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**THE ANALYSIS OF AIR FORCE INSTITUTE  
OF TECHNOLOGY THESES RELATED TO  
CONTRACTING**

THESIS

Thomas M. Clohessy, Captain, USAF

AFIT/GSP/ENV/05M-01

**DEPARTMENT OF THE AIR FORCE  
AIR UNIVERSITY**

**AIR FORCE INSTITUTE OF TECHNOLOGY**

**Wright-Patterson Air Force Base, Ohio**

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The views expressed in this thesis are those of the author and do not reflect the official policy or position of the United States Air Force, Department of Defense, or the United States Government.

AFIT/GSP/ENV/05M-01

THE ANALYSIS OF AIR FORCE INSTITUTE OF TECHNOLOGY THESES  
RELATED TO CONTRACTING

THESIS

Presented to the Faculty

Department of Systems and Engineering Management

Graduate School of Engineering and Management

Air Force Institute of Technology

Air University

Air Education and Training Command

In Partial Fulfillment of the Requirements for the  
Degree of Master of Science in Strategic Purchasing

Thomas M. Clohessy, BS

Captain, USAF

March 2005

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THE ANALYSIS OF AIR FORCE INSTITUTE OF TECHNOLOGY THESES  
RELATED TO CONTRACTING

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date

### **Abstract**

At the end of March 2005, the final students will graduate from the Air Force Institute of Technology's (AFIT) contracting graduate degree curricula—comprised at various times of both contract management and strategic purchasing course sequences—which have been relocated to the Naval Post-Graduate School (NPS).

With the end of the contracting graduate programs at AFIT, it is appropriate to ask what contributions AFIT theses have made to the contracting community. Scholars (e.g., Das and Hanfield 1997) have argued that thesis and dissertation research is one useful method in determining contributions to the field. Accordingly, a rigorous review of contracting-related theses done at AFIT should provide useful information regarding the contributions made to the contracting community and possibly suggest how future research, performed elsewhere, might continue to make contributions in the future.

Through this study it was discovered that the majority of the contracting research conducted at AFIT pertained to purchasing planning, organization, policy, and personnel. There has been little research done on commercial purchasing issues such as buyer-supplier relationship and supply chain integration. The majority of the research done was in exploratory study format using mostly case studies, interviews, and surveys as the research design to collect the data. The most popular form of data analysis technique used was descriptive statistics followed by anecdotal evidence.

## **Acknowledgments**

I would like to express my sincere appreciation to my faculty advisor, Maj Bryan Hudgens, for his guidance and support throughout the course of this thesis effort. The insight and experience was certainly appreciated. I would, also, like to thank my thesis advisor, Lt Col Ross McNutt, for his guidance and support throughout the course of this thesis effort. I am also indebted to the AFIT library staff that assisted me in conducting the research for my thesis.

Thomas M. Clohessy

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# THE ANALYSIS OF AIR FORCE INSTITUTE OF TECHNOLOGY THESES RELATED TO CONTRACTING

## **I. Introduction**

### **Background**

At the end of March 2005, the final students will graduate from the Air Force Institute of Technology's (AFIT) contracting graduate degree curricula—comprised at various times of both contract management and strategic purchasing course sequences—which have been relocated to the Naval Post-Graduate School (NPS). The termination of contracting graduate programs at AFIT marks an appropriate point for a retrospective study of graduate contracting education at AFIT.

The Air Force Institute of Technology (AFIT), located at Wright-Patterson AFB, Ohio, is the Air Force's graduate school of engineering and management. AFIT was originally established in 1919 as the Air School of Application, located at McCook Field in Dayton, Ohio. In 1926, Congress authorized the creation of the Air Corp and the school was renamed the Air Corps Engineering School and relocated to Wright Field in 1927. After World War II in 1946, the school was established as the Army Air Force Institute of Technology. The school was composed of two colleges: Engineering and Maintenance, and Logistics and Procurement. The school also fell under the command of Air Materiel Command. In 1947, when the Air Force became a separate service, the

school was then renamed Air Force Institute of Technology and in 1950, command jurisdiction of AFIT transferred from Air Materiel Command to Air University (Air Force Institute of Technology, 2003).

As a component of Air University, AFIT is committed to providing defense-focused graduate education and research. AFIT is composed of three resident schools: the Graduate School of Engineering and Management which offers doctor of philosophy and master's degrees, the School of Systems and Logistics, and the Civil Engineer and Services School which both provide professional continuing education. The first resident degree was granted in 1956. Since then, over 15,000 graduate degrees have been awarded (Air Force Institute of Technology, 2004).

This study focuses primarily on the Graduate School of Engineering and Management, and more specifically on the Department of Systems and Engineering Management. The Graduate School of Engineering and Management offers master's degrees in various engineering and science disciplines, engineering management, environmental management, military meteorology, operational analysis, space operations, systems engineering, cost analysis, logistics management, acquisition logistics management, supply management, transportation management, information systems management, systems management, contracting management, software systems management, and information resource management (Air Force Institute of Technology, 2003). Because this study focuses on the AFIT contracting program, the research will cover thesis research on contracting topics. While these theses might come from any of several formal degree programs, and possibly from more than one academic department, it is likely that the significant majority of relevant theses will be those done by students

earning a Master of Science with a major in Acquisition Management (GAQ) and a Master of Science with a major in Strategic Purchasing (GSP).

For fifty years, the AFIT contracting curricula has provided masters-level graduate education focused on contracting in the defense environment. Most recently, AFIT describes the contributions it seeks to make through its contracting program as producing personnel “with the knowledge and skills needed to effectively manage and work in a variety of complex and challenging contracting roles within the Department of Defense (DoD) and the Air Force systems environment (Air Force Institute of Technology, 2003, p. 154).

### **Specific Problem**

With the end of the contracting graduate programs at AFIT, it is appropriate to ask what contributions AFIT theses have made to the contracting community. Scholars (e.g., Das and Hanfield 1997) have argued that thesis and dissertation research is one useful method in determining contributions to the field. Accordingly, a rigorous review of contracting-related theses done at AFIT should provide useful information regarding the contributions made to the contracting community and possibly suggest how future research, performed elsewhere, might continue to make contributions in the future.

### **Research Question**

This thesis reviews the history of AFIT’s contracting graduate programs, and investigates the contributions of AFIT research to the contracting community by analyzing relevant theses.

## **Investigative Questions**

The seven investigative questions that this thesis will attempt to answer are:

IQ 1. What are the highlights in the history of AFIT's contracting graduate programs?

IQ 2. How many theses have been written pertaining to the contracting community?

IQ 3. What subject category does each thesis address?

IQ 4. What type of research was performed in each thesis?

IQ 5. What type of research design was used in each thesis?

IQ 6. What type of data analysis techniques were used in each thesis?

IQ 7. Are there any trends that developed over time concerning thesis writing pertaining to the contracting community?

## **Proposed Methodology**

In order to answer the research question, each investigative question will be addressed. The majority of the methodology has been adapted from the studies done by Carter and Ellram (2003) and Das and Hatfield (1997), who performed similar investigations in the fields of supply chain management and operations management respectively. The first investigative question will be answered by reviewing documentation and catalogs at AFIT. Investigative question two will be answered by conducting an exhaustive search of specific catalog databases to determine which theses apply to the research. Investigative questions three through six will be answered by reviewing each thesis to determine which categories apply to each thesis identified in

investigative question two, and through appropriate statistical analyses. Investigative question seven will be answered by analyzing the resulting data across time.

### **Scope and Limitations**

This research focuses specifically on theses that were written in the AFIT Master's Degree program. This research seeks to determine what contributions AFIT has made to the contracting community before all contracting graduate programs are moved from AFIT to NPS. Thus, the theses written in related programs at the Naval Post Graduate School (NPS) were not taken into consideration; neither were any theses written at other defense-related schools or civilian graduate schools.

There are limitations to this research. No records are maintained at AFIT that track how many theses have been written about contracting issues. The challenge with the current body of knowledge is that the theses are not organized so that it is easily identifiable how AFIT has contributed to the contracting community. Despite detailed searches, all relevant theses might not have been identified; other theses that could be considered contracting-related might have been missed. Another limitation to this research is the potential subjectivity of classification. The researcher attempted to mitigate this subjectivity through various means, including specifically defining categories and using multiple coders to categorize the data; nevertheless, potential effects of subjectivity cannot be completely eliminated.

## **Overview of the Thesis**

The remainder of this thesis is structured as follows. Chapter two presents the methodology used in gathering all the necessary data and how each of the seven investigative questions will be addressed. Chapter three presents the data analysis and findings by addressing the seven investigative questions previously discussed. Chapter four presents the summary and conclusion of the research conducted for this thesis.



## **II. Methodology**

Since the focus of this research is to identify and categorize theses that have been written pertaining to contracting, the definitions of each category used in this research to classify the theses will be imperative. The methodology was based on those used in studies conducted by Carter and Ellram (2003) and Das and Hatfield (1997). These studies analyzed either journal articles or doctoral dissertations in the fields of supply chain management and purchasing respectively and classified each article or dissertation according to subjects, authors, research methods and analysis tools used to conduct the studies. This study was conducted in three steps. The first step was to identify all of the theses that have been written at AFIT pertaining to contracting. The second step was to classify each thesis according to clearly-defined categories. The third step was to analyze the data created from categorizing the theses and determine what contributions have been made to the contracting community.

### **Investigative Questions**

As discussed in chapter one, the following investigative questions guided the thesis research:

**Investigative Question 1.** What are the highlights in the history of AFIT's contracting graduate programs?

This investigative question was addressed in the literature review. Research was conducted by reviewing various documents at AFIT that describe the Contracting graduate programs and how it has progressed over the years.

**Investigative Question 2.** How many theses have been written pertaining to the contracting community?

The AFIT/AFRL Library Catalog and the Defense Technical Information Center (DTIC) web site were examined for theses in the field of contracting for the period of AFIT's inception in 1919 to 2003. Contracting is defined as "purchasing, renting, leasing, or otherwise obtaining supplies or services from nonfederal sources. (United States Small Business Administration United States Small Business Administration, 2001)." A search of both databases provided a combined 588 theses resulting from queries using the following key words: 'acquisition', 'acquisitions', 'contract', 'contracts', 'procurement', 'procurements', 'quality', 'purchasing', 'outsourcing', 'sourcing', 'supply chain', 'negotiation', 'ethical', and 'legal'. Another query was done on DTIC using the identifier for the Graduate Strategic Purchasing Academic Program (GSP) and the identifier for the Graduate Acquisition Management (GAQ) Program. These theses were screened to ensure that each one was related to contracting before continuing with the classification process. This process identified 435 theses related to contracting.

**Investigative Question 3.** What subject category does each thesis address?

The next step in analyzing the theses was to create subject categories that would be used in classifying the theses. This investigative question was answered by conducting a content analysis through reading the abstract and problem statements of each thesis individually. The list of subject categories was generated from subject categories identified in similar studies done by Carter and Ellram (2003) and Das and Handfield (1997). In order to create one list to use during this study, the subject category

lists from the previously mentioned articles were compared to each other. If there were subject categories between the two lists that were related to each other, they were combined into one category. The result was fourteen categories that are listed below. Once the researcher gained an understanding about the subject of the thesis, each thesis was assigned to a specific category that best illustrated its main focus. The list used for this study contains 14 subject categories.

1. ***Buyer Behavior*** – Decision making, purchasing motivations, and risk management, including dealing with uncertainty and shortages (Carter and Ellram, 2003, 30).
2. ***Buyer-Supplier Relationship*** – Action programs to achieve long-term closer buyer-supplier ties. Covers collaboration, partnerships and strategic alliances among suppliers and buyers. Does not include initial supplier selection or development activities (Das and Handfield, 1997, 105).
3. ***Cost, Pricing, and Contracts*** – Supplier pricing practices, buyer cost and price analysis, total cost analysis and use, forward buying, target costing, contract types, practices and determinants (Das and Handfield, 1997, 105).
4. ***Global Sourcing*** – Issues, solutions, practices and policies in international buying and global sourcing. Purchasing interactions with global manufacturing and marketing issues. Processes, evaluation, impacting variables, benefits and practices (Das and Handfield, 1997, 105).
5. ***Human Resource Issues*** – Hiring issues, job performance, psychological issues, training, pay and promotion, job roles and definition/description (Carter and Ellram, 2003, 30).

6. ***Legal, Ethical, and Environmental Issues*** – Government (domestic) social and ethical issues affecting buyers and suppliers (Das and Handfield, 1997, 105).
7. ***New Product Development*** – Early supplier involvement in concurrent engineering, cost reduction, value engineering, logistics and time-to-market and time-to-product cycle time reduction. Processes, guidelines, measures, enablers, benefits, problems (Das and Handfield, 1997, 105).
8. ***Purchasing Information Systems*** – Information flows to/from purchasing, electronic data interchange (EDI) with suppliers, procedures and record maintenance and computer applications in purchasing areas (Das and Handfield, 1997, 105).
9. ***Purchasing Performance Measurement*** – Performance evaluation of purchasing and purchasers; systems, criteria, issues, and linkages to corporate objectives (Das and Handfield, 1997, 105).
10. ***Purchasing Planning, Organization, Policies, and Personnel*** – Strategic research and long term objectives, planning, budgeting, make/buy, organizational structure, policies regarding suppliers and buyers, buyer selection and development related issues (Das and Handfield, 1997, 105).
11. ***Single/Multiple Sourcing*** – Benefits, problems, practices, systems in sole/single/parallel and multiple sourcing decisions (Das and Handfield, 1997, 105).

12. ***Supply Chain Integration*** – Research on purchasing and supplier interaction, trade-offs and relationships from a holistic supply chain perspective including inter-organizational information systems (non-purchasing) logistics (Das and Handfield, 1997, 105).
13. ***Supplier Quality*** – Supplier and buyer responsibilities, quality dimensions, practices, specifications, inspection, cost of quality, testing and quality control issues (Das and Handfield, 1997, 105).
14. ***Supplier Selection and Development*** – Issues relating to supplier selection, evaluation and development strategies, practices and performance gains (Das and Handfield, 1997, 105).

Once the classification of each thesis was done, the data was analyzed using frequency counts of the number of theses assigned to each category. Then the researcher examined the subject category data over time to determine if any trends were evident in the data. The data was examined over 5 ten year periods, starting from 1955 – 1964 and ending at 1995 – 2004. Finally, a Chi-Square Test was conducted to determine if there were any significant differences across time periods. All of the chi-square tests conducted for investigative questions 3 – 6 returned a warning that 20 percent of the cells have an expected count of less than 5, making the chi-square test suspect. There are varying opinions between authors as to the validity of a chi-square test that reports the previously mentioned warning (Kachigan, 1986). While results of the chi-square test are reported in some instances, other supporting analyses, e.g., graphical analyses, were performed in all cases. In all cases, because of uncertainty in their results, the contingency table analyses were considered supplementary to the graphical analysis.

**Investigative Question 4.** What type of research was performed in each thesis?

This question addresses the type of research that was performed in the theses.

This evaluation was based on the typology of Mentzer and Kahn (1995), which was also used in Carter and Ellram (2003). This investigative question was answered by reading the abstract and the methodology section of each thesis individually. Once the researcher gained an understanding about the type of research performed in the thesis, the type of research list was reviewed to determine which type of research was incorporated into the thesis. Simple frequency counts were made of the number of theses using each research type. The type of research was broken down into five categories.

1. ***Normative Literature*** – “Research that examines what ought to be and what individuals and organizations ought to do” (Mentzer and Kahn, 1995).  
  
Literature might be cited in the article, but the point of the inclusion of this literature is to support the opinions/assertions of the author (Mentzer and Kahn, 1995).
2. ***Literature/Methodology Review*** – A review and synthesis of existing literature or research methodologies, the result of which is the development of a framework, propositions, or normative prescriptions grounded in the existing literature (Mentzer and Kahn, 1995).
3. ***Exploratory Studies*** – “Research that makes observations for the purposes of developing theories, but leaves the testing of the theories for other studies” (Mentzer and Kahn, 1995).
4. ***Hypothesis Testing*** – Articles that introduce and then test research hypotheses or propositions (Carter and Ellram, 2003, 31).

When the initial review of the theses was performed, there were eleven theses recorded in the methodology review category. In order to provide more meaningful statistical analysis of the results for this question, the categories of literature review and methodology review were combined. Once the classification of each thesis was done, the data was compiled to show how many theses were assigned to each category. Then the researcher examined the type of research data over five ten-year periods, starting from 1955 – 1964 and ending at 1995 – 2004. Finally, a Chi-Square Test was conducted to determine if there were any significant differences across time periods.

**Investigative Question 5.** What type of research design was used in each thesis?

This question addresses the type of research design used in the theses. In order to conduct a more in-depth analysis on the type of research designs used in thesis research, the model implemented in the Carter and Ellram (2003) study was used rather than the model presented in the Das and Hanfield (1997). The Das and Hanfield (1997) study classified research designs into only three categories (survey, case, secondary). The Carter and Ellram (2003) study was a more in-depth model by presenting seven categories for research design that are listed below. This investigative question was answered by reading the abstract and the methodology section of each thesis individually. Once the researcher gained an understanding about the type of research design implemented in the thesis, the type of research design list was reviewed to determine which type of research design was utilized in the thesis and the thesis was classified appropriately. The type of research design is broken down into seven categories.

1. **Survey** – “The researcher poses a series of questions to willing participants; summarizes their responses with percentages, frequency counts, or more sophisticated statistical indexes; and then draws inferences about a particular population from the responses of the sample” (Leedy and Ormrod, 2000, 196).
2. **Case Study** – “A type of qualitative research in which in-depth data are gathered relative to a single individual, program, or event, for the purpose of learning more about an unknown or poorly understood situation” (Leedy and Ormrod, 2000, 114).
3. **Interviews** – “An interchange of views between two persons conversing about a theme of mutual interest (Kvale, 1996, 2)”
4. **Archival Study** – “A systematic body of theory that supports the practice of appraising, acquiring, authenticating, preserving, and providing access to recorded materials (The Society of American Archivists, 2004).”
5. **Experiment** – “A study in which participants are randomly assigned to groups that undergo different experimental treatments, followed by observations or measurements to assess the effects of the treatments” (Leedy and Ormrod, 2000, 114).
6. **Simulation** – “Use a computer to evaluate a model numerically (Law and Kelton, 1999, 1).”
7. **Mathematical Modeling** – “Models that mimic reality by using the language of mathematics (Bender, 1978, 1).”

Once the classification of each thesis was done, the data was compiled to show what percent of the theses were assigned to each category. Then the researcher



examined the type of research data over time to determine if any trends were evident in the data. The data was examined over five ten-year periods, starting from 1955 – 1964 and ending at 1995 – 2004. Finally, a Chi-Square Test was conducted to determine if there were any significant differences across time periods.

**Investigative Question 6.** What type of data analysis techniques were used in each thesis?

This question addresses the type of data analysis techniques that were performed in the theses written at AFIT pertaining to contracting. In order to create an adequate list of data analysis techniques, the models done by Carter and Ellram (2003) and Das and Hanfield (1997) were combined to cover the data analysis techniques used for AFIT thesis research. The categories that were in both models included means testing, regression, ANOVA/MANOVA, factor analysis, and an “other” category. For this study, factor analysis was incorporated in the “other” category. In order to get a better understanding of the data analysis techniques used in this study, three more categories were included, modeling/simulation from Das and Hanfield (1997) and descriptive statistics and anecdotal evidence from Carter and Ellram (2003). This investigative question was answered by reading the abstract, the methodology section, and the data analysis and results section of each thesis individually. Once the researcher gained an understanding about the type of data analysis technique implemented in the thesis, the type of data analysis technique category list was reviewed to determine which type of data analysis technique was utilized in the thesis, and the thesis was classified appropriately. If a thesis contained more than one data analysis technique, then each technique was counted. This brought the total amount of data collected in this

investigative question to 440. The type of data analysis technique is broken down into seven categories.

1. ***Descriptive Statistics (C&E)*** – “This type of research involves either identifying the characteristics of an observed phenomenon or exploring possible correlations among two or more phenomena” (Leedy and Ormrod, 2000, 191).
2. ***Modeling/Simulation (D&H)*** – “Data are gathered in order to estimate the desired true characteristics of the model (Law and Kelton, 1999, 1).”
3. ***Means Testing (C&E)*** – “To determine whether a statistically significant difference exists between two means” (Leedy and Ormrod, 2000, 278).
4. ***Regression (D&H)*** – “To examine how effectively one or more variables allow(s) you to predict the value of another (dependent) variable” (Leedy and Ormrod, 2000, 278).
5. ***Analysis of Variance (ANOVA)/Multiple Analysis of Variance (MANOVA) (D&H)*** – “To look for differences among three or more means by comparing the variances both within and across groups” (Leedy and Ormrod, 2000, 278).
6. ***Anecdotal Evidence*** – Evidence which consists of information derived from subjective reports or observations.
7. ***Other (D&H)*** - This category includes any data analysis that was performed in a thesis that did not fall under the previous categories defined regarding data analysis techniques.

When the initial review of the theses was performed, the category with the highest frequency was the “other” category with 196 out of the 435 total theses (45%). In order

to get a better understanding about the type of data analysis techniques that were being utilized in the AFIT thesis research, all theses in the “other” category were rescrutinized and the categories for data analysis technique were reconfigured. An anecdotal evidence category was created. Since there were very few accounts of factor/cluster analysis being used in the AFIT thesis research, this particular category was deleted and all the factor/cluster analysis counts were included in the “other” category. After this subsequent analysis, the “other” category was reduced to 72 out of the total 435 theses (16%).

Once the classification of each thesis was done, the data was compiled to show how many theses were assigned to each category. Then the researcher examined the type of data analysis technique over time to determine if any trends were evident in the data. The data was examined over five ten-year periods, starting from 1955 – 1964 and ending at 1995 – 2004. Finally, a Chi-Square Test was conducted to determine if there were any significant differences across time periods.

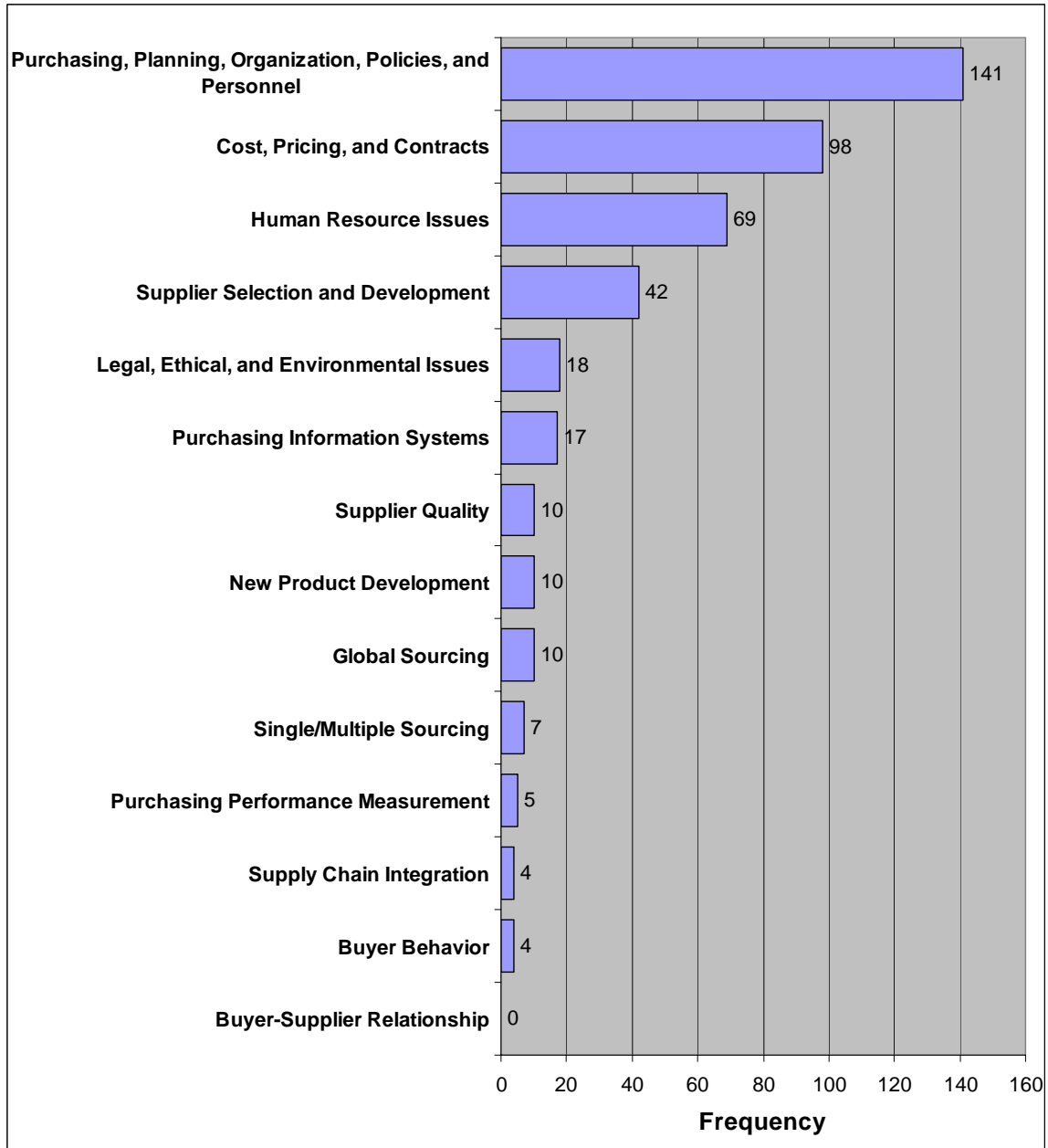
### **III. Data Analysis and Findings**

This chapter presents the analysis of the data collected according to the methodology presented in chapter two, to answer the investigative questions presented in chapter one. The analysis of the data followed generally Carter and Ellram (2003). The analysis performed by Carter and Ellram (2003) was more easily understandable than the meta-analysis performed by Das and Hanfield (1997). A reader who was less informed on analysis techniques would have an easier time reviewing the analysis technique performed by Carter and Ellram (2003). The analysis is presented for each investigative question in turn. Because investigative questions one and two were answered in chapters one and two respectively, this chapter begins with investigative question three.

#### **Investigative Question 3.**

*What subject category does each thesis address?*

A content analysis was performed, assigning each thesis to a specific category that best illustrated its main focus. Figure 1 shows the number of articles assigned to each subject category, in descending order. The largest number (142) of AFIT theses focused on the subject of purchasing planning, organization, policies, and personnel, and the second largest number (98) addressed issues of cost, pricing, and contracts. Both human resources (69) and supplier selection and development (42) also received significant coverage. Most other categories had comparatively few theses. Interestingly, no theses were written on Buyer-Supplier Relationships.

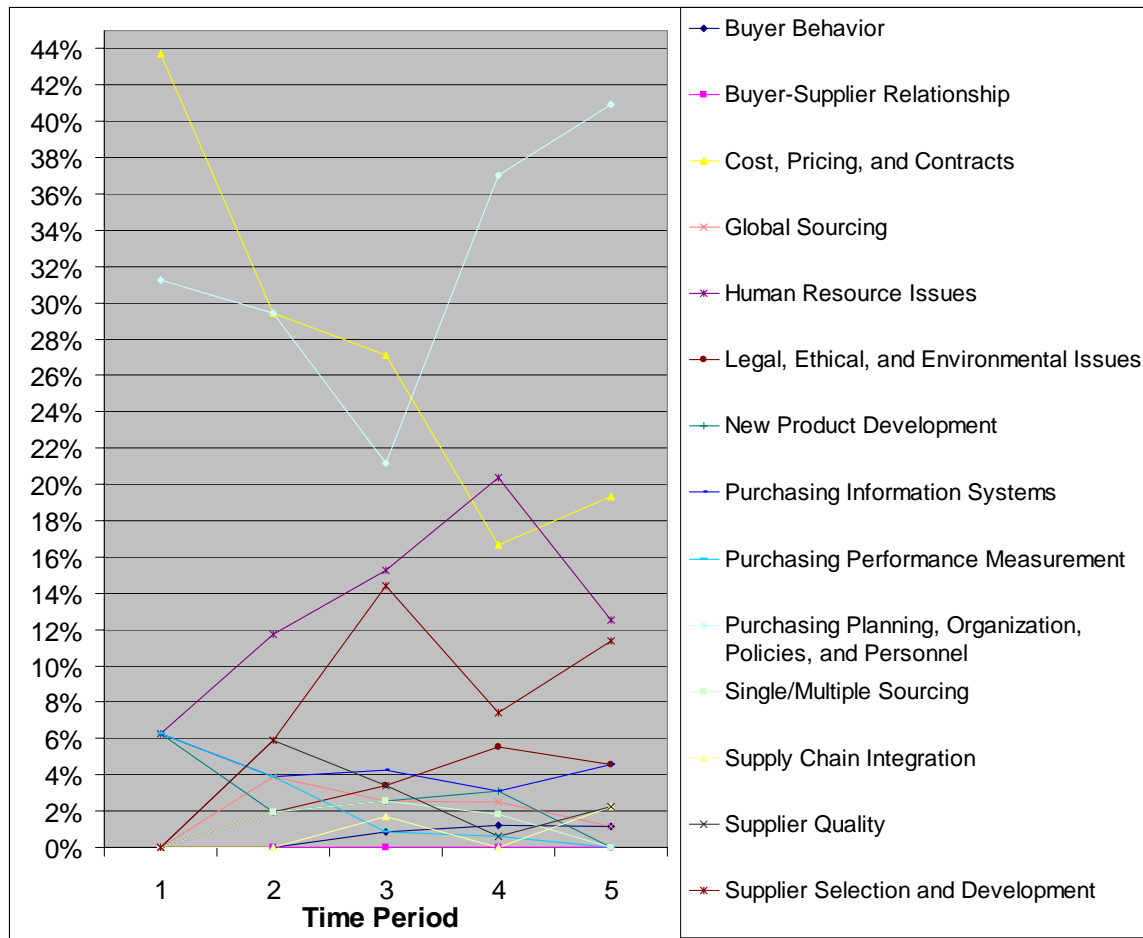


**Figure 1 – Frequency of Subject Categories**

The researcher also examined the subject category data over time to determine if any trends were evident in the data. Figure 2 shows the data over 5 ten year periods, starting from 1955 – 1964 and ending at 1995 – 2004. While the most common subject category is purchasing planning, organization, policies, and personnel, 86 percent of

these theses were written during the past 30 years. There seemed to have been a strong emphasis put on human resource issues during 1975 – 1994, accounting for over 73 percent of the human resource issues theses were written. Legal, ethical, and environmental issues seems to be a subject category with increasing interest. More than 94 percent of the legal, ethical, and environmental issues theses were written between 1975 - 2004. Eighty percent of new product development theses were written during 1975 – 1994. The category of cost, pricing, and contracts drew the most interest from 1955 – 1984, then gradually decreased from 1985 – 2004.

Purchasing planning, organization, policies, and personnel seemed to be the only subject category that was addressed consistently throughout the entire 50 years of AFIT thesis research. The only subject category that decreased in interest over the entire 50 year period is purchasing performance measurements. Cost, pricing, and contracts has also seen a decline throughout most of the past 50 years; however, it has seen a slight increase in interest over the most recent 10 years. There has also been less interest recently in new product development since no theses were written on this topic during the time period of 1995 - 2004. A Chi-square test was not conducted for subject categories used across time periods because the results were not amenable to statistical analysis.

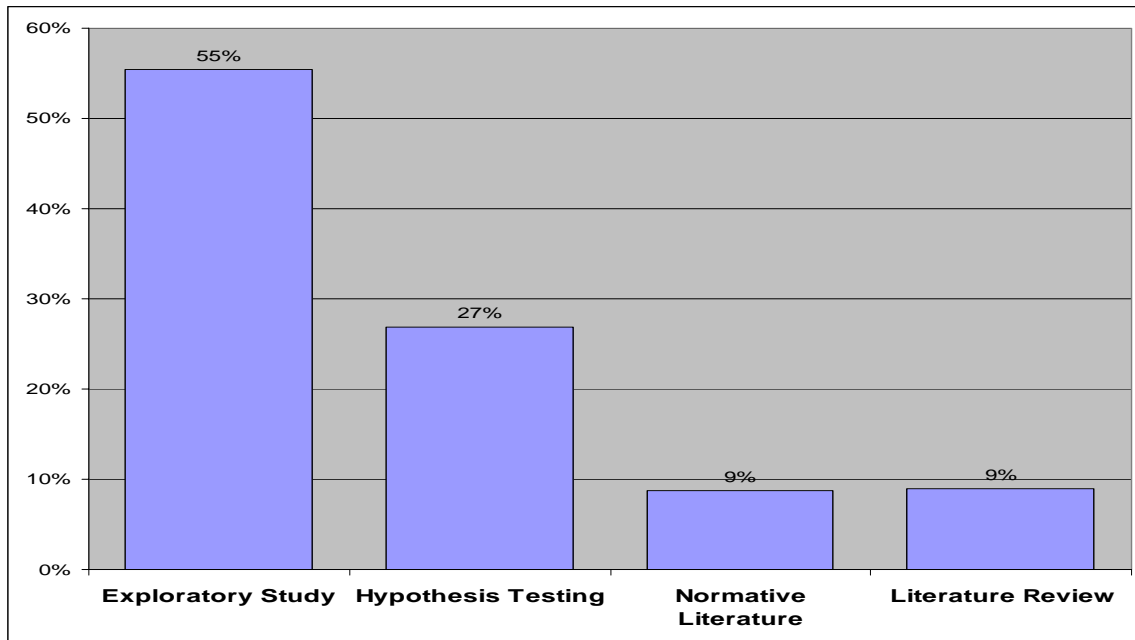


**Figure 2 – Subject Category by Time Period**

#### **Investigative Question 4.**

*What type of research was performed in each thesis?*

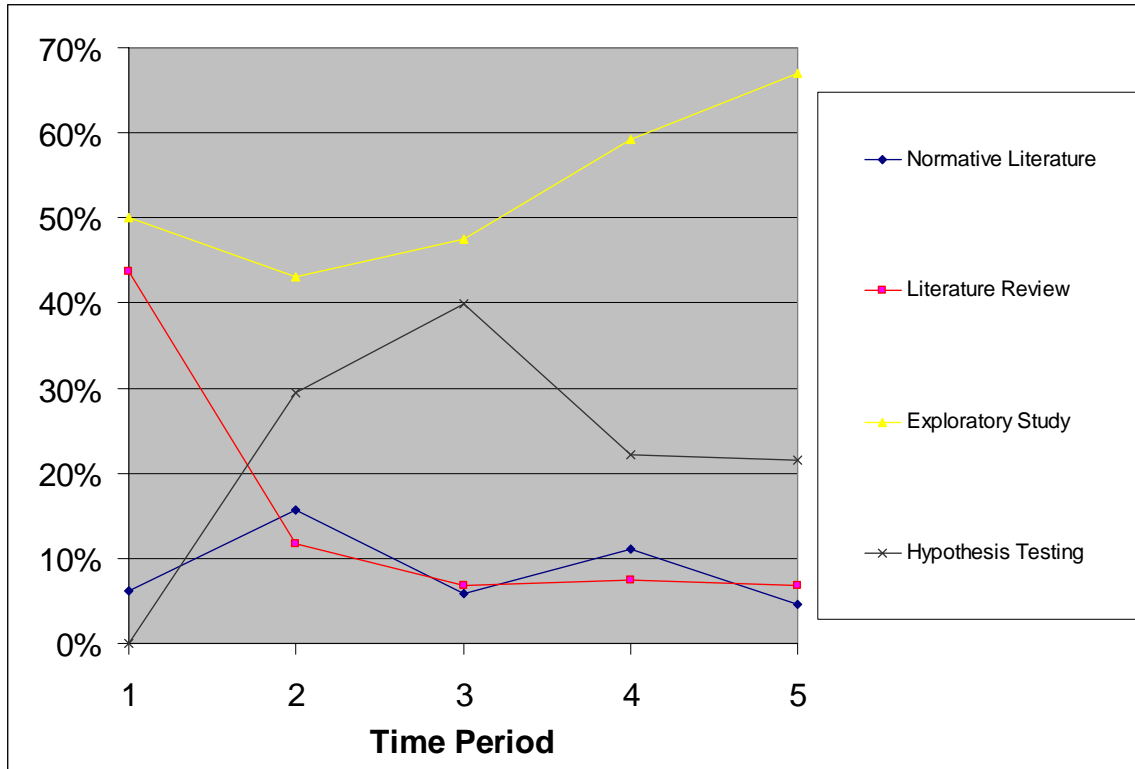
During the data collection, each thesis was classified according to the type of research that was performed. Figure 3 shows the percentage of articles assigned to each type of research category. Fifty-five percent of the theses conducted exploratory studies, followed by hypothesis testing at twenty-seven percent. There was comparatively little use of either normative literature or literature and methodology reviews in the theses analyzed.



**Figure 3 – Percentage of Type of Research Performed**

The researcher also examined the type of research data over time to determine if any trends were evident in the data. Figure 4 shows the data over five ten-year periods, starting from 1955 – 1964 and ending at 1995 – 2004. Overall, it seems as though the exploratory study research method is the most popular type of research used throughout each time period. The use of exploratory research has gradually increased from 1965 – 2004. The use of hypothesis testing peaked during 1975 – 1984. Then the use of hypothesis testing decreased from 1985 – 1994. Literature and methodology reviews were popular in 1955 – 1964, but after that time period, the use of literature and methodology reviews declined dramatically. The only type of research that saw little fluctuation from 1955 – 2004 was methodology review. The use of this type of research was never greater than six percent in any given period.





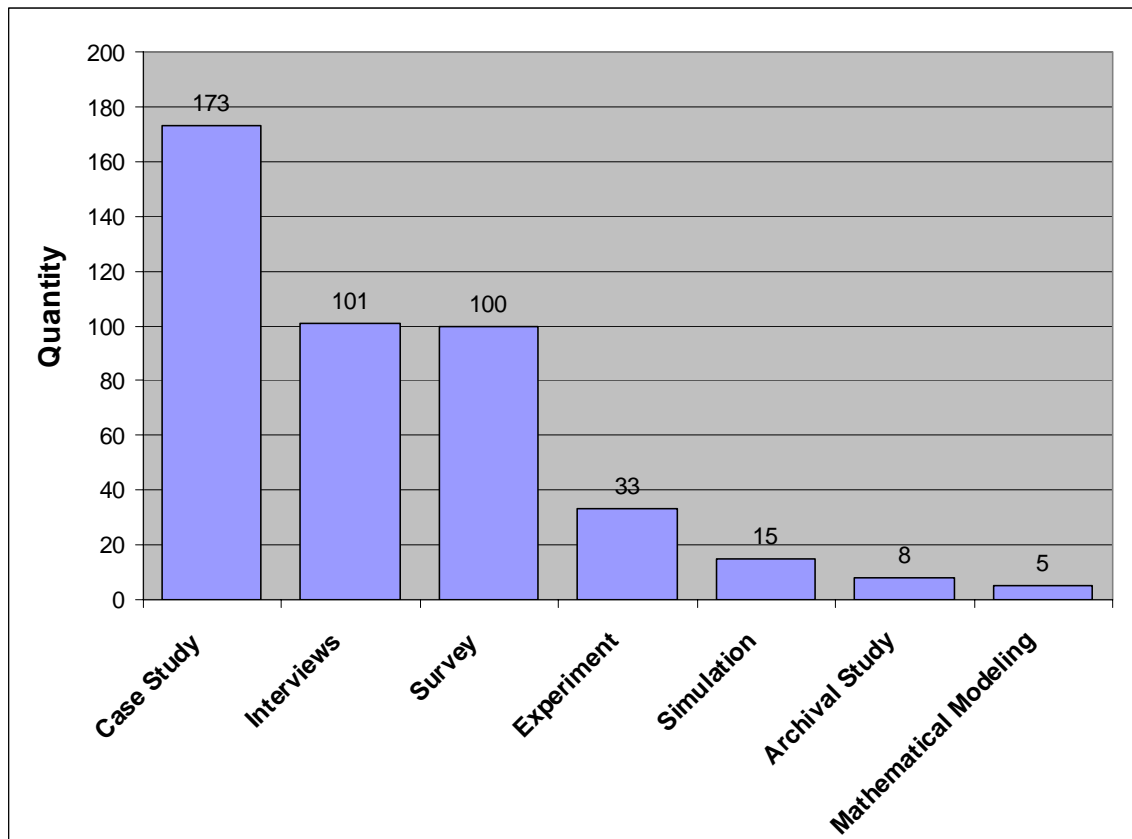
**Figure 4 - Type of Research by Time Period**

A Chi-square test was conducted to determine if there were any significant differences for the type of research used across time periods. This test was conducted using a significance level of  $\alpha = .05$ . The type of research used in the AFIT research study shows a statistically significant change over time ( $p < .0001$ ). This is also evident in Figure 4 above. The use of the different types of research over time has changed significantly. Exploratory studies increased over time while there was a significant decrease in literature reviews over time. The only type of research used that seemed consistent over the 50 years of AFIT research was exploratory studies. This type of study was always greater than 40 percent in every time period. While the results of the chi-square analysis are potentially suspect due to the cells with fewer than five, they tend to support the graphical analysis which suggests trends in various research designs.

### Investigative Question 5.

*What type of research design was used in each thesis?*

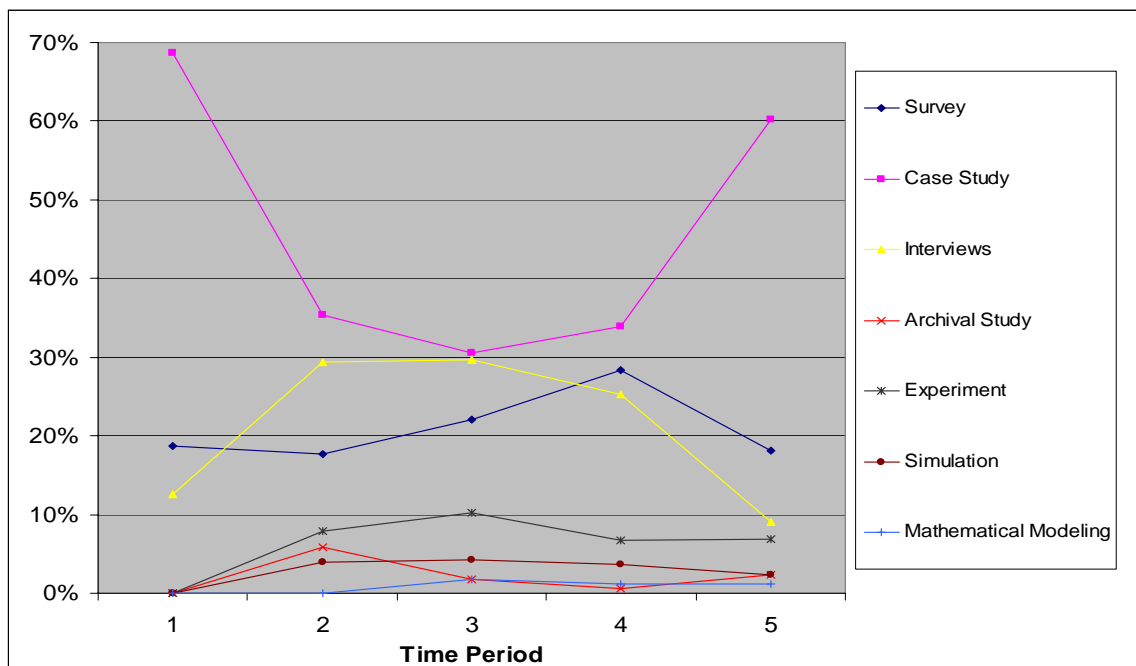
During the data collection, each thesis was classified according to the type of research design used. Figure 5 shows the number of theses assigned to each type of research design. The most frequently applied types of research design were case study, survey, and interviews, respectively. These three types of research design accounted for over 80 percent of the theses reviewed.



**Figure 5 – Quantity of Type of Research Design**

The researcher also examined the type of research data over time to determine if any trends were evident in the data. Figure 6 shows the data over 5 ten year periods, starting from 1955 – 1964 and ending at 1995 – 2004. Two trends that seems to be

evident over time is the gradual decline, then increase of case study research design and the gradual increase and then decrease of the interview research design. It may be possible that these two trends are related. The lowest point of the case study research design and the highest point of the interview research design are during 1975 – 1984. From 1955 – 1974, case studies are decreasing and interviews are increasing. From 1985 – 2004, case studies increase and interviews decrease. The use of interviews peaked from 1965 – 1974 and saw its lowest usage from 2000 – 2004. Case studies were most popular in 1955 – 1964 with its lowest usage from 1965 -1974. The presence of a survey research design increased from 1965 – 1994. Then there was a dramatic decrease in the use of survey design from 1995 – 2004. There was a rise in the use of experimental designs from 1955 – 1984 and then usage dropped off to stay fairly constant from 1985 – 2004. Mathematical modeling, archival study, and simulation stayed relatively constant of the 50 year time period and were not a popular type of research design.



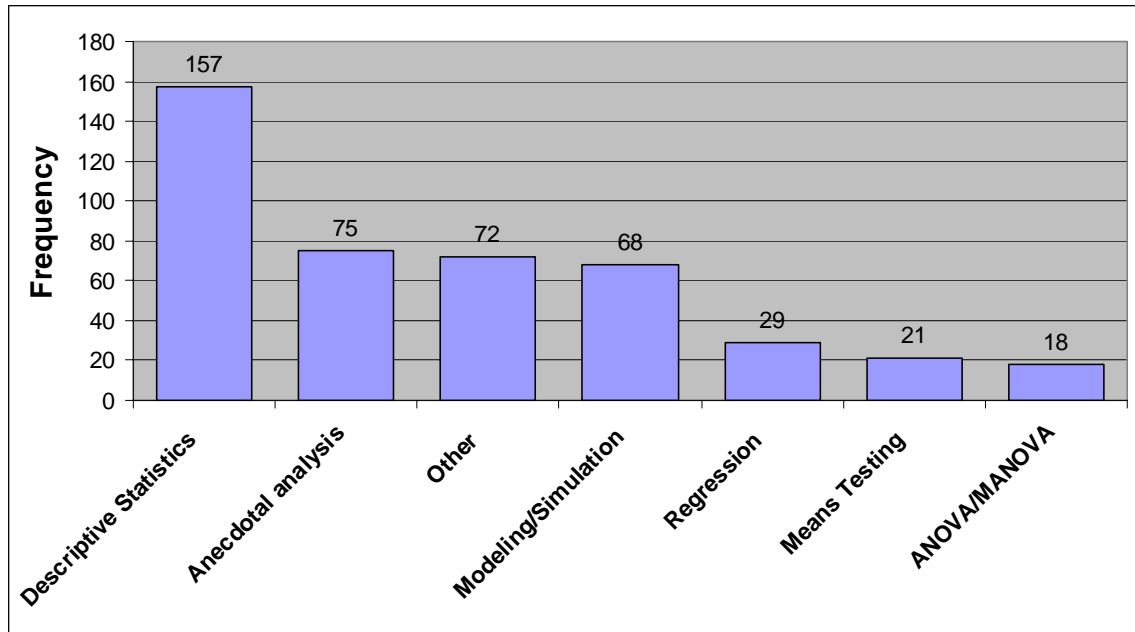
**Figure 6 – Type of Research Design by Time Period**

A Chi-square test was conducted to determine if there were any significant differences for the type of research designs used across time periods. This test was conducted using a significance level of  $\alpha = .05$ . The type of research design used in the AFIT research study shows a statistically significant change over time ( $p = .0044$ ). This is also evident in Figure 6 above. The use of the different types of research design over time has changed significantly. Case studies and interviews had dramatic increases and decreases over time. While the results of the chi-square analysis are potentially suspect due to the cells with fewer than five, they tend to support the graphical analysis which suggests trends in various research designs.

#### **Investigative Question 6.**

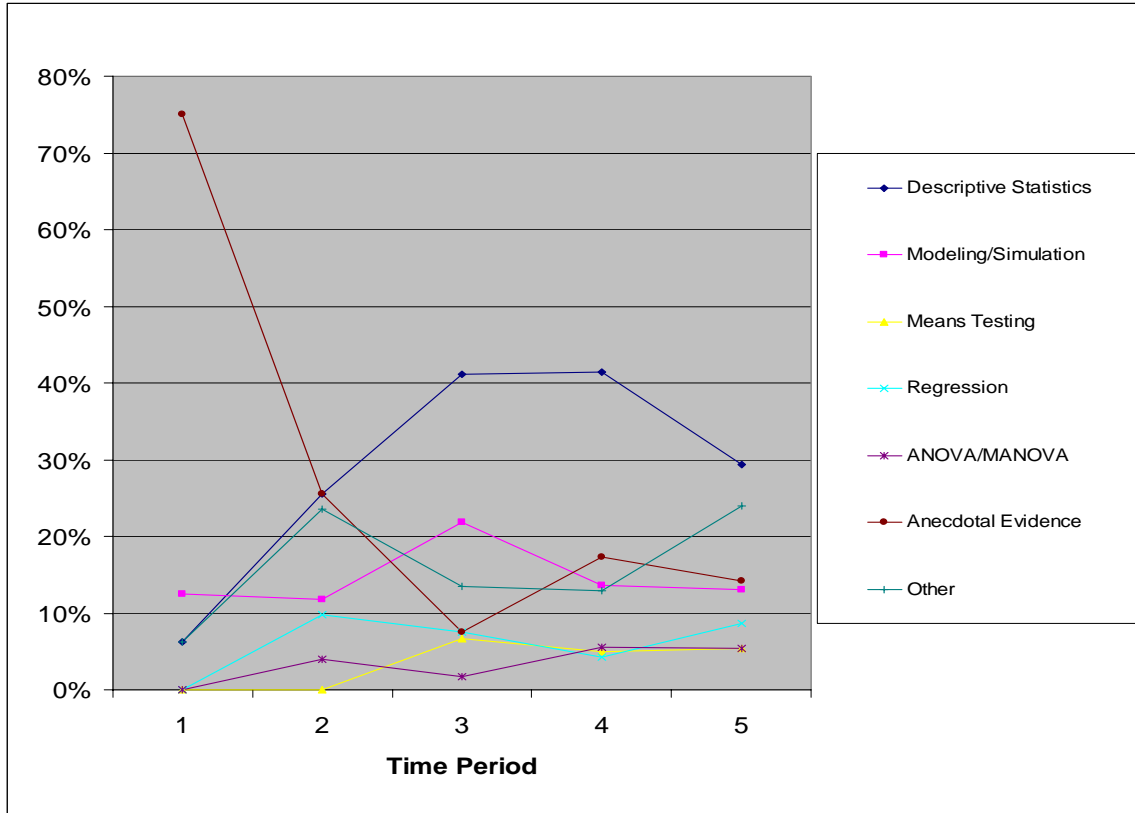
*What types of data analysis techniques were used in each thesis?*

During the data collection, each thesis was classified according to the type of data analysis technique that was performed. Figure 7 shows the number of theses assigned to each data analysis technique. The most commonly used method of data analysis technique was descriptive statistics (36%), followed by anecdotal evidence (18%), “other” (16%), and modeling/simulation (15%). These four techniques were used in over 85 percent of the theses reviewed. Regression, means testing, and ANOVA/MANOVA were much less commonly used. The “other” category consisted of data analysis techniques that did not fall into the other six categories. Examples of data analysis techniques included in the “other” category are content analysis, the Delphi study, and other various data analysis techniques.



**Figure 7 – Frequency of Type of Data Analysis Technique**

The researcher also examined the type of data analysis technique over time to determine if any trends were evident in the data. Figure 8 shows the data over five ten-year periods, starting from 1955 – 1964 and ending at 1995 – 2004. The use of anecdotal evidence dominated thesis research from 1955 – 1974. Descriptive statistics increased greatly from 1965 – 1984 with a decline in use from 1994 – 2004. There was a significant use of modeling and simulation from 1975 – 1984, followed by a drop 1985 – 2004. Regression was introduced from 1965 – 1974 and then saw a decline in usage from 1975 – 1994 with a resurgence from 1995 - 2004. Means testing appeared during the time period of 1975 – 1984 and slowly declined from 1985 - 2004. The use of ANOVA/MANOVA was most popular from 1994 - 2004. The “other” category was greatest during 1965 – 1974 and 1995 – 2004.



**Figure 8 – Type of Data Analysis Technique by Time Period**

A Chi-square test was conducted to determine if there were any significant differences for the type of data analysis techniques used across time periods. This test was conducted using a significance level of  $\alpha = .05$ . The type of data analysis techniques used in the AFIT research study shows a statistically significant change over time ( $p < .0001$ ). This is also evident in Figure 8 above. There were significant changes over the 50 years of AFIT research in the use of anecdotal evidence and descriptive statistics. There were three data analysis techniques that were consistent across time periods. The use of regression, means testing, and ANOVA/MANOVA analysis techniques were used less than 10 percent of the time during each time period.

This chapter presented the analysis of investigative questions three through six. The analysis consisted of both descriptive techniques and trend analyses to interpret the data collected. Chapter 4 discusses conclusions drawn from the analysis, limitations from the research, and suggestions for further study.

## **IV. Conclusions and Recommendations**

### **Introduction**

This chapter summarizes the results of the thesis. First, this chapter uses the analysis done in the previous chapter to draw conclusions. Next, it discusses the limitations of the results of the analysis. Finally, it makes suggestions for further study.

### **Conclusions from analysis**

The research done in this thesis provides a basis for the following conclusions. First, the topics researched at AFIT appear consistent with the practices of the Air Force in the contracting community. The most popular topic in AFIT thesis research is purchasing planning, organization, policies, and personnel. There has always been an emphasis on improving purchasing strategy and reviewing policy in the Air Force and the amount of AFIT thesis research is commensurate with the importance the Air Force places on this area. The research conducted at AFIT does an adequate job of researching personnel issues through human resource issues. Approximately 16 percent of the theses written throughout the 50 years at AFIT pertain to human resource issues. One important focus of the contracting community is to ensure that the personnel are properly trained and well equipped to perform duties. One area that AFIT research lacks is purchasing performance measurement to determine if the contracting community personnel are performing their duties effectively. The area of performance measurements is a critical component to creating success within the commercial sector. Lambert (2004) believes that individual performance measures must be tied to the specific objectives required to improve profitability and shareholder value. Legal, ethical, and environmental issues are



becoming more popular thesis research topics. The increase might be due to the increased awareness of environmental issues in the United States.

The AFIT thesis research did not focus on some topics that are researched in the commercial market. There is no emphasis in AFIT research on buyer-supplier relationships and little emphasis on supply chain integration. Currently, these are two topics that have drawn a large amount of attention from the commercial community because of the possible improvements these topics could provide for commercial businesses. “In this emerging competitive environment, the ultimate success of the single business will depend on management’s ability to integrate the company’s intricate network of business relationships” (Lambert, 2004). The Air Force is putting more emphasis on utilizing the benefits of purchasing and supply chain management used in the commercial sector. The Office of the Assistant Secretary of the Air Force for Acquisition (SAF/AQC) procurement transformation division stresses exploiting technology and industry best practices to enhance education and training (SAF/AQC, 2005). This research would almost certainly include topics that have not been addressed through AFIT research, such as supply chain integration, single/multiple sourcing, and buyer-supplier relationships.

Another topic that has been stressed by Defense Secretary, Donald Rumsfeld, is transformation. “This is the time to press forward with transformation in our nation’s defenses” (OFT, 2004). Transformation, it is hoped, will allow the DoD to create and sustain weapon systems more efficiently and effectively using acquisition techniques such as evolutionary acquisition and spiral development. The research conducted at AFIT does not adequately reflect the importance that is put on acquisition transformation.

In order to be successful in acquisition transformation, research needs to be conducted to determine the best and most effective ways to transform the acquisition process within the military.

Strategic purchasing is another important topic in the contracting community. One example of this is the creation of commodity councils to purchase products and services at a discounted rate through ordering large quantities. There is a good amount of research done at AFIT pertaining to purchasing and planning. Approximately 32 percent of the theses written at AFIT pertain to purchasing planning, organization, policies, and personnel.

The AFIT thesis research was also very consistent during the past fifty years in which type of research was performed. Most AFIT thesis research that was done focusing on the contracting community consisted of exploratory studies and hypothesis testing. This is consistent with the research conducted at AFIT. Most of the theses at AFIT go beyond reviewing literature and creating assumptions and hypotheses from theoretical argument. The research at AFIT is more focused on exploratory studies and hypothesis testing.

There was also a common trend discovered through the research regarding the type of research design. The AFIT theses analyzed showed that the majority of the research is designed to collect information through case studies, surveys and interviews. The AFIT thesis research concerning the contracting community usually focuses on addressing and improving issues within the community; gathering information from current practitioners through interviews and/or surveys is obviously an important approach.

**Limitations of the study**

There were certain limitations in the research conducted. The research conducted was done on only the theses written at AFIT pertaining to the contracting community. By no means does this study represent all of the thesis research done regarding the contracting community. This research did not take into account the research that is done by the Naval Postgraduate School and other schools that could possibly contribute to the contracting community. While an extensive search identified 435 theses that were subsequently analyzed for this study, the possibility remains that some theses written at AFIT were overlooked. Additionally, the classification of each thesis was subjective. Another limitation to the research was the use of one coder. It would be more appropriate for future similar to use multiple coders to decrease the amount of subjectivity used in classifying the theses.

**Suggestions for further study**

The data analyzed from this thesis has created a baseline that suggests there a few possible areas for further study. The Air Force is emphasizing the importance of incorporating best commercial practices into the contracting community. More research needs to be conducted on supply chain management issues. Currently some difficulties exist within the contracting community concerning the poor relationships between customers and suppliers. This includes relationships between the government and contractors and the Air Force contracting function and its customers. There has been no research at AFIT done regarding buyer-supplier relationship and only four theses were written pertaining to supply chain integration. Research focusing on supply chain

integration and buyer-supplier relationship could help alleviate some of the difficulties that are encountered in customer-supplier relationships.

Another possibility for further study is new product development. More thesis research that focuses on new product development could perform a great service to the acquisition community. The acquisition community is attempting to make the process for developing new weapon systems more efficient and effective through acquisition transformation. This includes utilizing acquisition techniques such as evolutionary acquisition and spiral development. Research should be conducted to determine if the current acquisition techniques being used are implemented correctly and determine if they are more useful than the previous acquisition techniques that they replaced.

The termination of contracting graduate programs at AFIT marked an appropriate point for a retrospective study of graduate contracting education at AFIT. Through this study it was discovered that the majority of the contracting research conducted at AFIT pertained to purchasing planning, organization, policy, and personnel. There has been little research done on commercial purchasing issues such as buyer-supplier relationship and supply chain integration. The majority of the research done was in exploratory study format using mostly case studies, interviews, and surveys as the research design to collect the data. The most popular form of data analysis technique used was descriptive statistics followed by anecdotal evidence.

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## **Vita**

Captain Thomas M. Clohessy graduated from Glenbard East High School in Lombard, Illinois. He entered undergraduate studies at the University of Illinois in Champaign/Urbana, Illinois where he graduated with a Bachelor of Science degree in Business Administration in May 1999. He was commissioned through the Detachment 190 AFROTC at the University of Illinois where he nominated for a Regular Commission.

His first assignment was at the 39<sup>th</sup> Contracting Squadron, Incirlik AB, Turkey as a contracting specialist in August 1999. In November 2000, he was assigned to the 48<sup>th</sup> Contracting Squadron, RAF Lakenheath, England where he served as contracting specialist. In October 2002, he was assigned to the 48<sup>th</sup> Operations Support Squadron, RAF Lakenheath, England where he served as Battlestaff Executive Officer and Combat Plans Officer. In September 2004, he entered the Graduate School of Engineering and Management, Air Force Institute of Technology. Upon graduation, he will be assigned to Bolling AFB, Washington D.C.

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