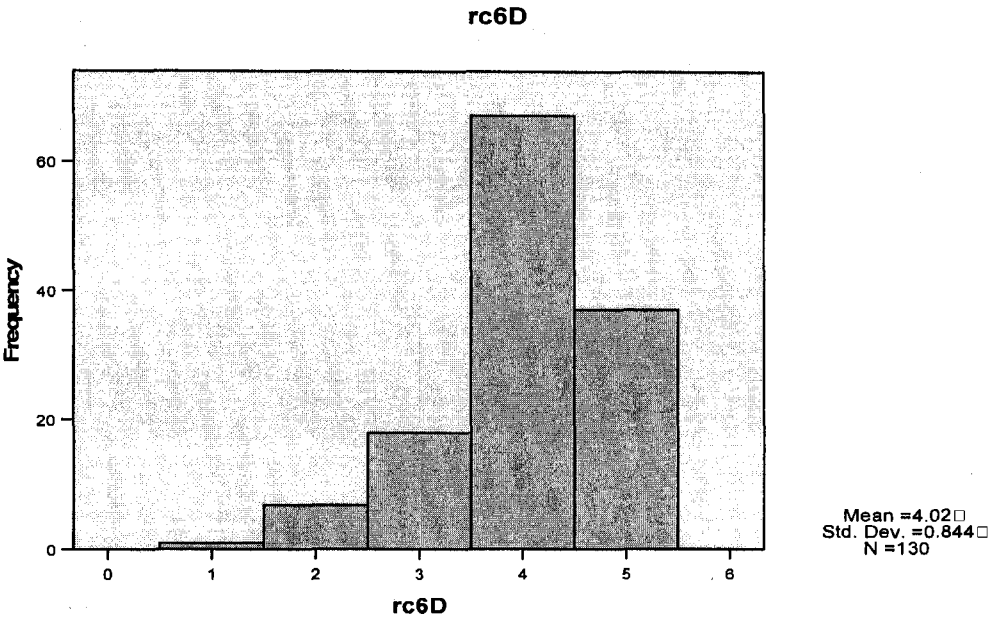
Second question histogram for the resource allocation variable.



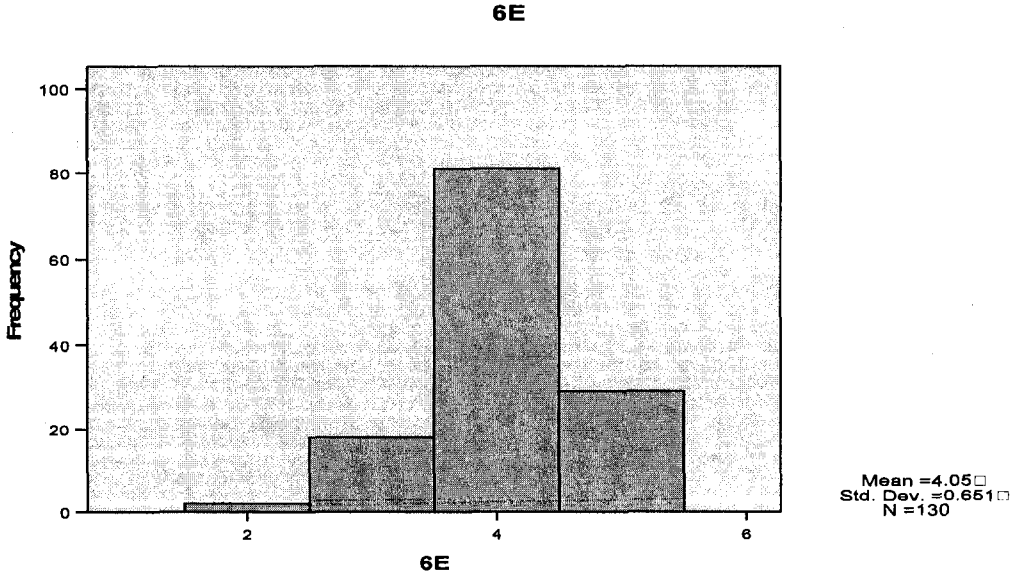
Third question histogram for the resource allocation variable.



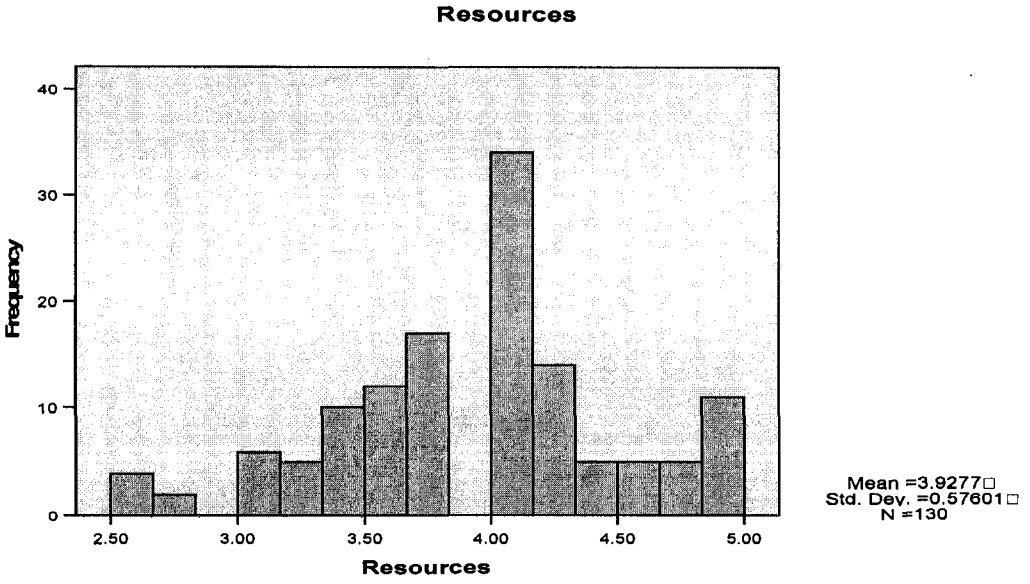
Fourth question histogram for the resource allocation variable.



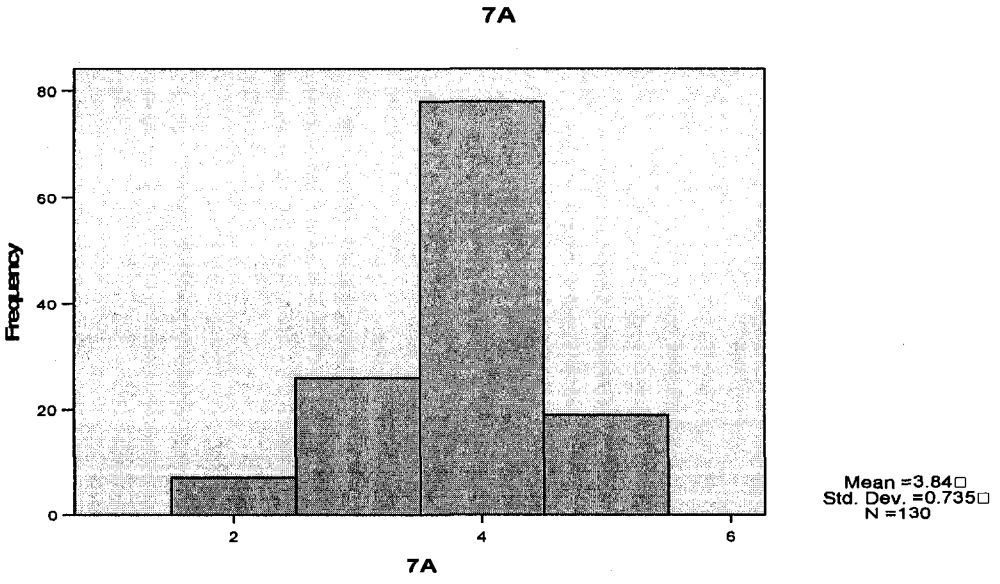
Fifth question histogram for the resource allocation variable.



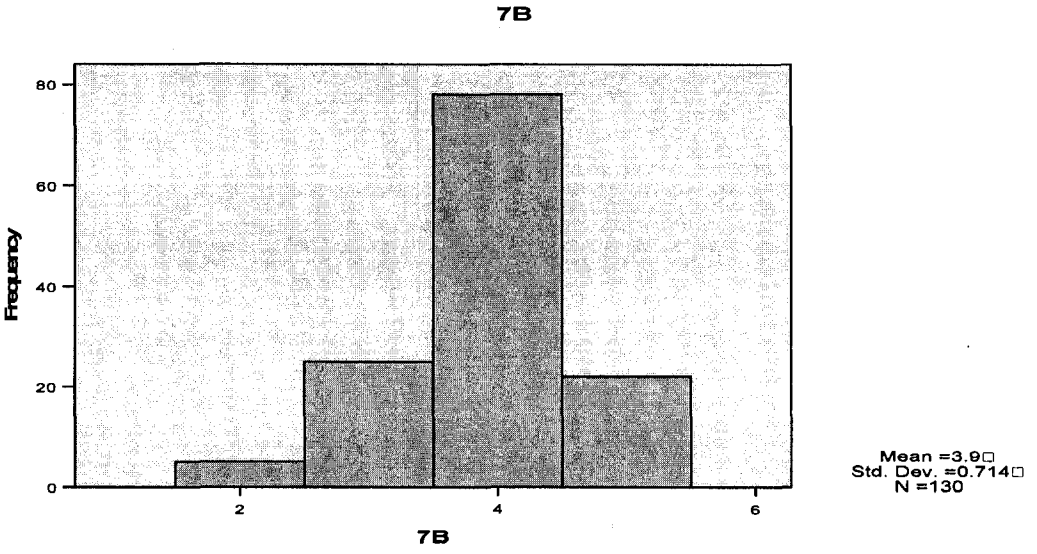
Resource allocation variable histogram.



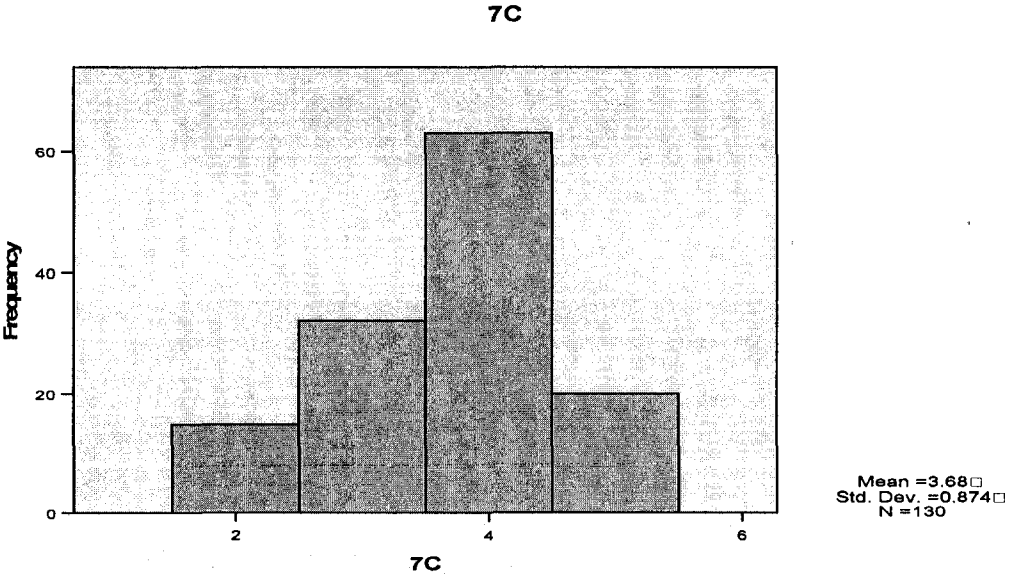
First question histogram for the competence variable.



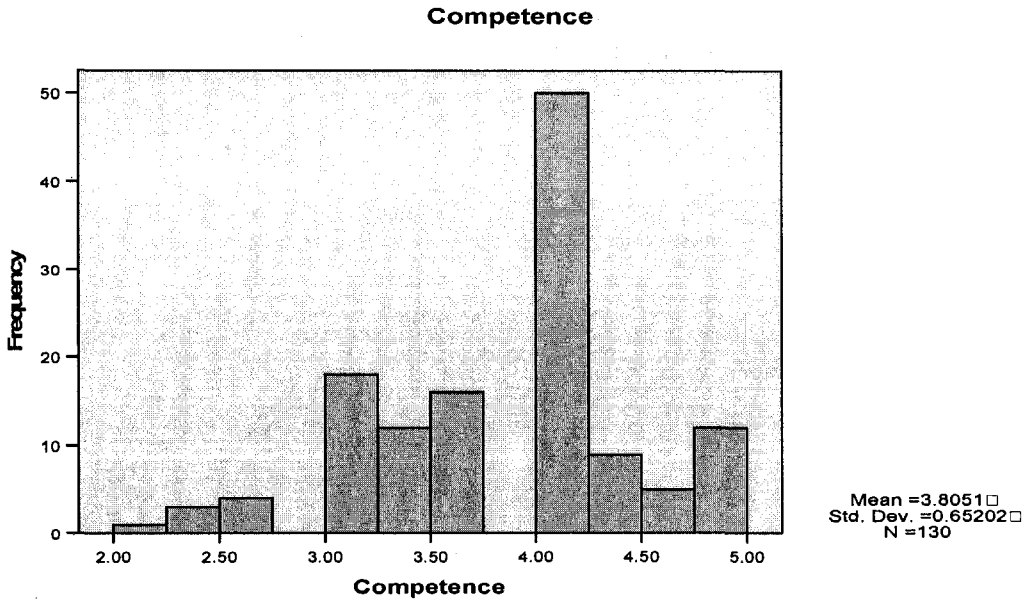
Second question histogram for the competence variable.



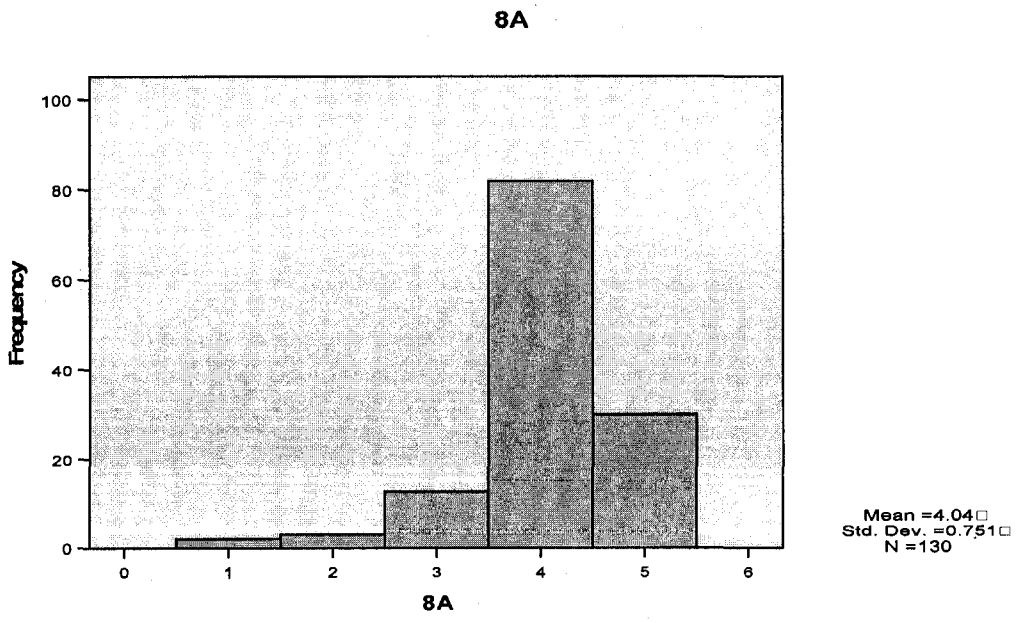
Third question histogram for the competence variable.



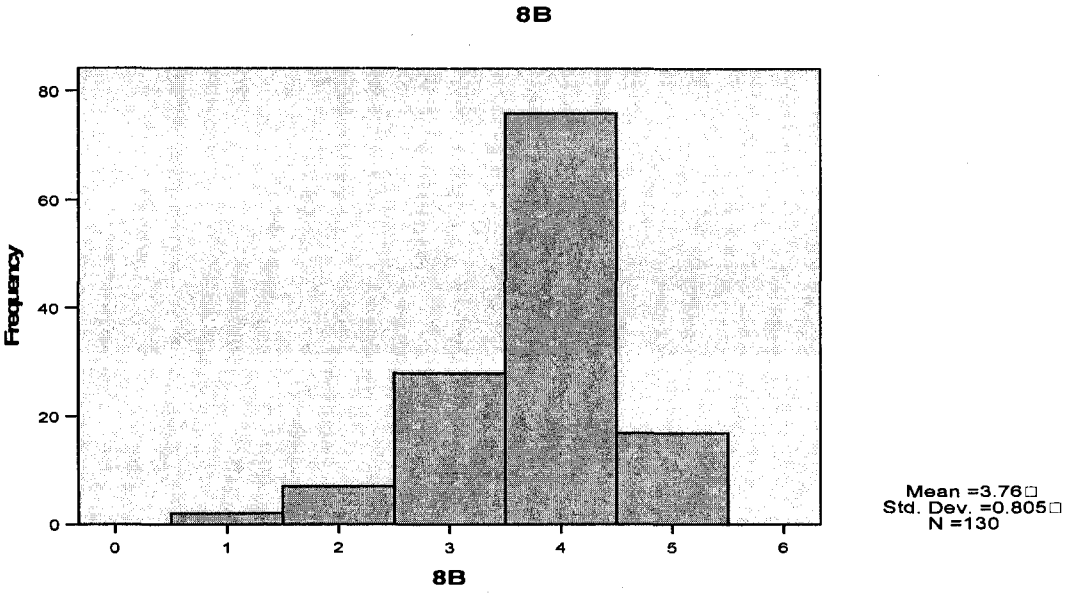
Competence variable histogram.



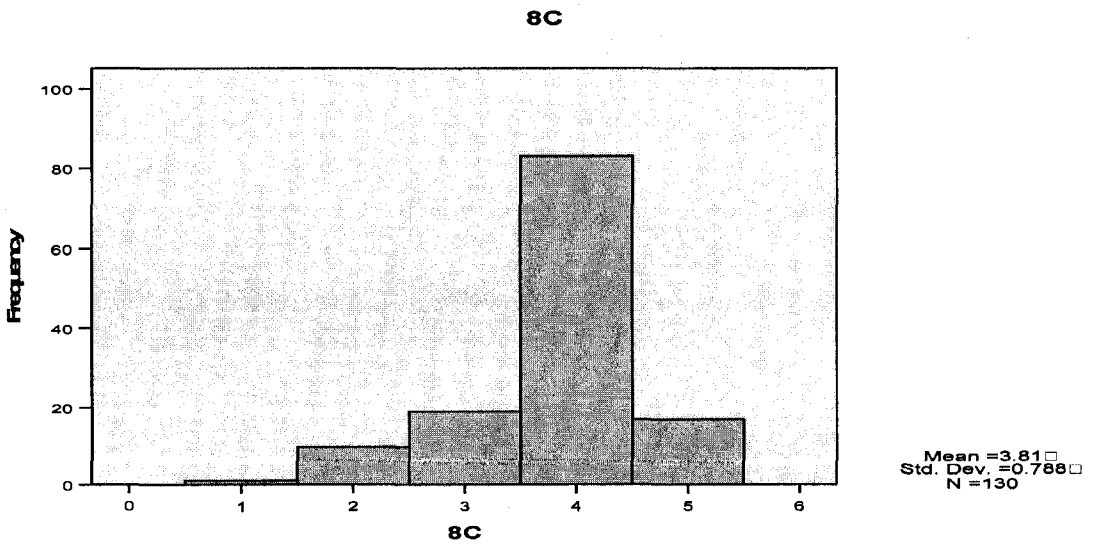
First question histogram for the feedback and controls variable.



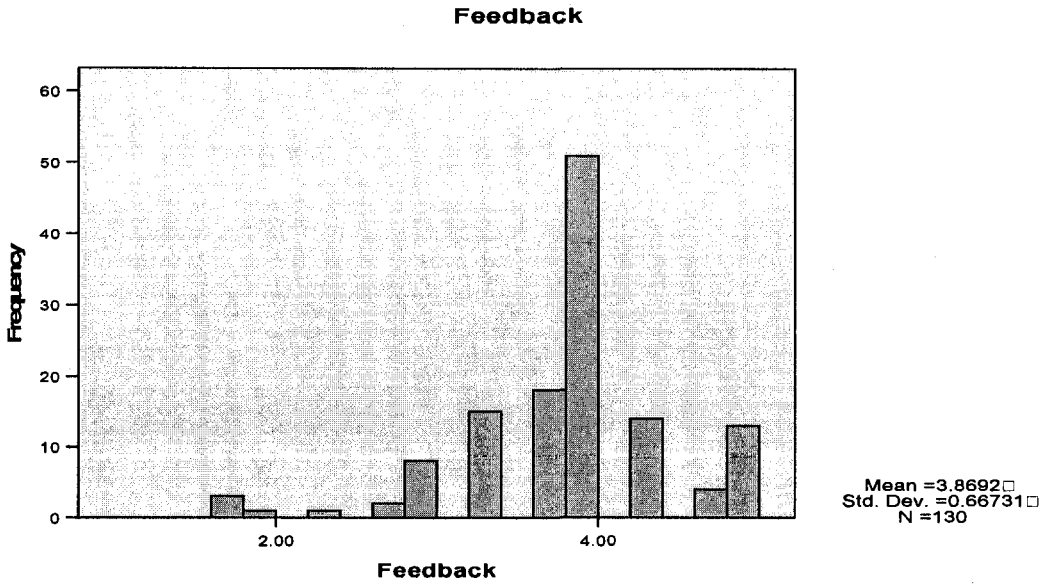
Second question histogram for the feedback and controls variable.



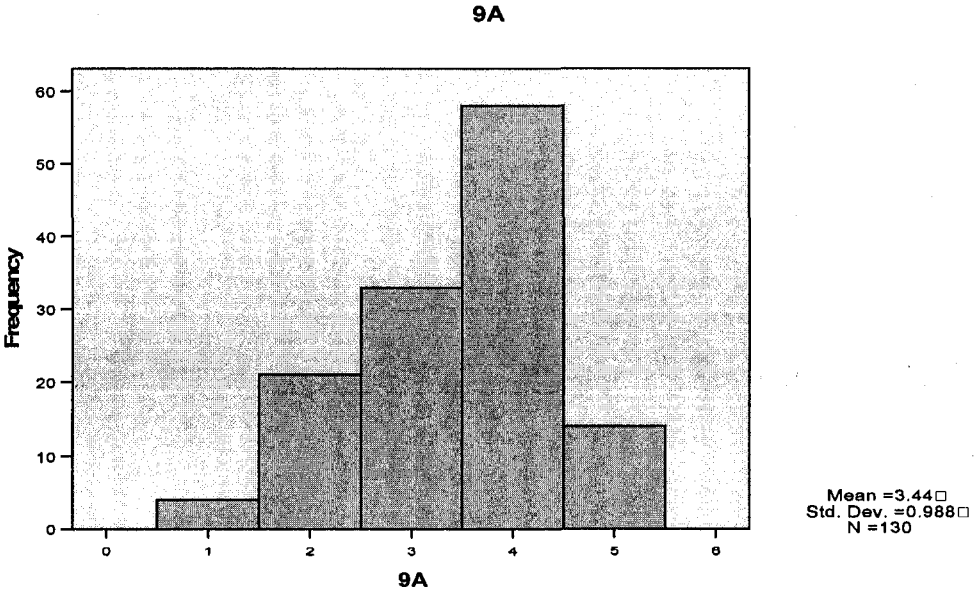
Third question histogram for the feedback and controls variable.



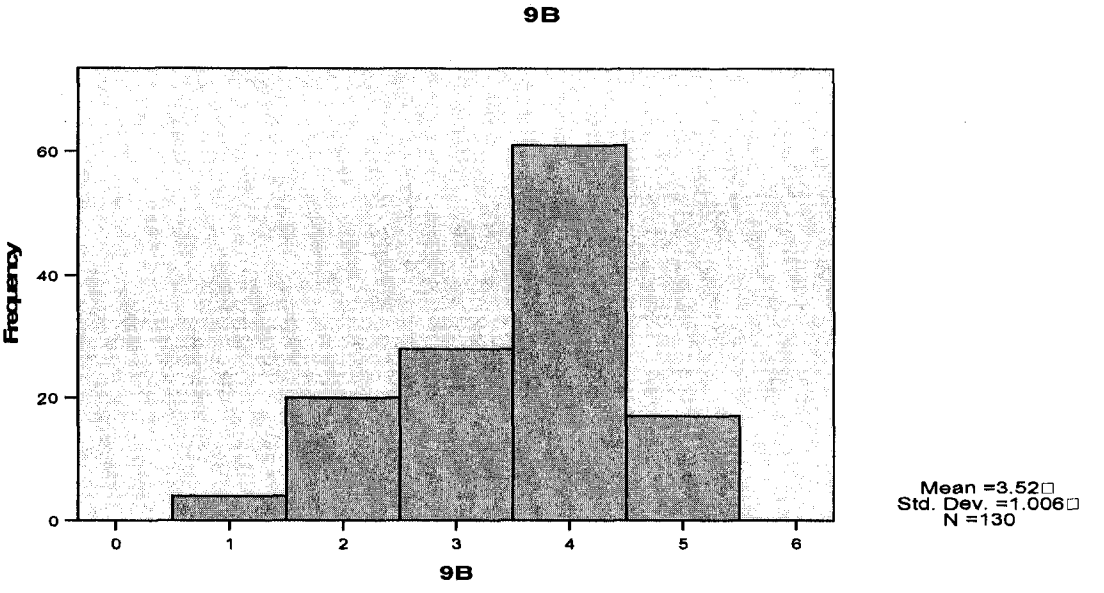
Feedback and controls variable histogram.



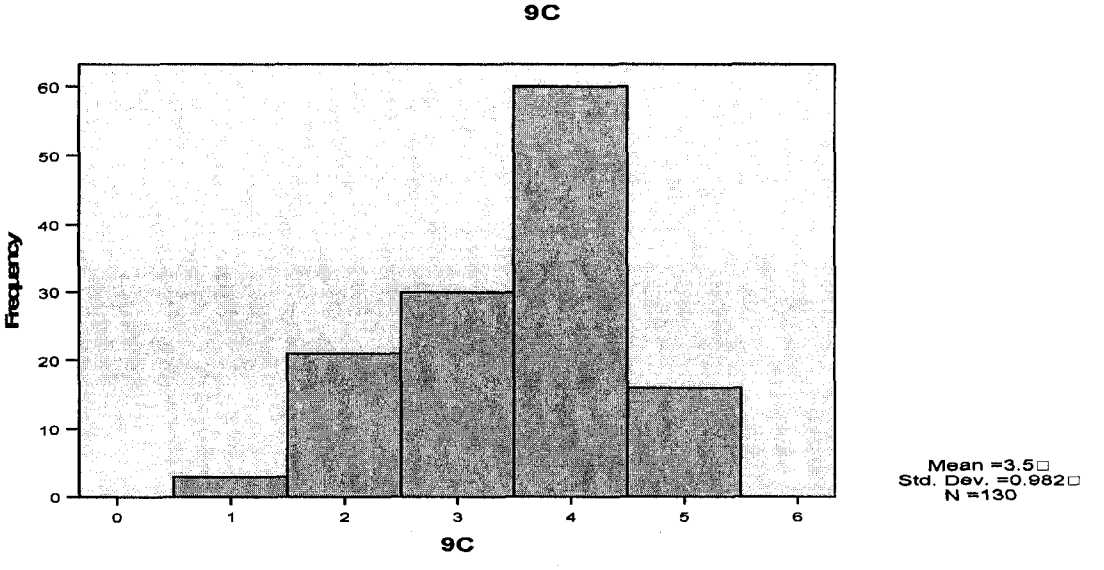
First question histogram for the rewards variable.



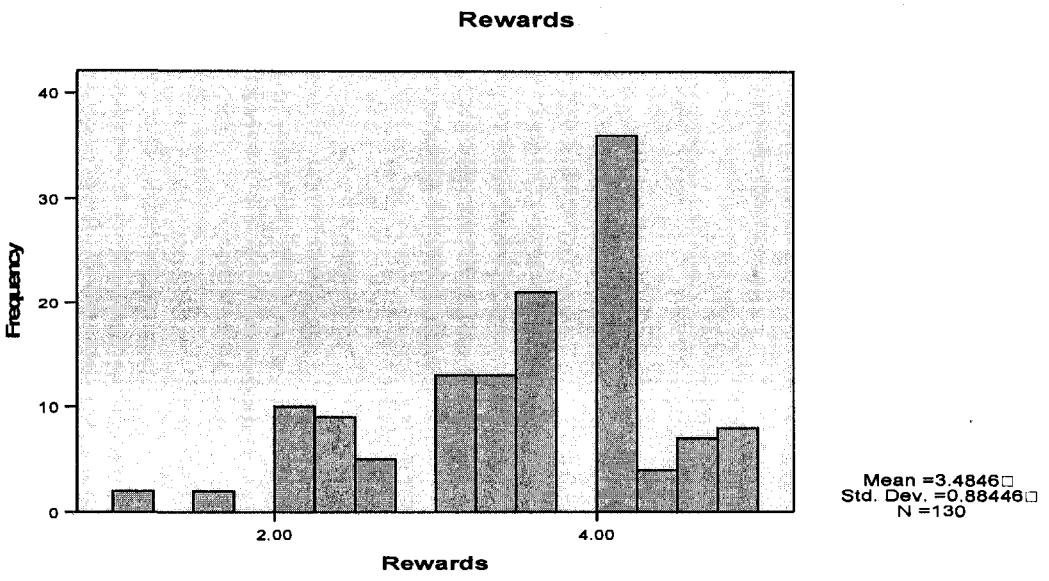
Second question histogram for the rewards variable.



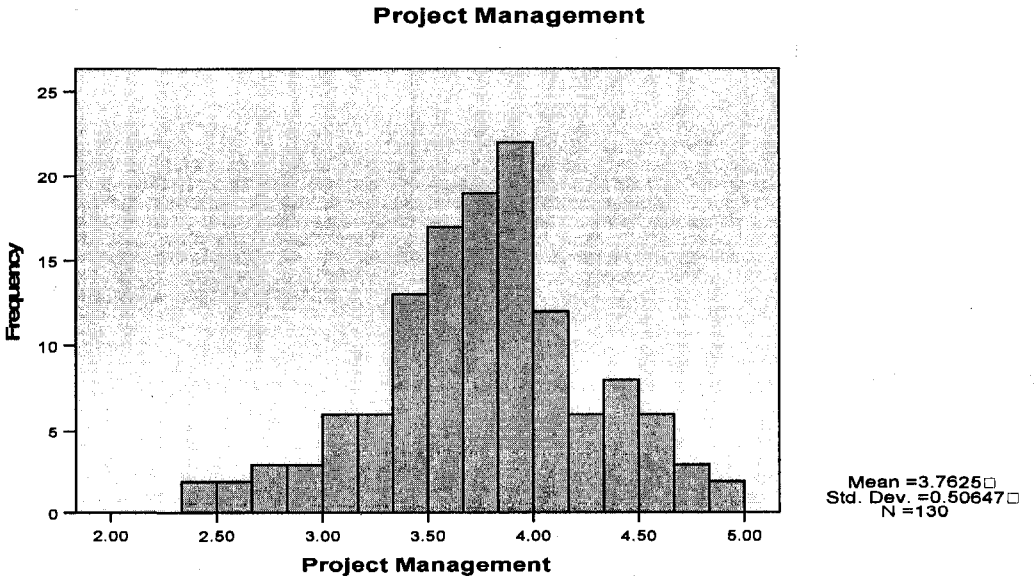
Third question histogram for the rewards variable.



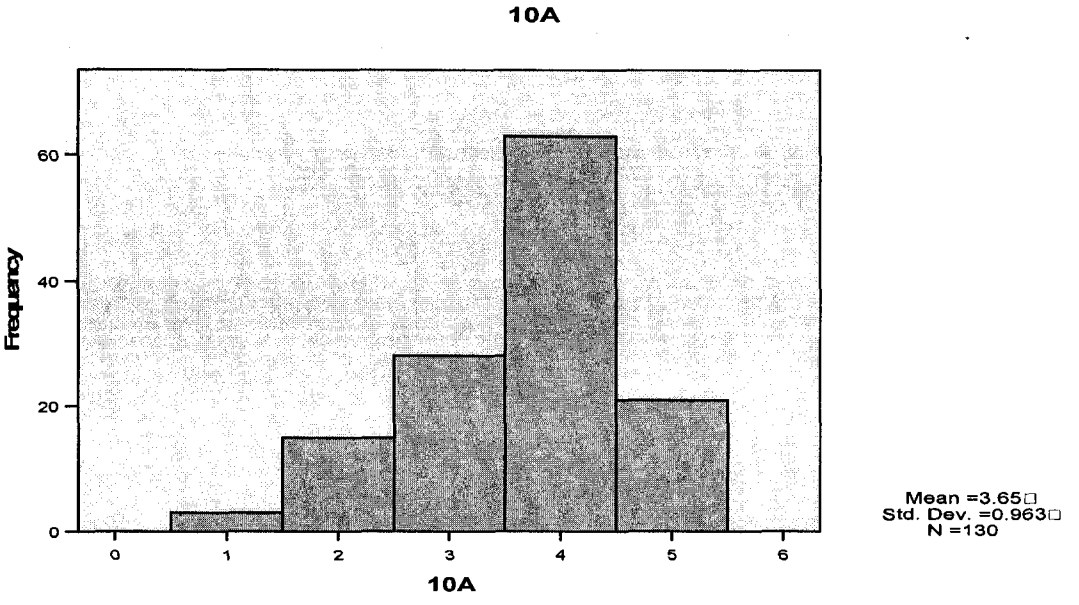
Rewards variable histogram.



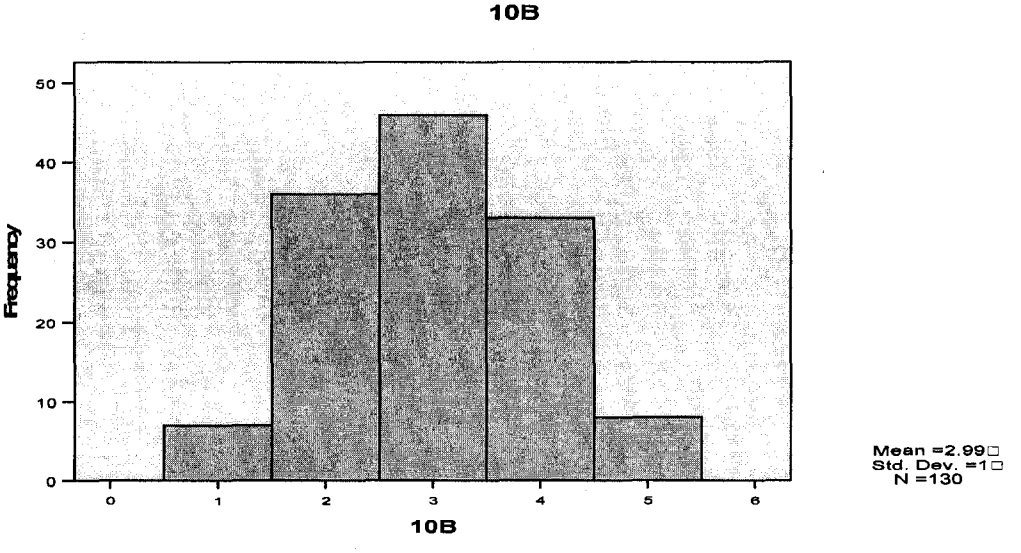
Project management variable histogram.



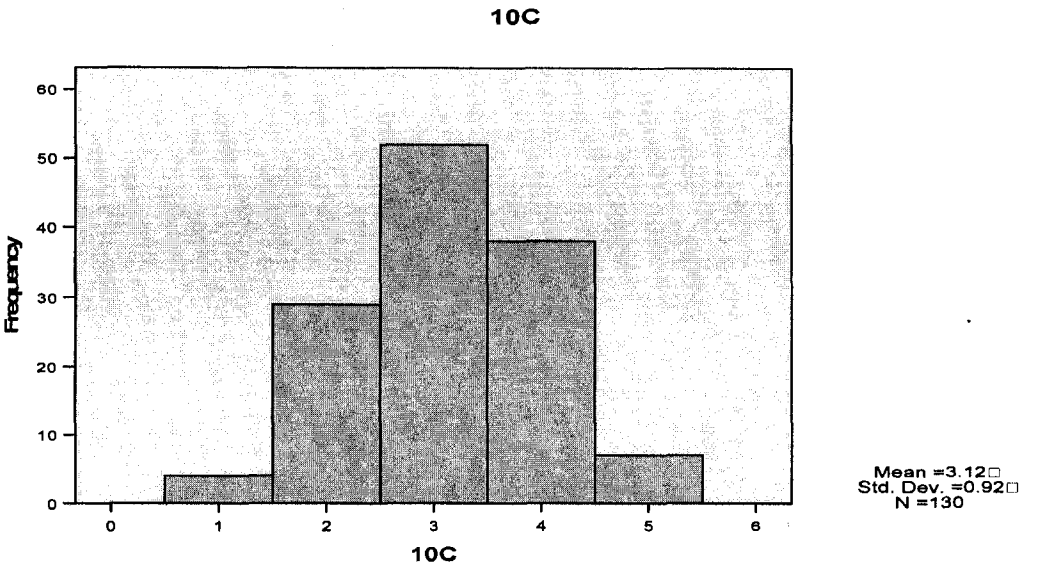
First question histogram for the repository variable.



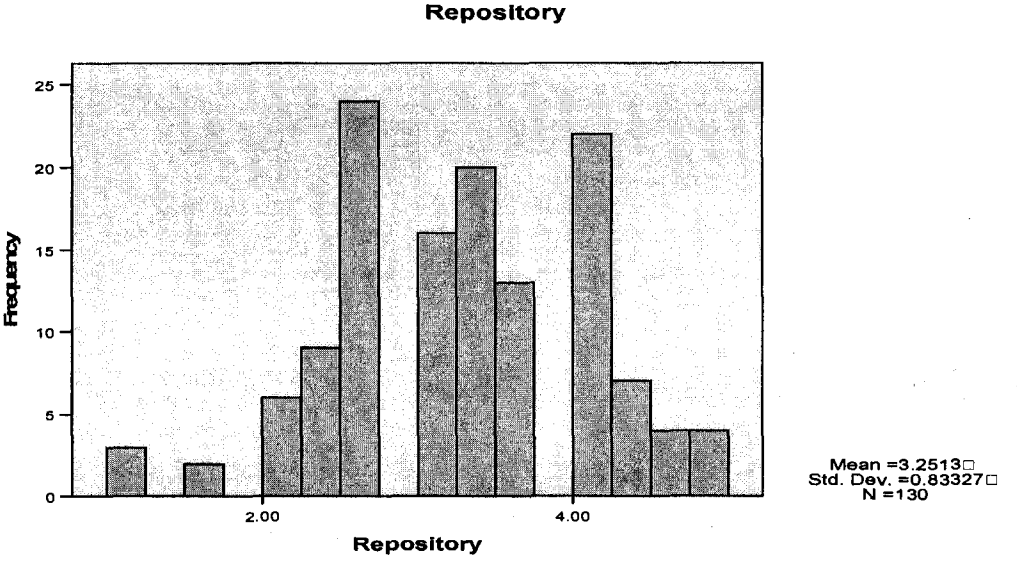
Second question histogram for the repository variable.



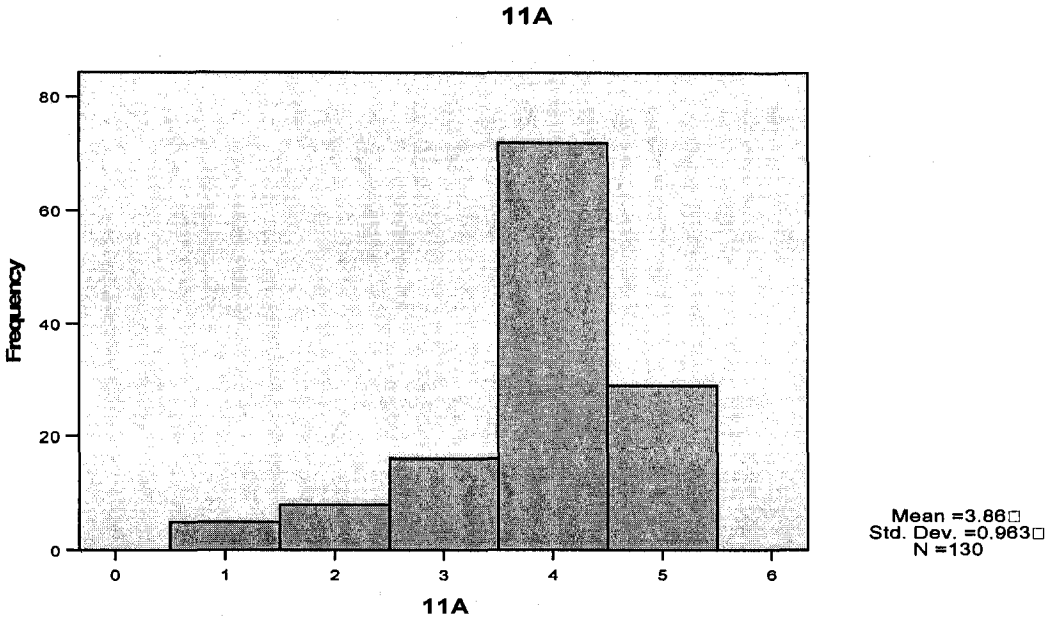
Third question histogram for the repository variable.



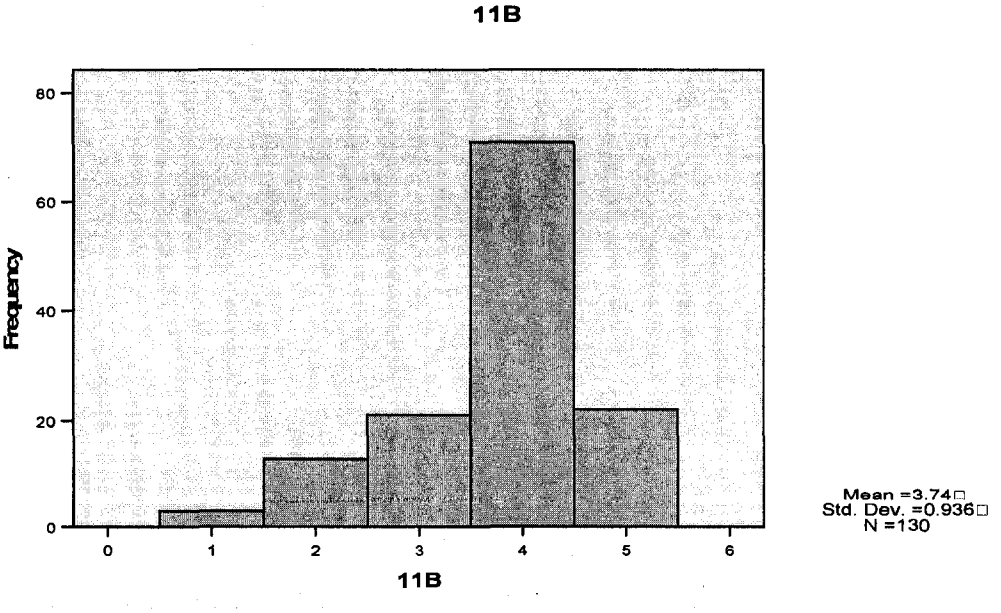
Repository variable histogram.



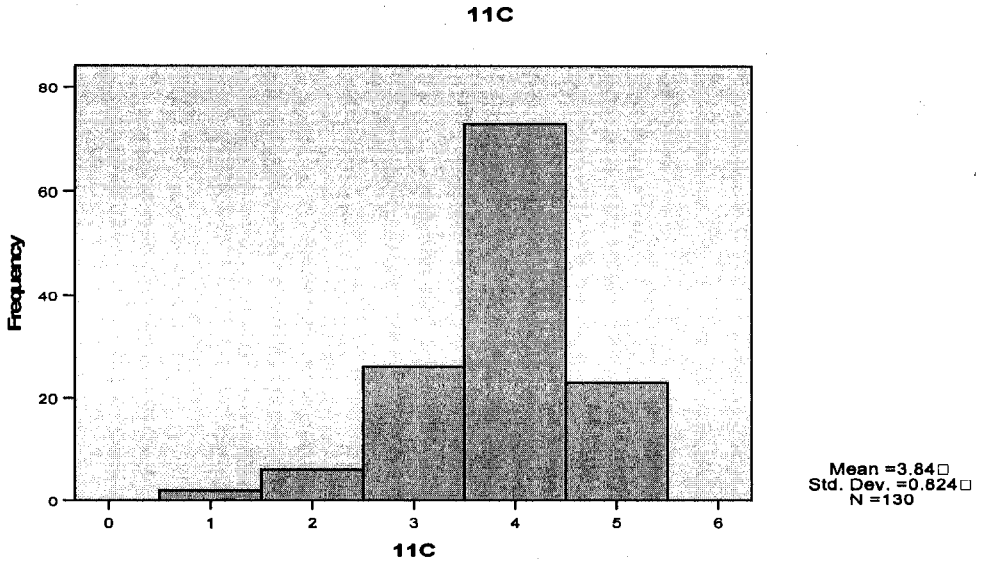
First question histogram for the business processes variable.



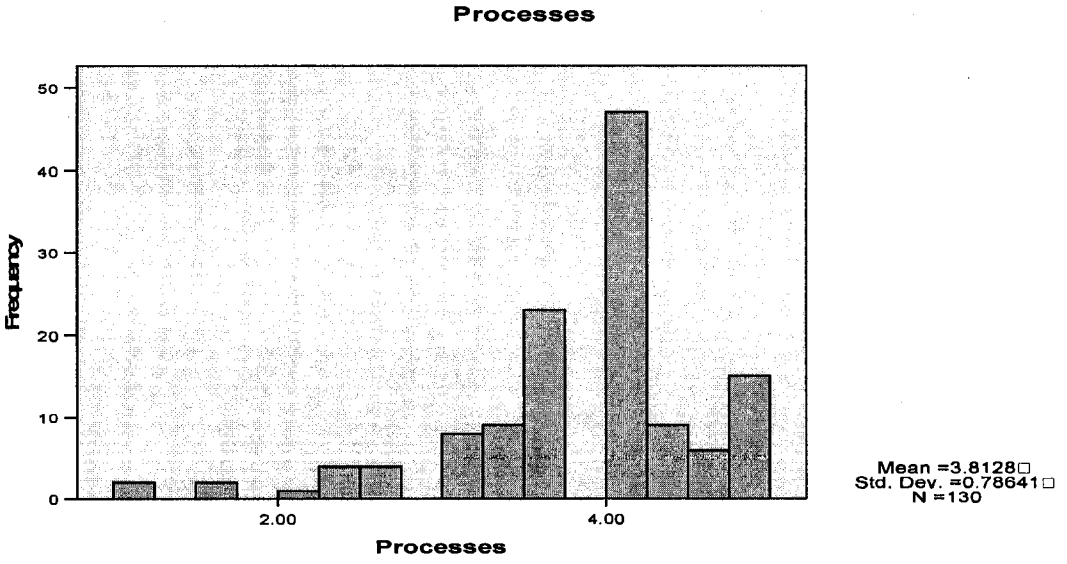
Second question histogram for the business processes variable.



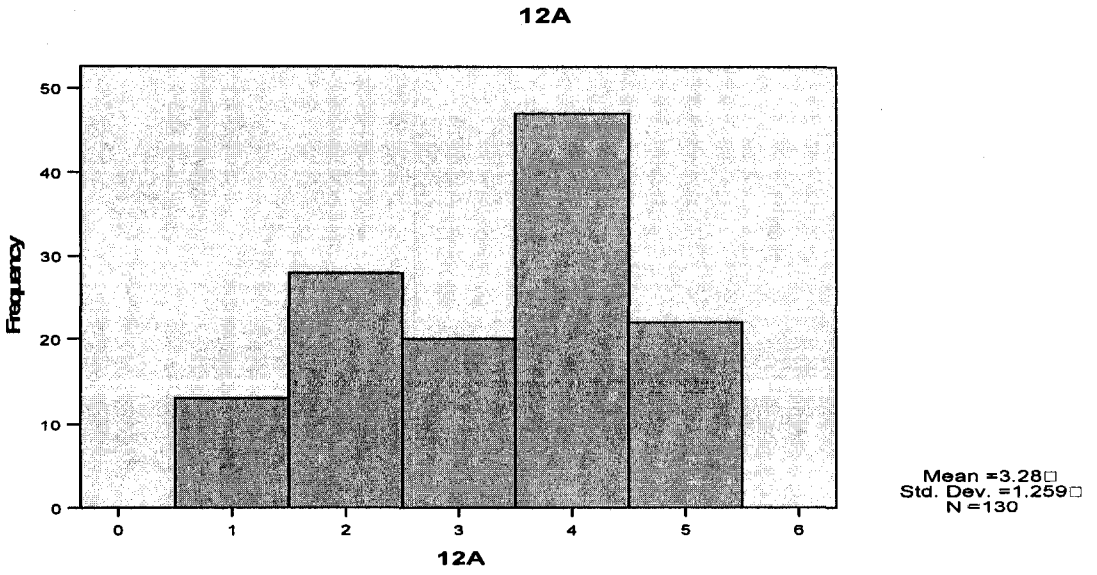
Third question histogram for the business processes variable.



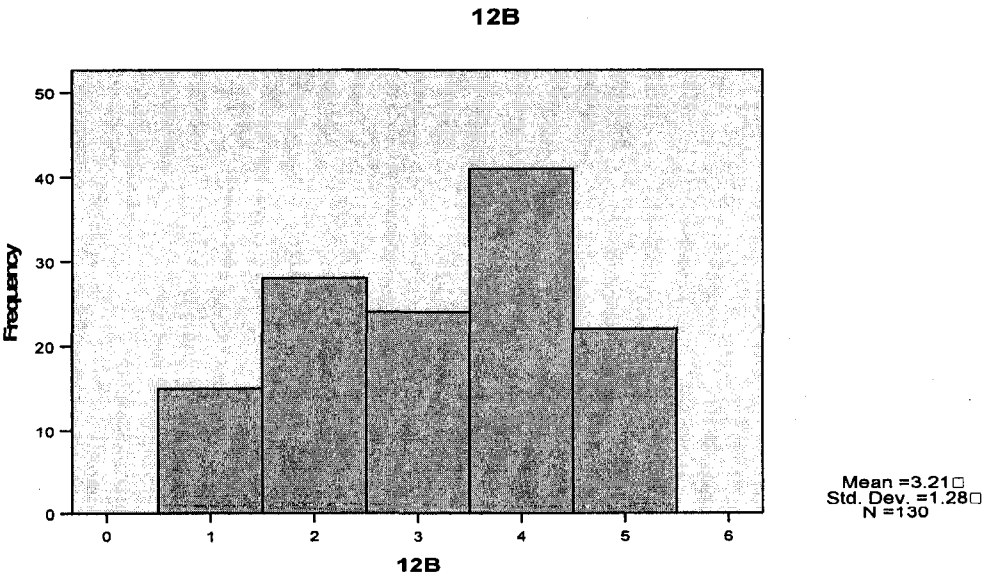
Business processes variable histogram.



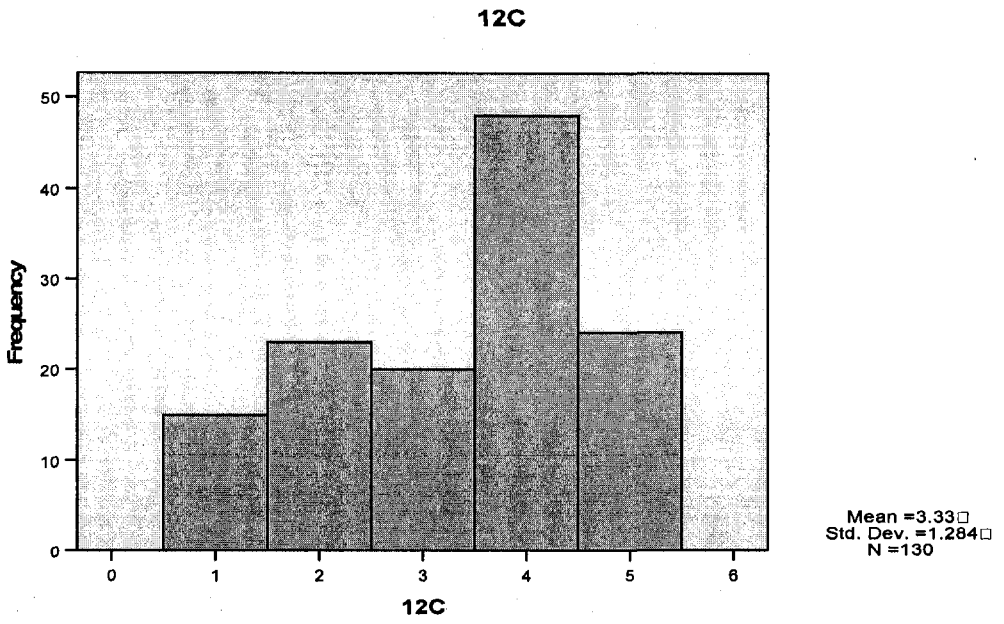
First question histogram for the enterprise resource planning variable.



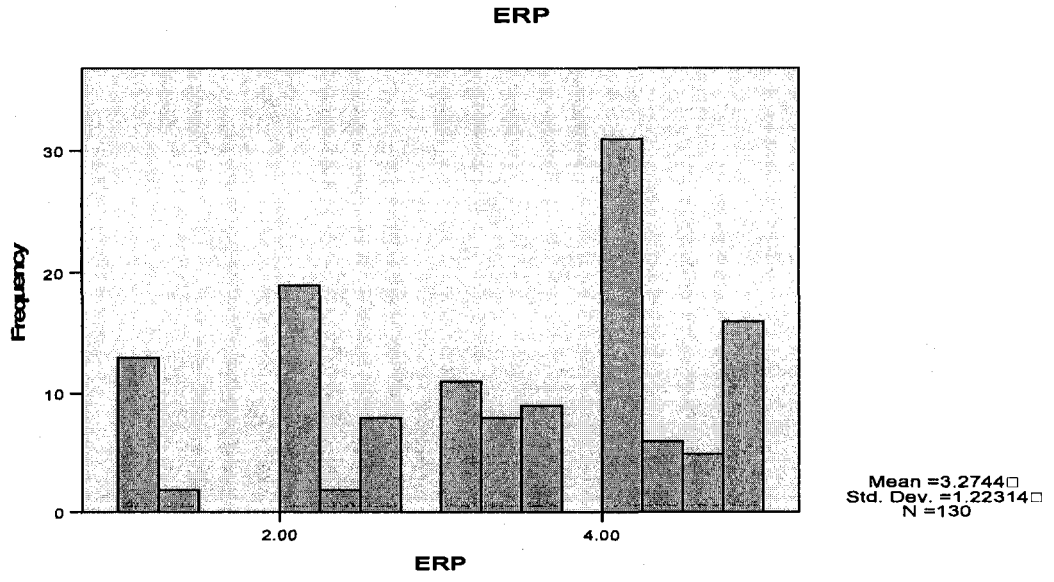
Second question histogram for the enterprise resource planning variable.



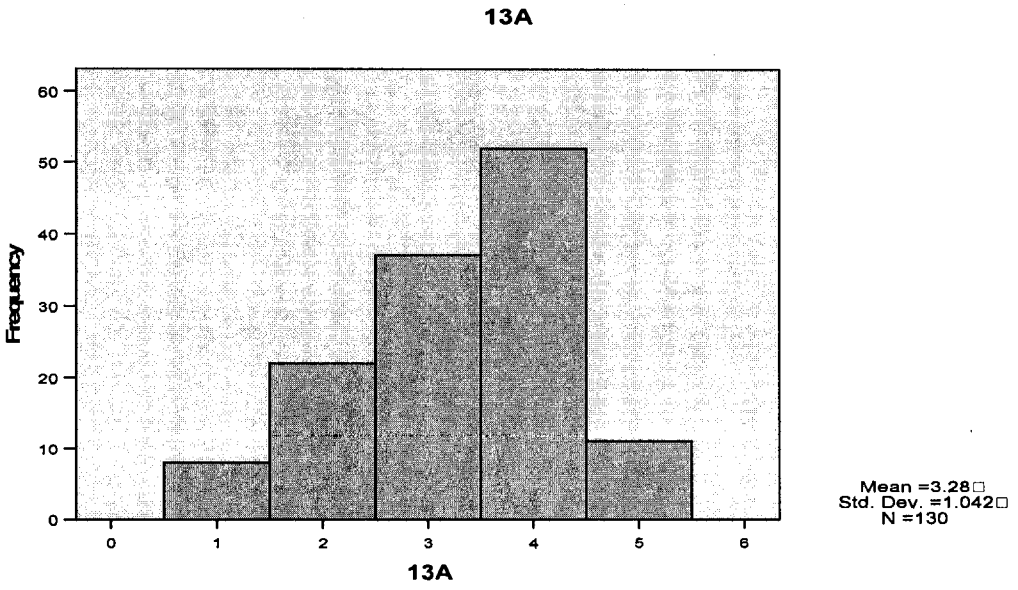
Third question histogram for the enterprise resource planning variable.



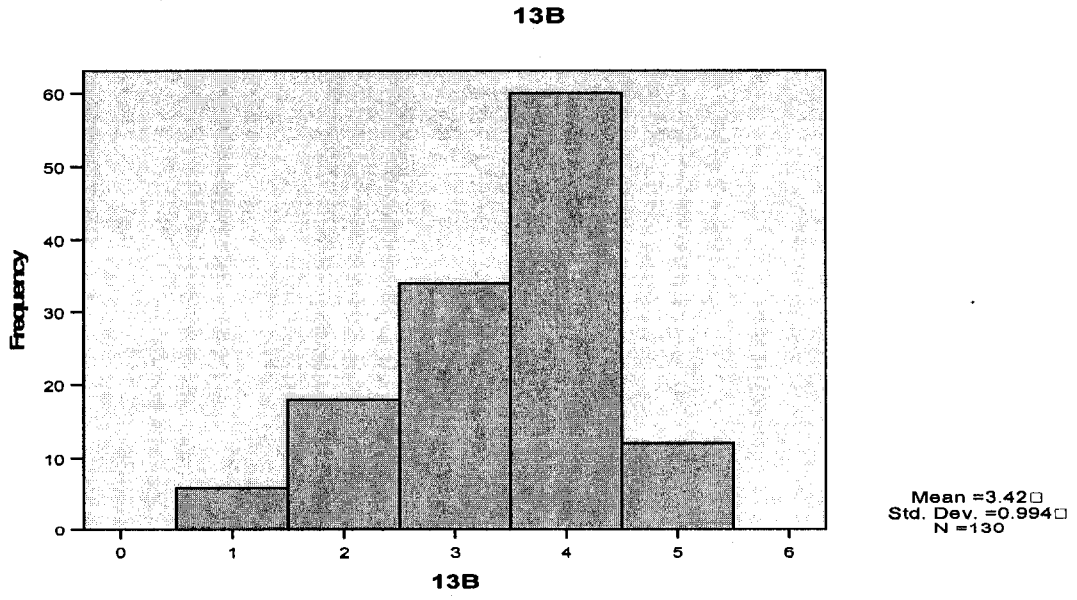
Enterprise resource planning variable histogram.



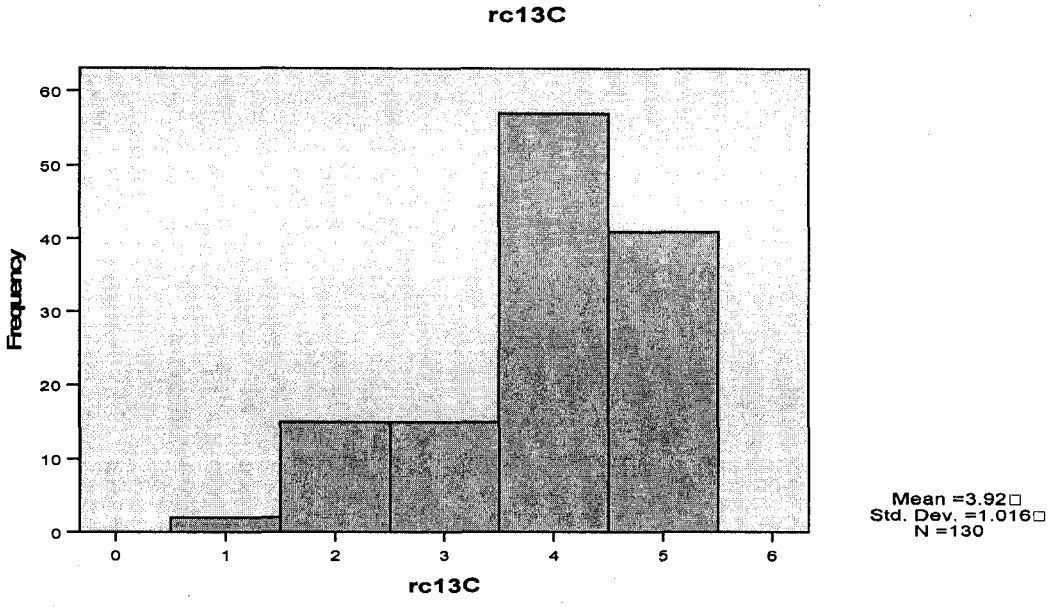
First question histogram for the culture variable.



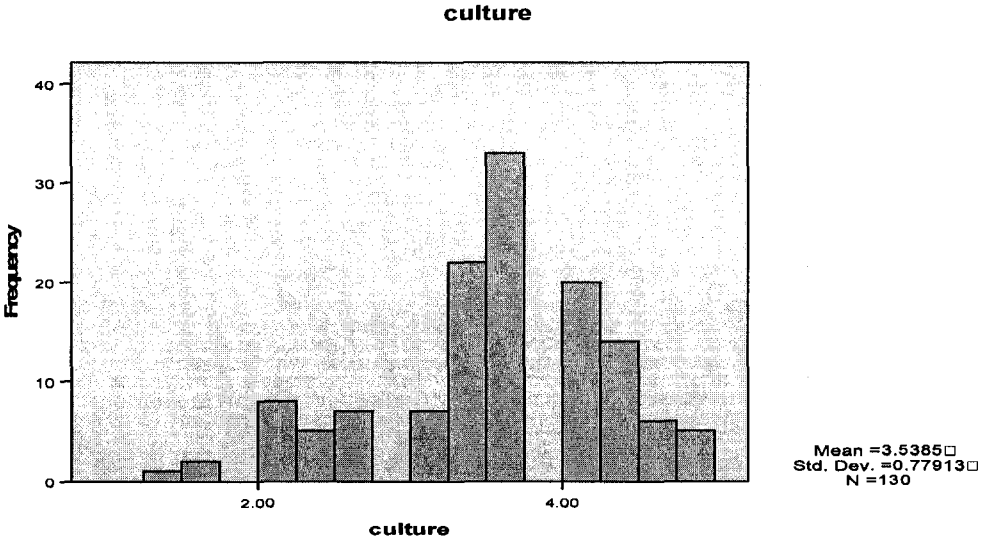
Second question histogram for the culture variable.



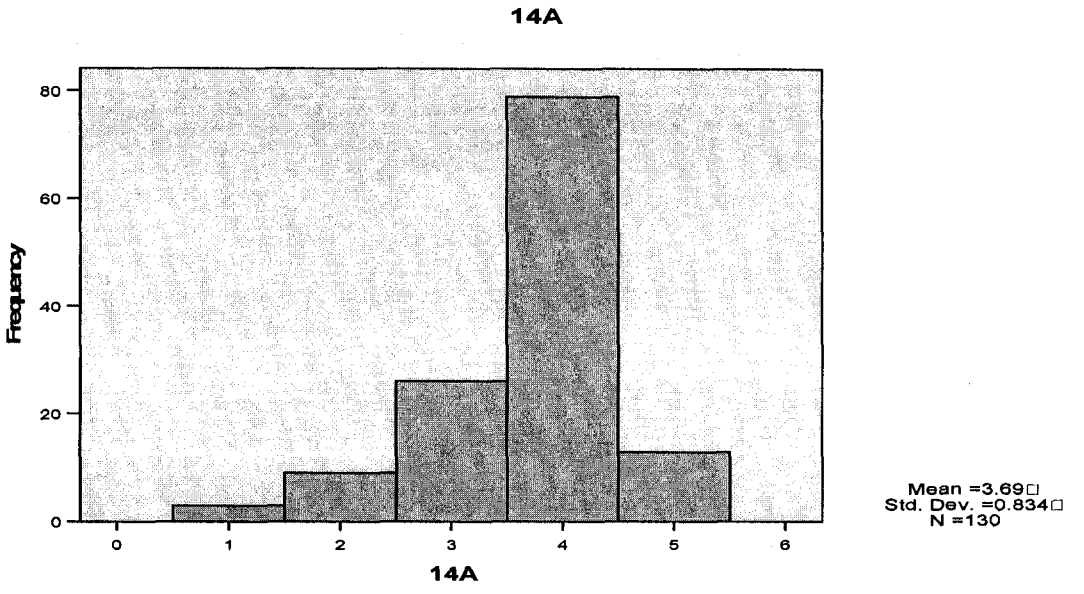
Third question histogram for the culture variable.



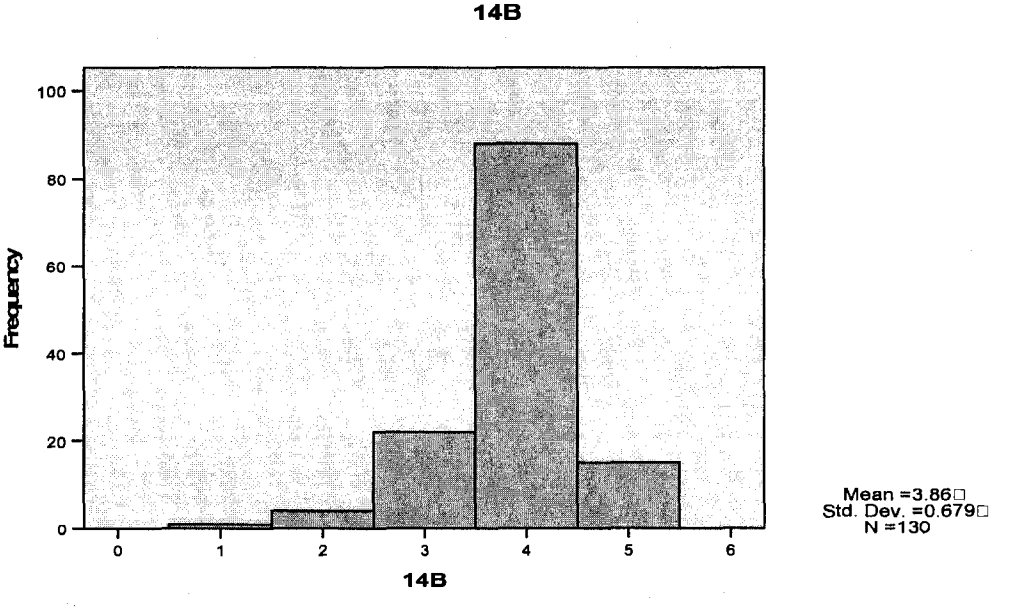
Culture variable histogram.



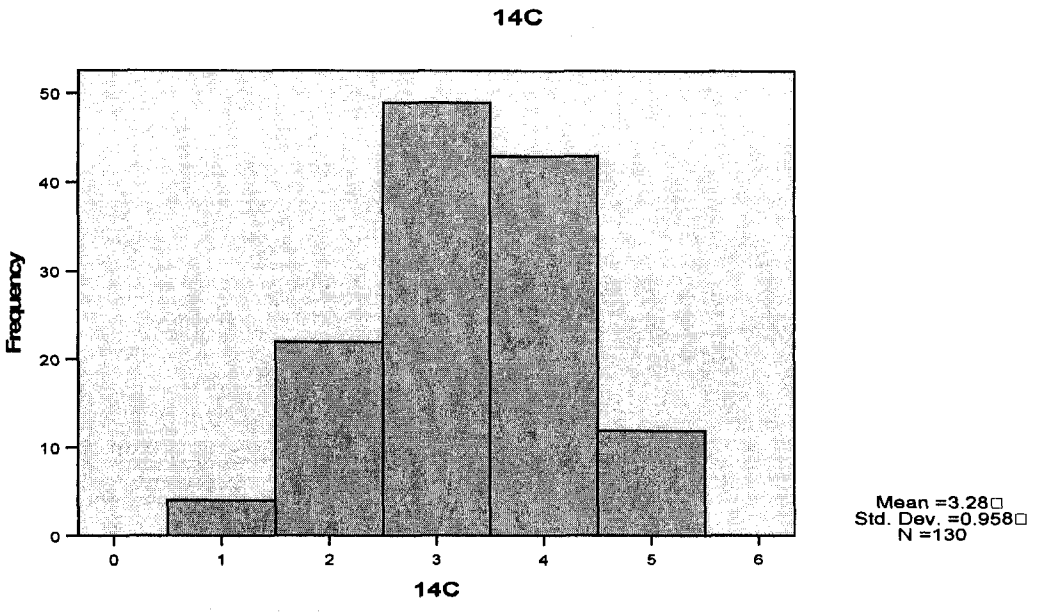
First question histogram for the knowledge transfer variable.



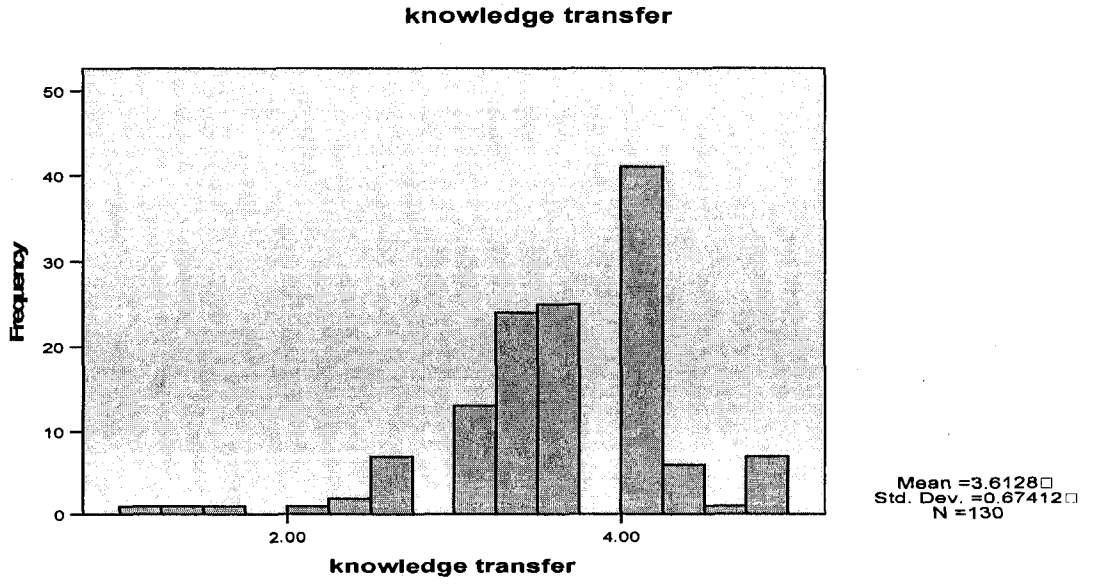
Second question histogram for the knowledge transfer variable.



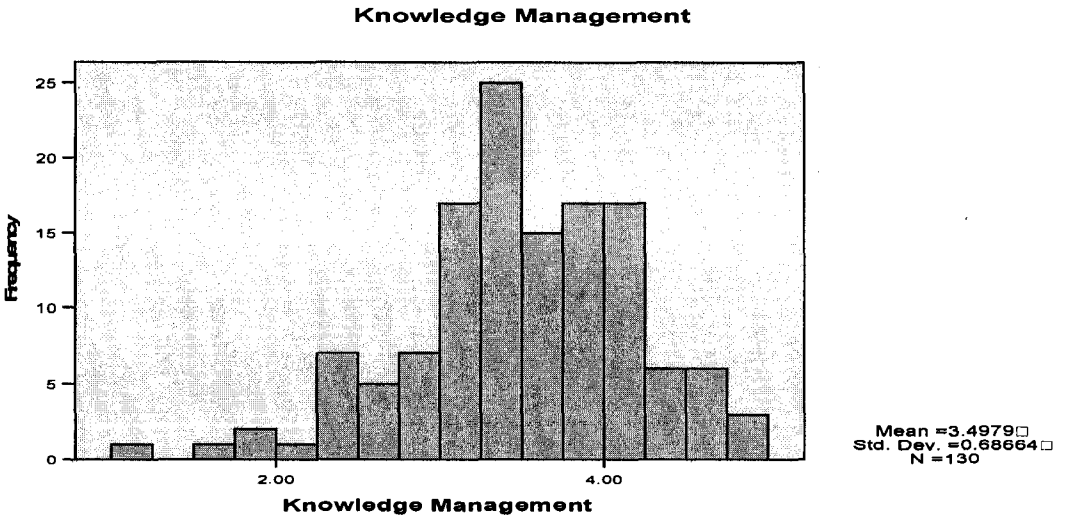
Third question histogram for the knowledge transfer variable.



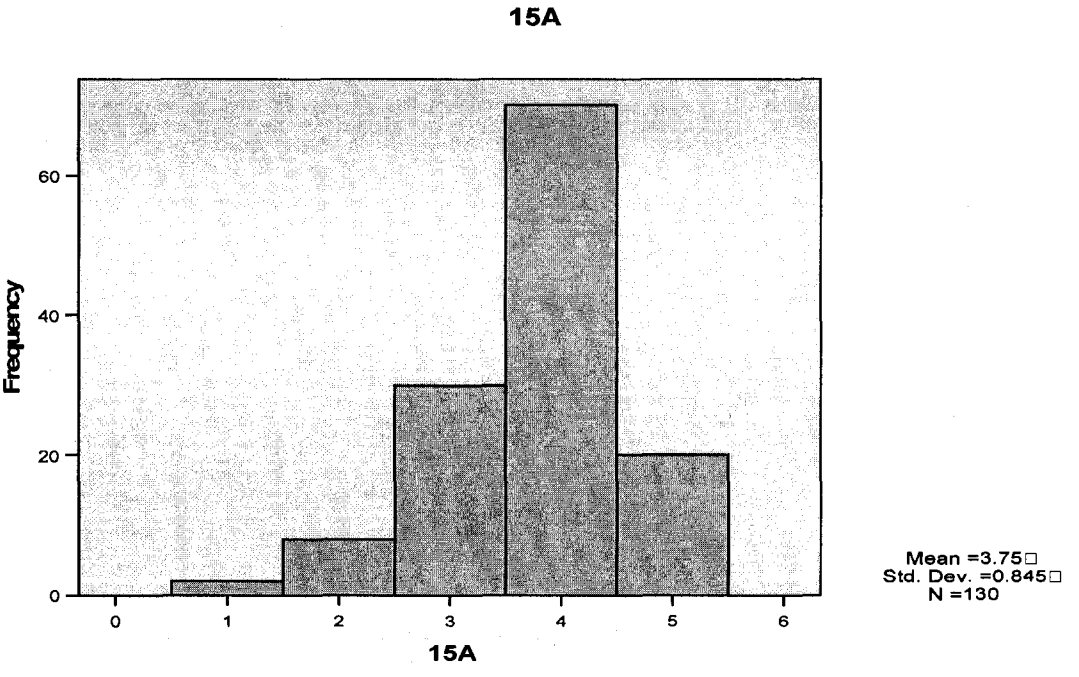
Knowledge transfer variable histogram.



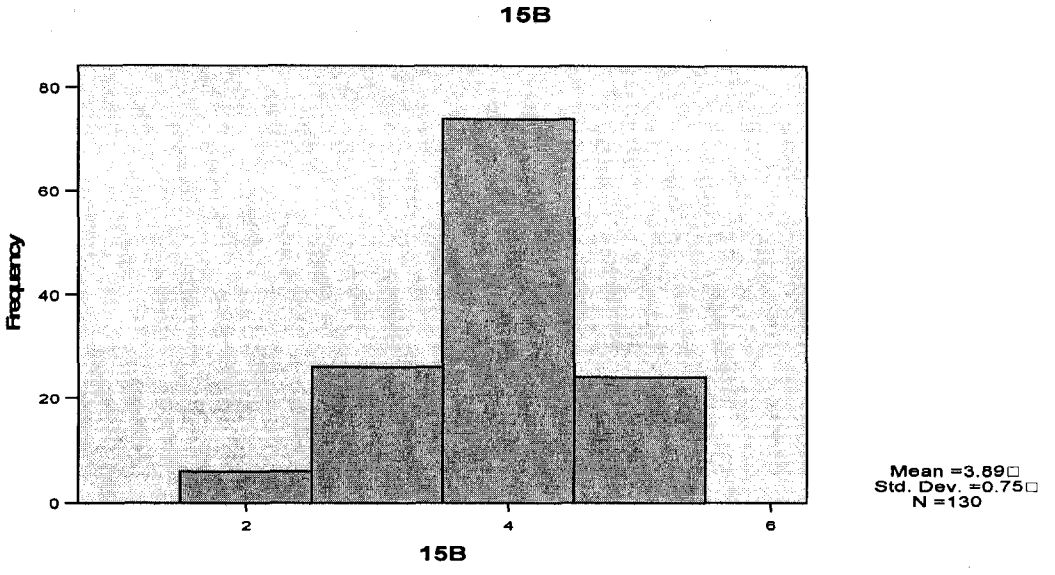
Knowledge management variable histogram.



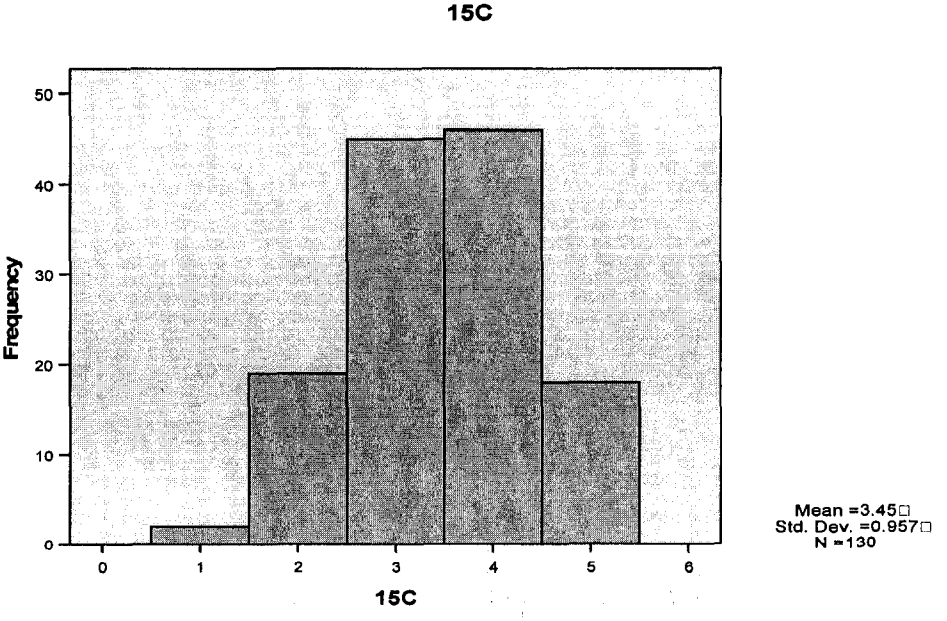
First question histogram for the planned emergence variable.



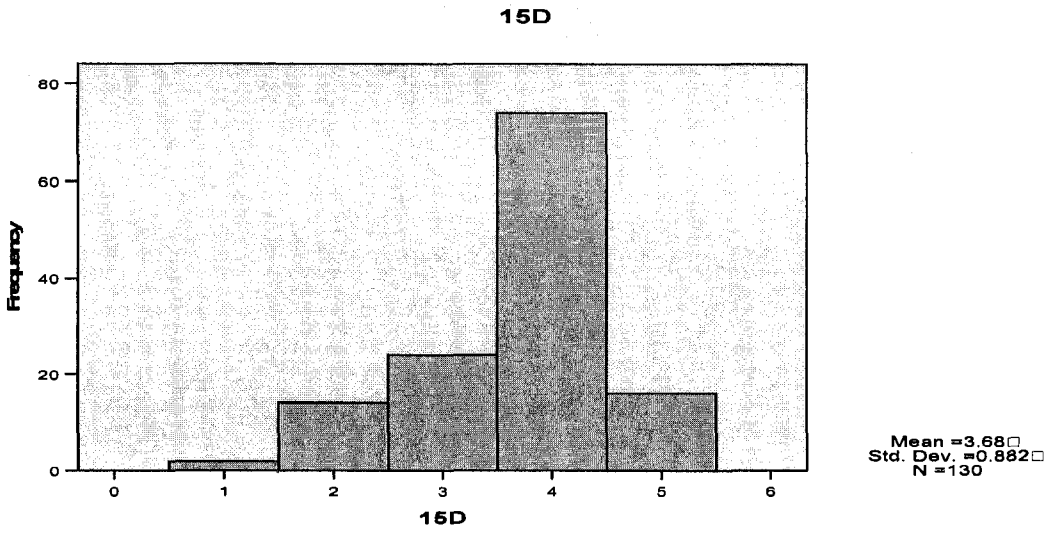
Second question histogram for the planned emergence variable.



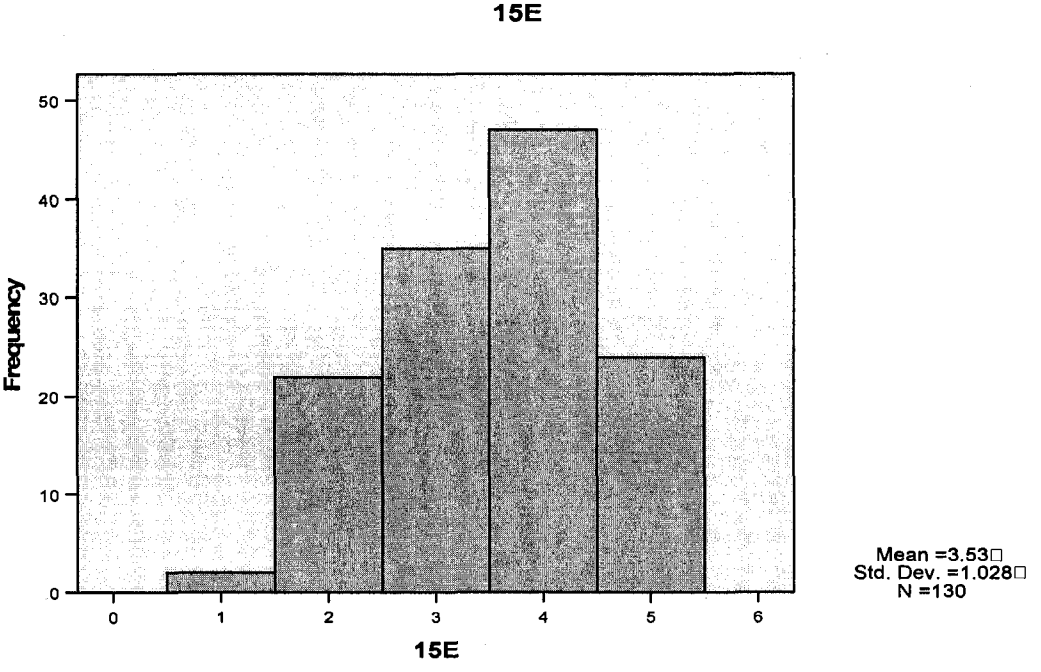
Third question histogram for the planned emergence variable.



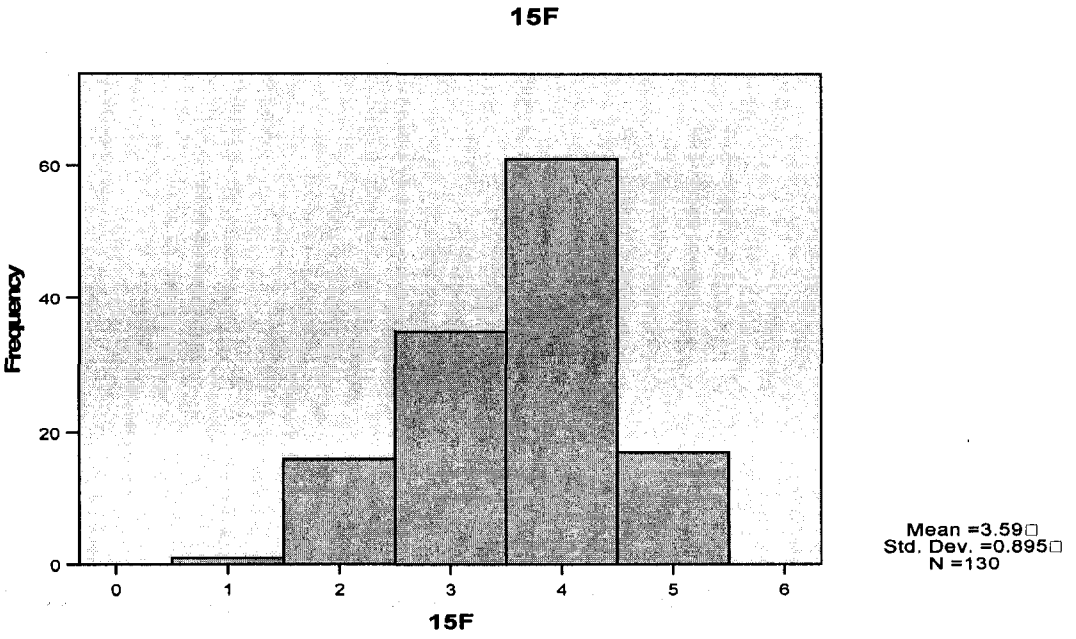
Fourth question histogram for the planned emergence variable.



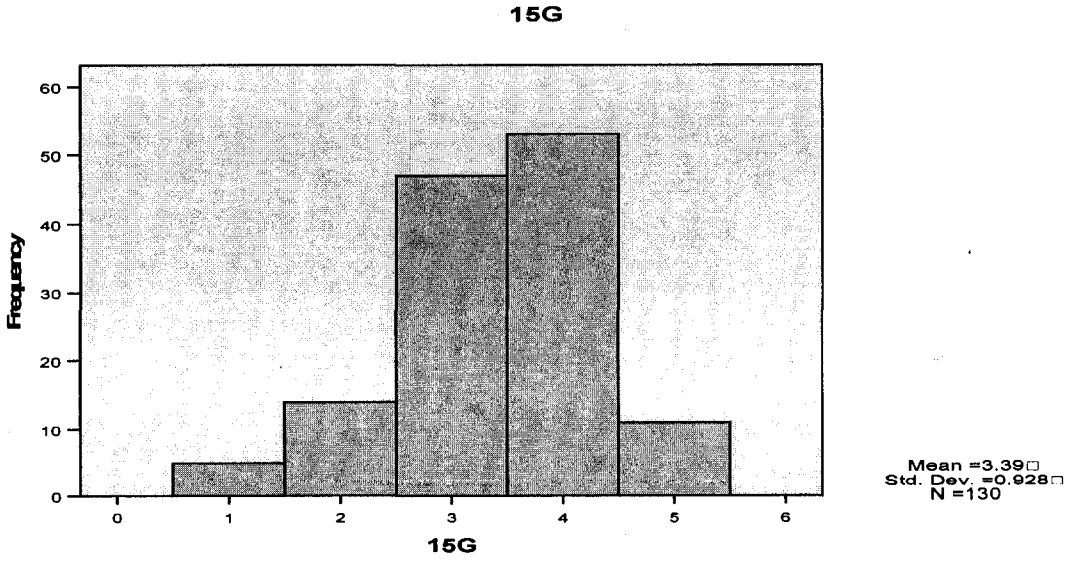
Fifth question histogram for the planned emergence variable.



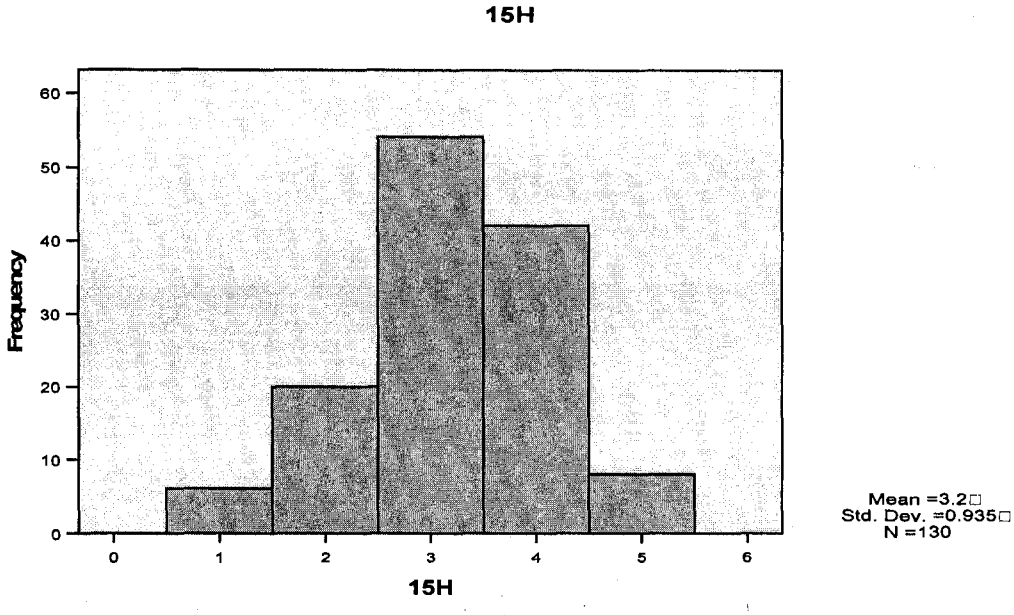
Sixth question histogram for the planned emergence variable.



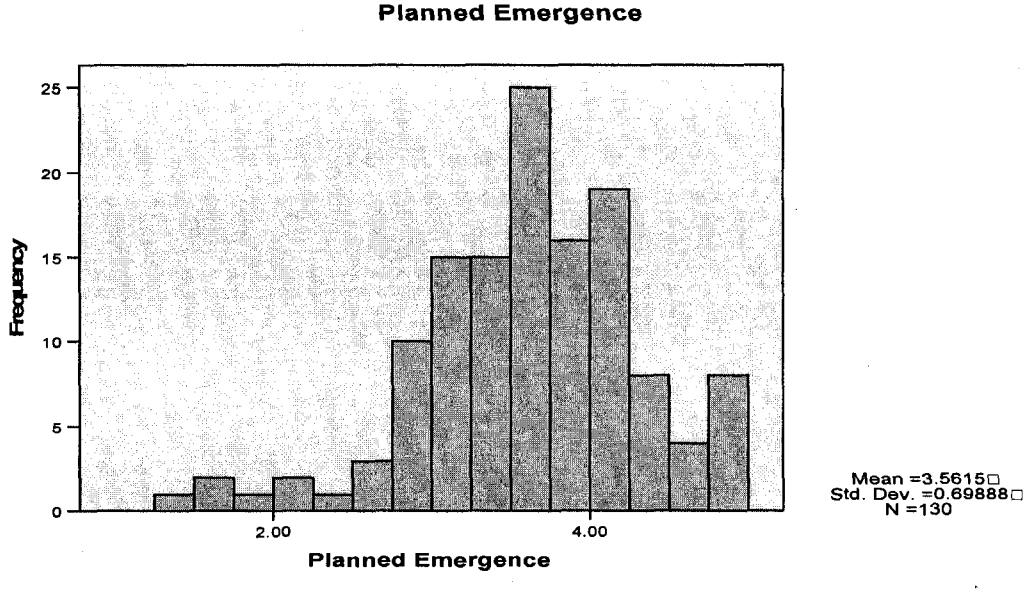
Seventh question histogram for the planned emergence variable.



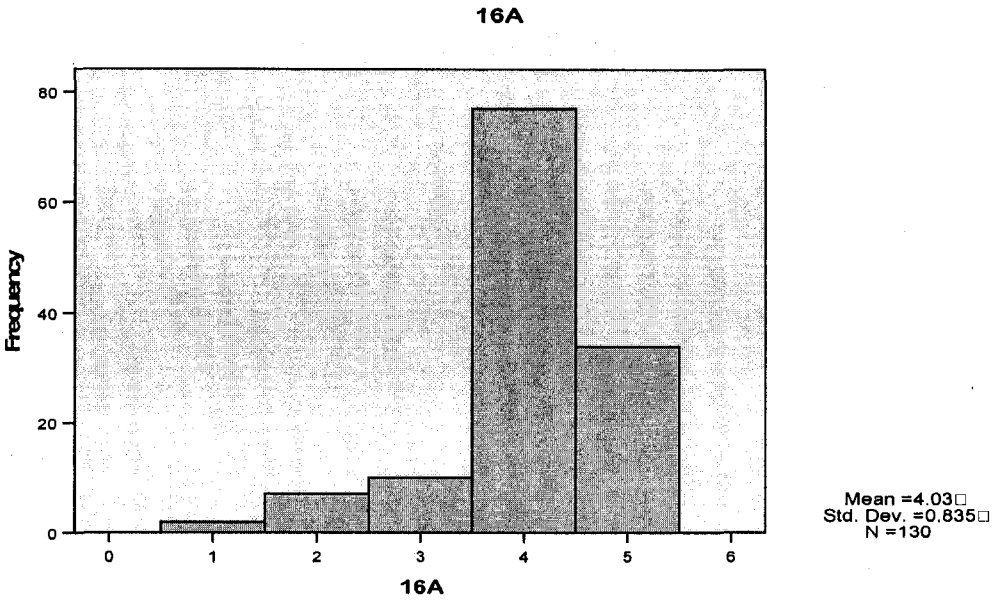
Eighth question histogram for the planned emergence variable.



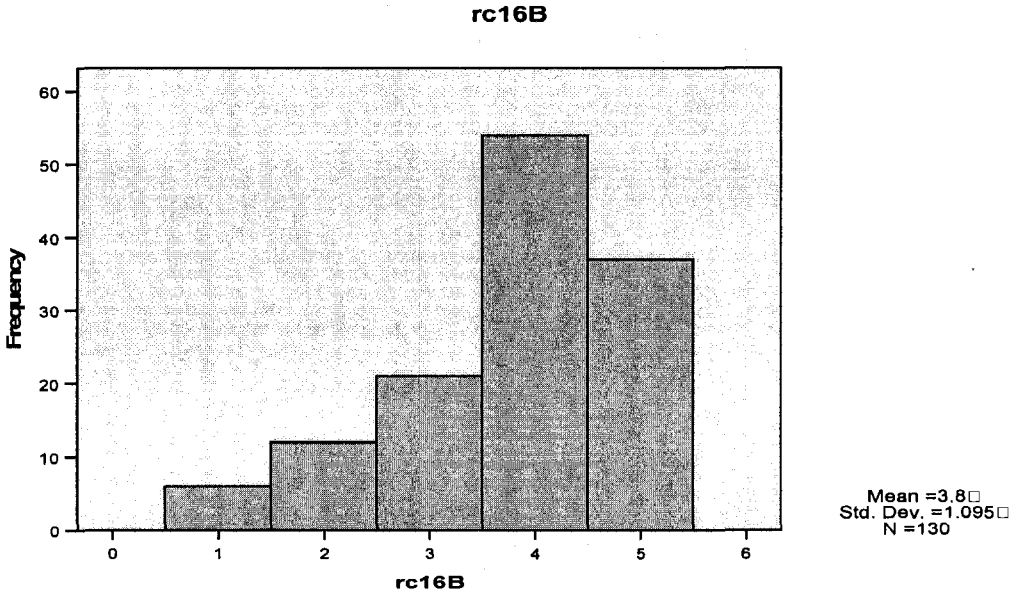
Planned emergence variable histogram.



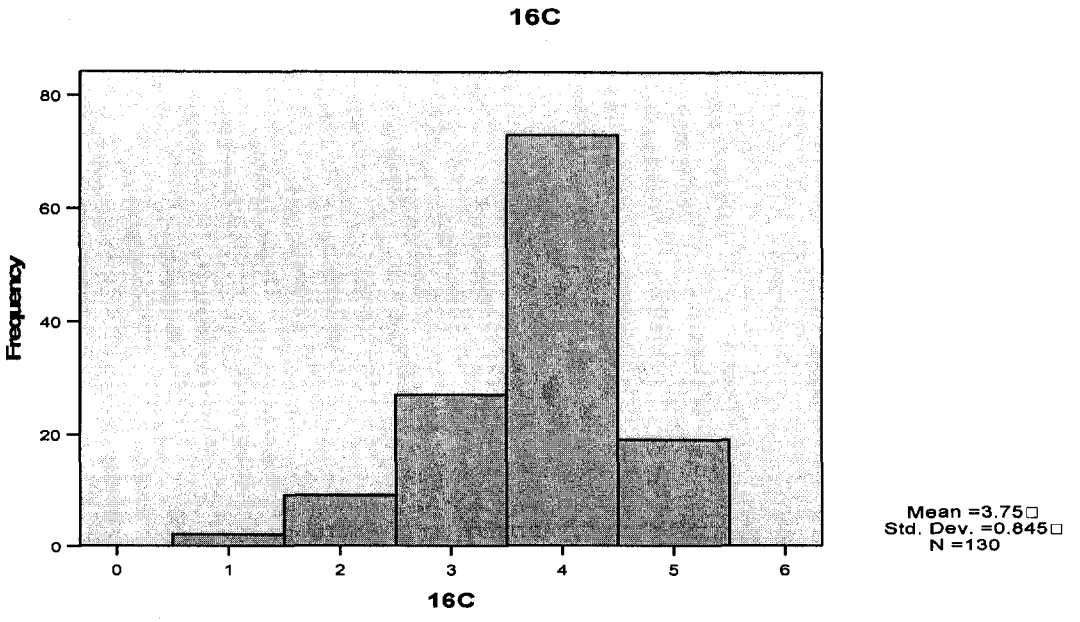
First question histogram for the upper management leadership variable.



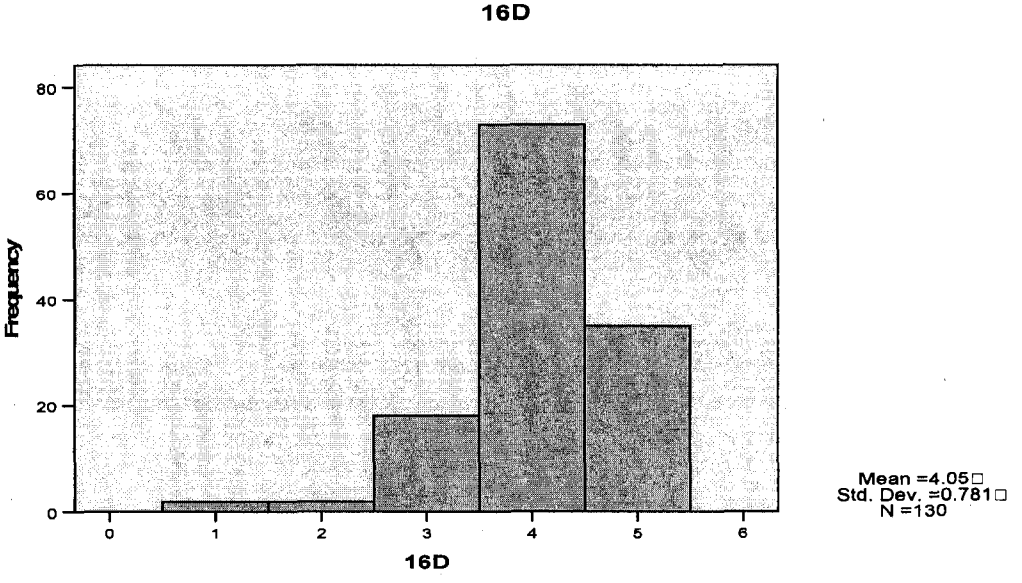
Second question histogram for the upper management leadership variable.



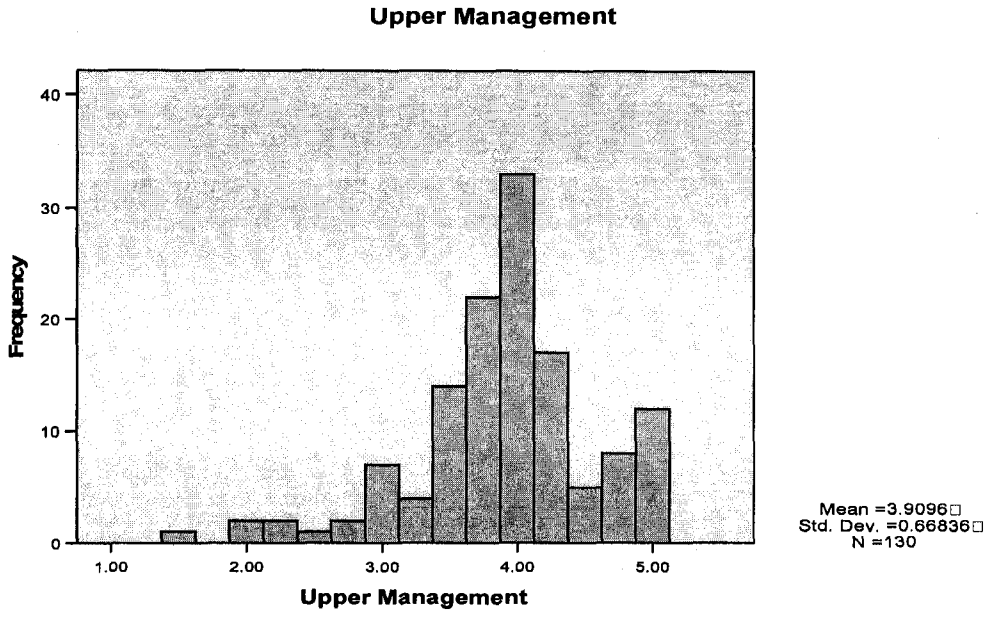
Third question histogram for the upper management leadership variable.



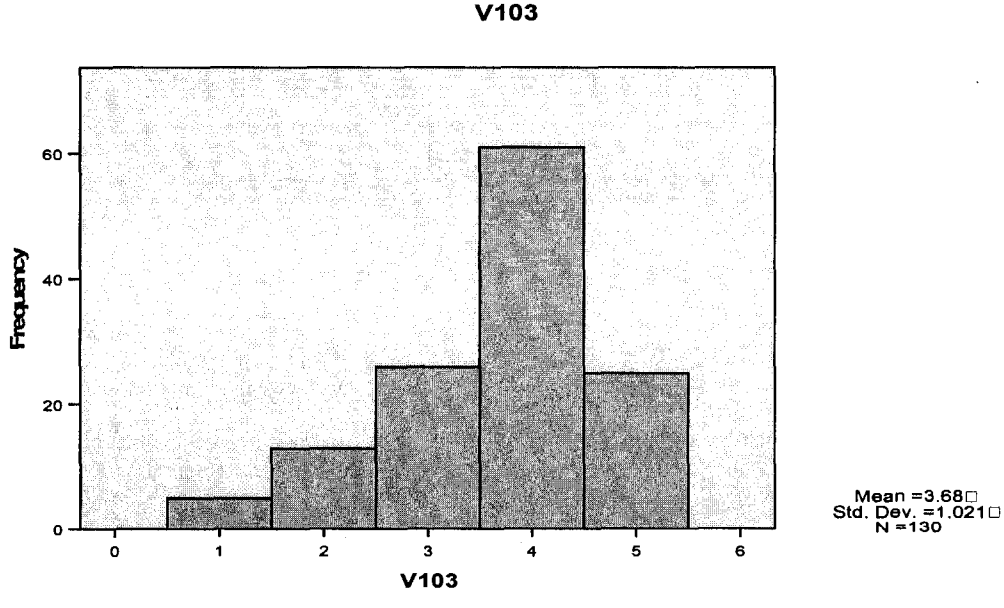
Fourth question histogram for the upper management leadership variable.



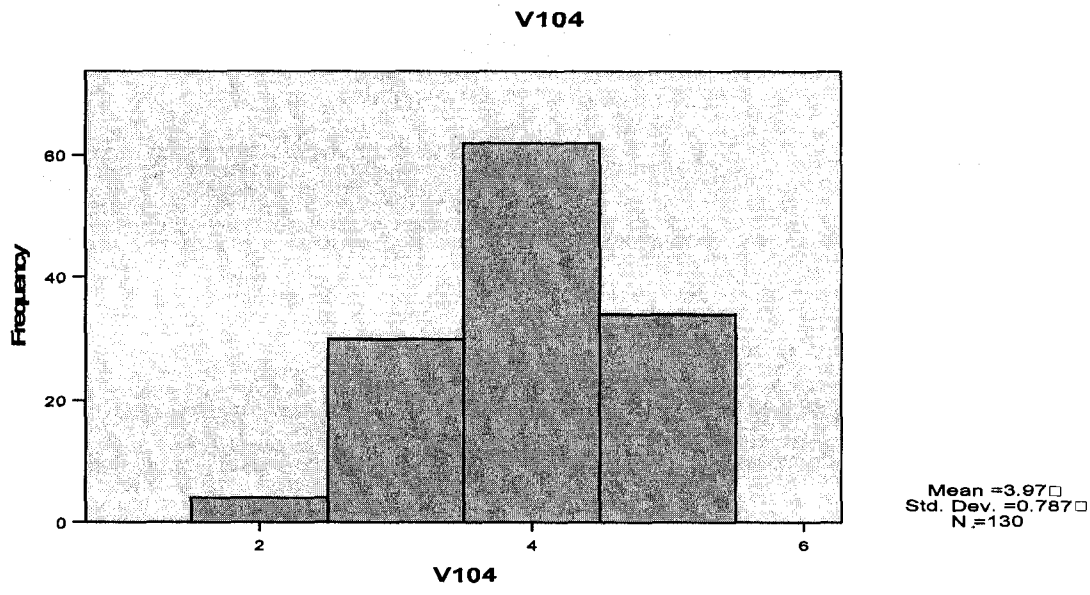
Upper management leadership variable histogram.



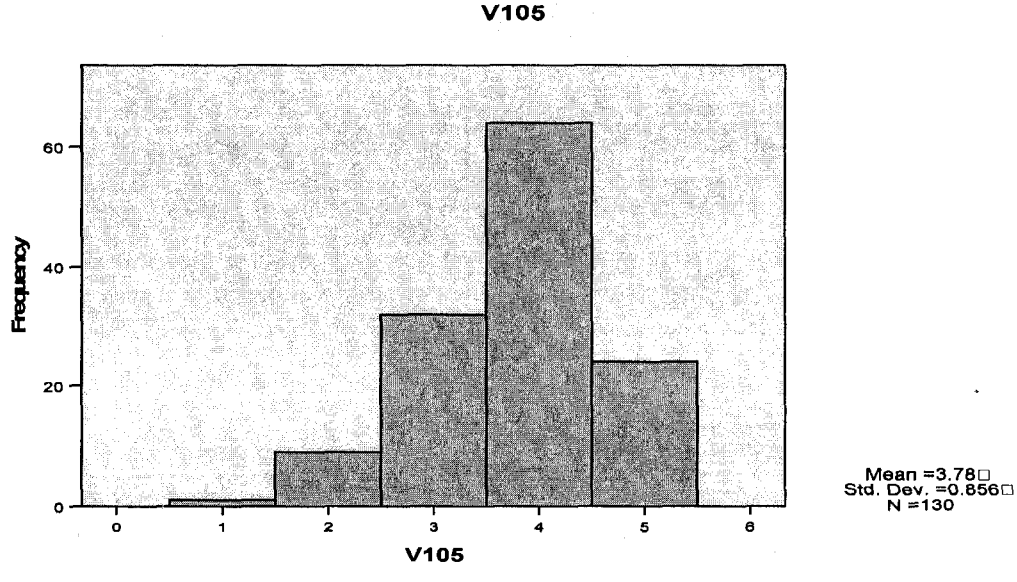
First question histogram for the strategy variable.



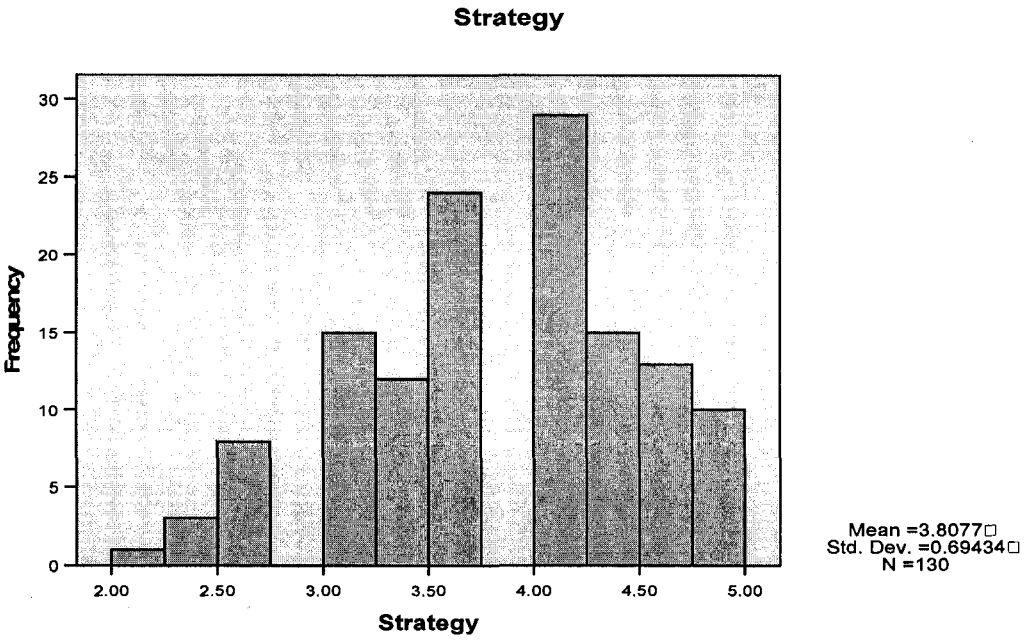
Second question histogram for the strategy variable.



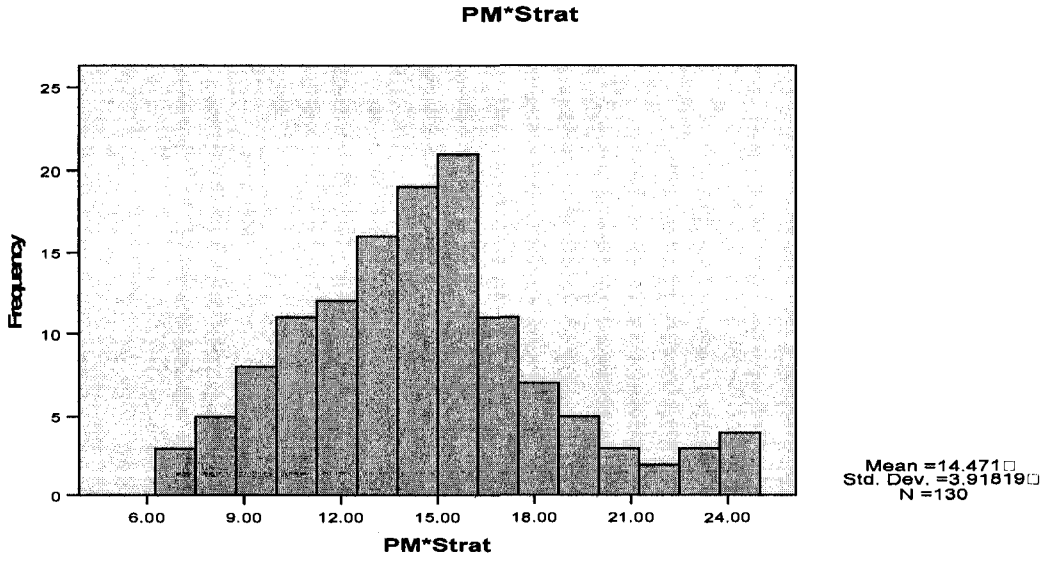
Third question histogram for the strategy variable.



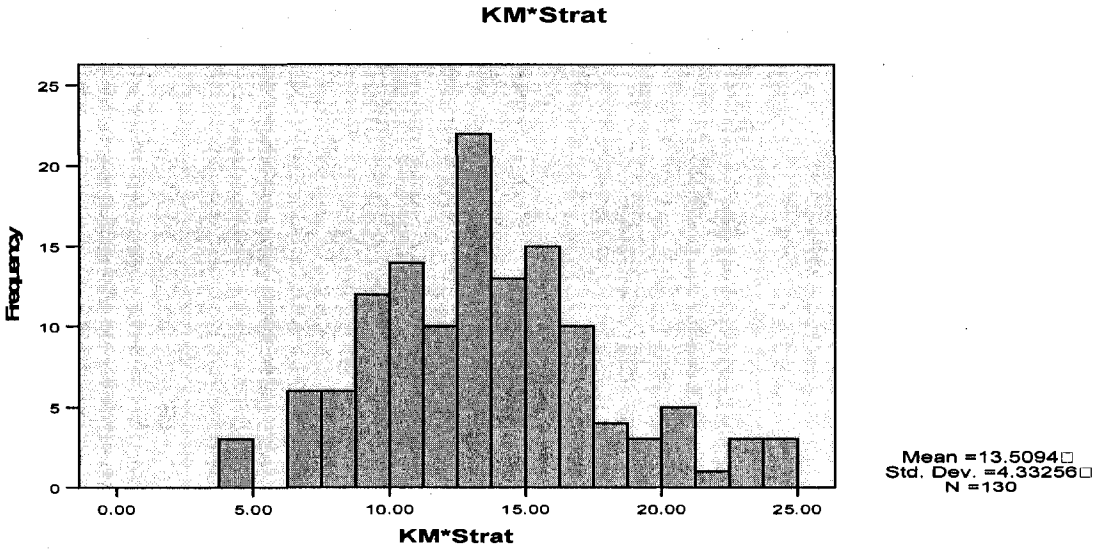
Strategy variable histogram.



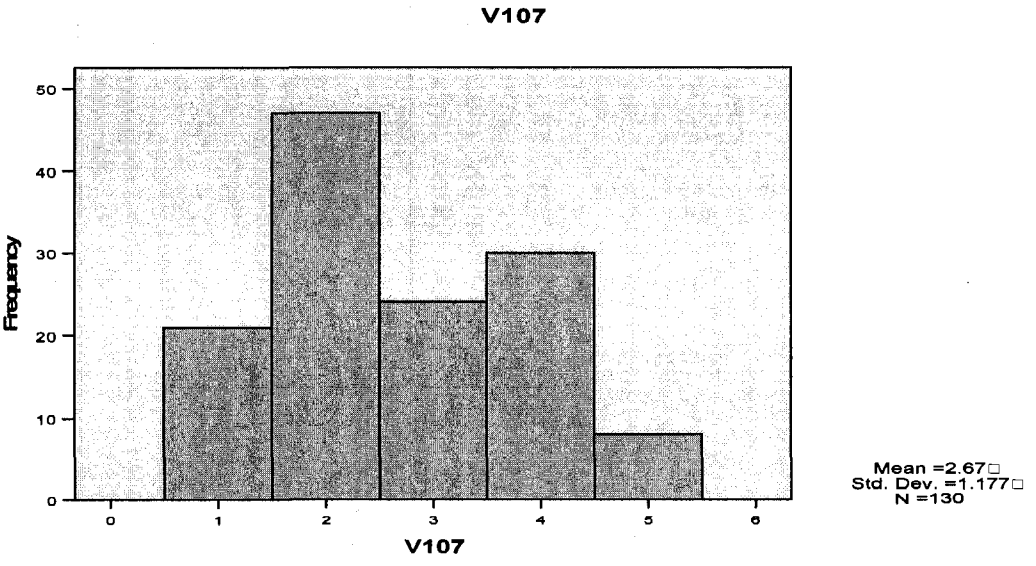
Project management multiplied by strategy variable histogram



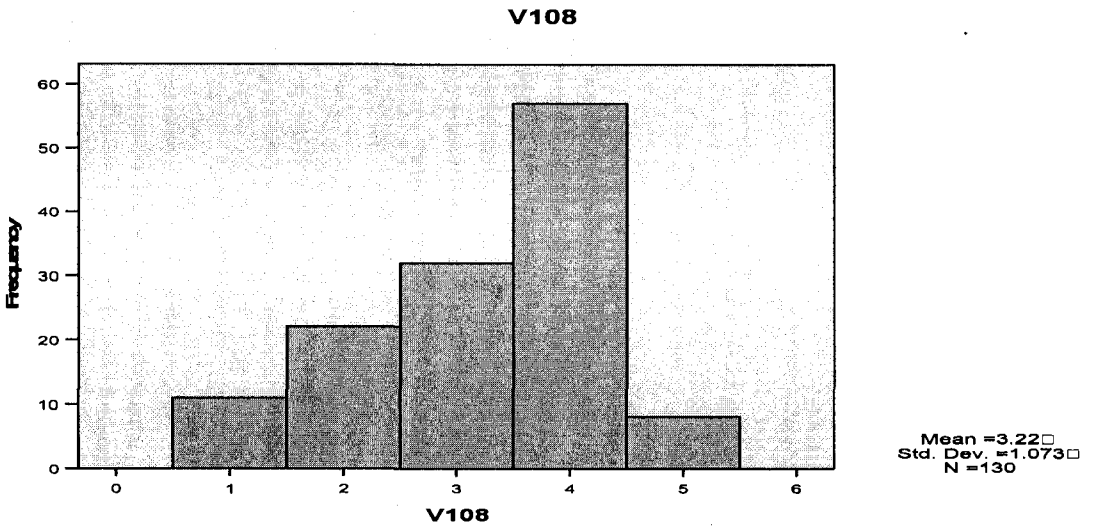
Knowledge management multiplied by strategy variable histogram



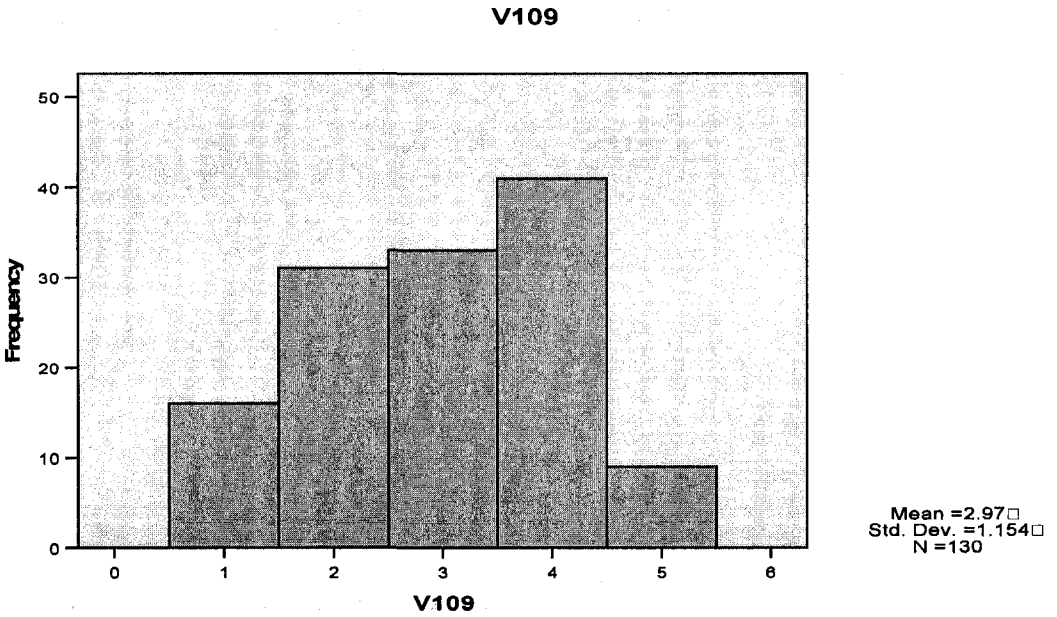
First question histogram for the structure variable



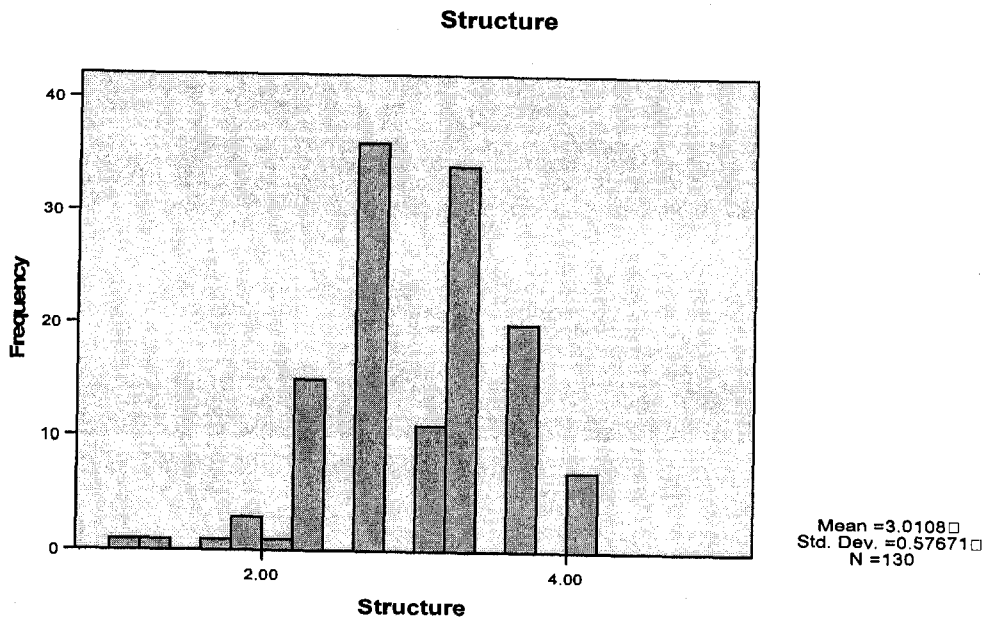
Second question histogram for the structure variable



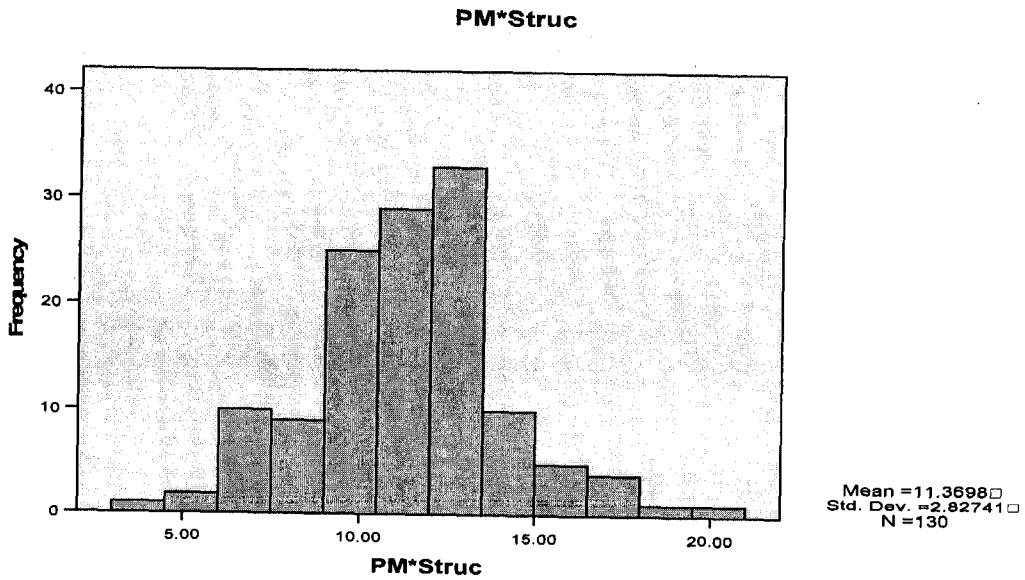
Third question histogram for the structure variable.



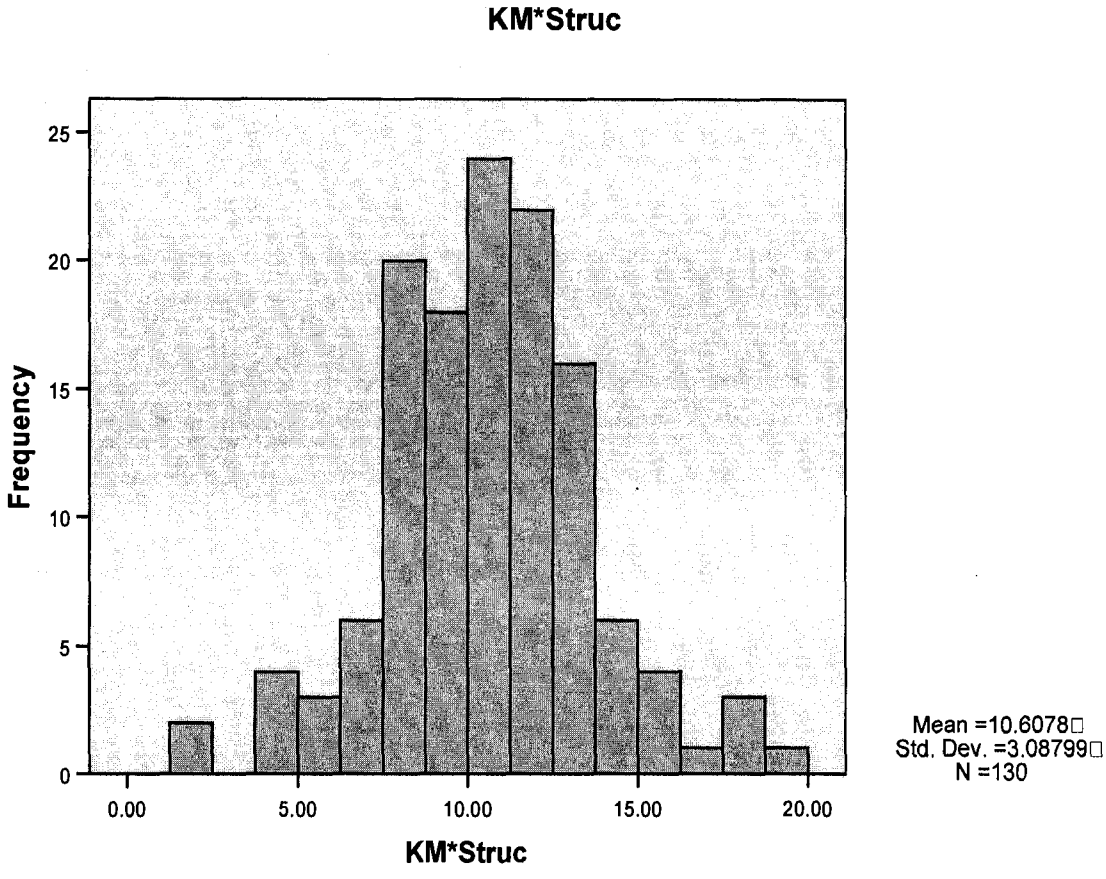
Structure variable histogram.



Project management multiplied by structure variable histogram.

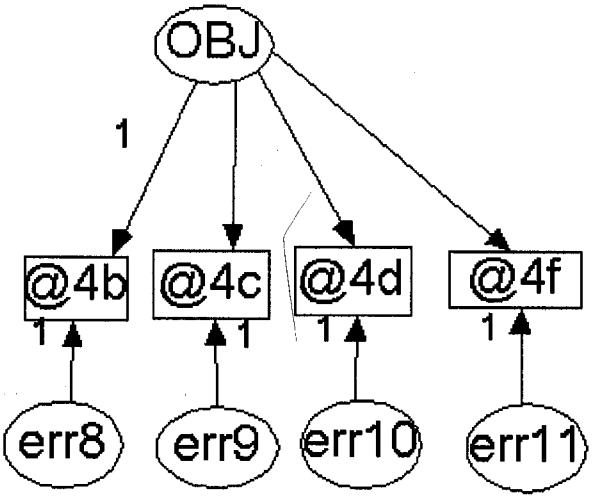


Knowledge management multiplied by structure variable histogram.

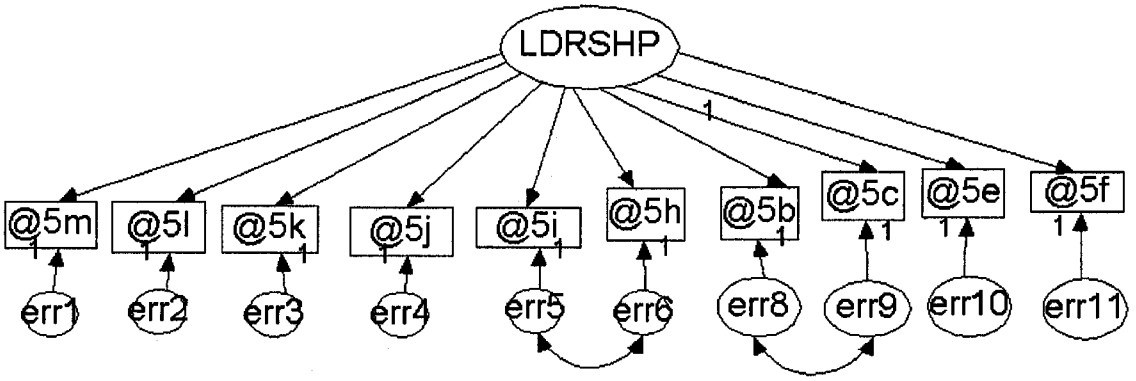


APPENDIX D

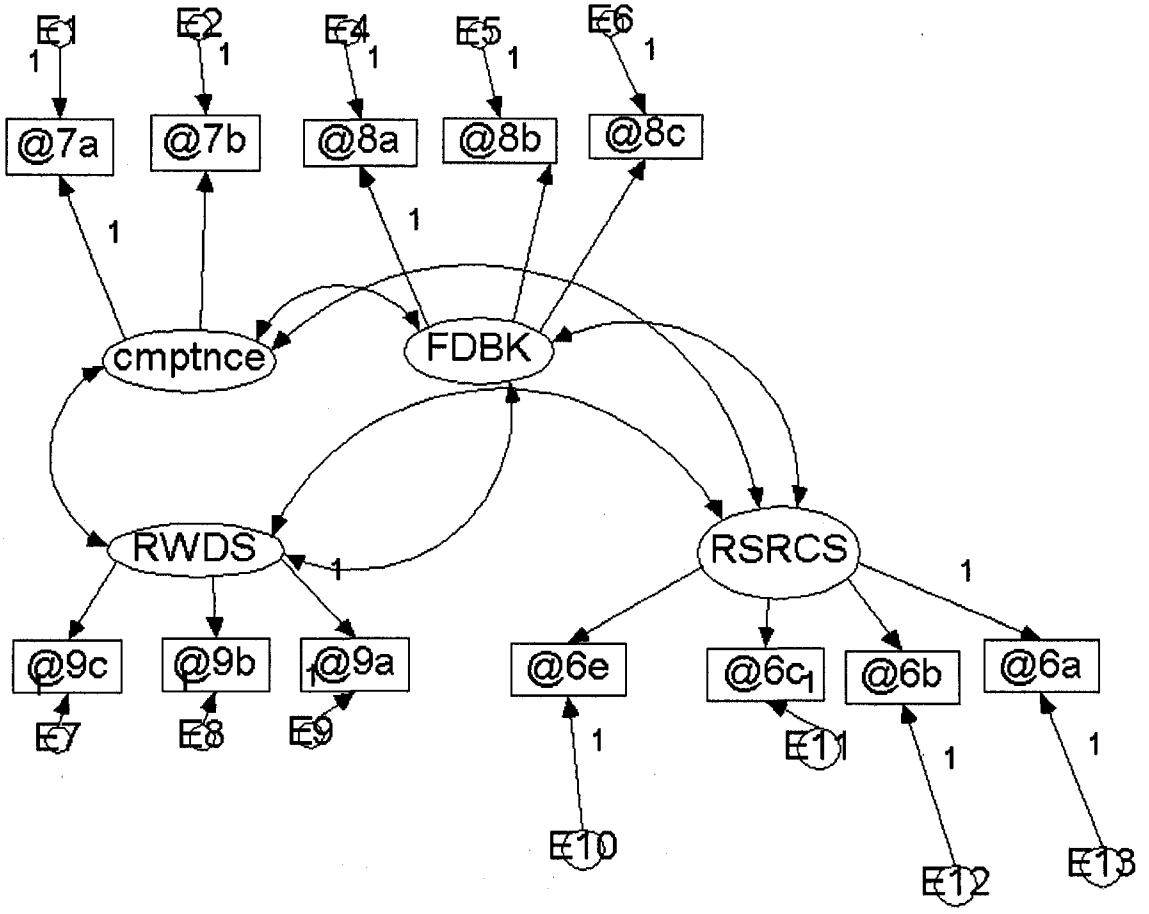
FACTOR ANALYSIS FOR EACH SURVEY QUESTION



Leadership and planning index information for project management variable.



Resources, competence, feedback, and rewards & incentives index information for project management variable.



Index information for knowledge management variables.