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ANALYTICAL TECHNIQUES AND THE AIR FORCE LOGISTICS READINESS OFFICER

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ABSTRACT

As the Air Force implements the Expeditionary Combat Support System (ECSS), it is imperative that Air Force logisticians competently analyze logistics data. This exploratory study sought to determine which analytical skills are useful for Logistics Readiness Officers (LROs), as reported by active-duty LROs and their supervisors. The research question was answered through a comprehensive literature review and the use of survey methodology. Analysis of survey responses found that Forecasting, Graphical Statistics and Descriptive Statistics are the analytical techniques valued most. The survey also identified a potential gap between perceived usefulness and competence levels. These findings were similar to what has been found in the civilian sector.

INTRODUCTION

In 2002, three separate Air Force logistics-related officer career fields (Supply, Transportation, and Logistics Plans) merged to form the new Logistics Readiness Officer (LRO) career field. In the past, logistics officers were "stove-piped" by design. That is, assignments during their career would primarily focus on applying their specialized knowledge to one of the aforementioned logistics categories. Today, the logistics readiness officer may perform duties in any of the previously mentioned positions in addition to managing acquisition and wholesale logistics, support agreements, war reserve materiel management, or base-level fuels operations.

Along with the career field merger, LROs have also adapted to an increasingly expeditionary force. The ongoing military actions in Iraq and Afghanistan have ensured that today's LRO is far more likely to deploy than their pre-9/11 predecessors. As such, new training for LROs has focused more on training the logistician technically than on educating the logistician academically.

In 2010, the Air Force plans to establish initial operating capability for the Expeditionary Combat Support System, an enterprise resource planning system that will be used extensively by Air Force logisticians. As logistics information becomes more readily available to logistics managers and practitioners, it will be imperative that Air Force logisticians are equipped with a set of analytical tools to make the best possible use of the information available.

The focus of this research is to specifically determine which analytical tools are the most useful for the active-duty Air Force LROs in the ranks of 2nd Lieutenant (O-1), 1st Lieutenant (O-2), Captain (O-3), Major (O-4), and Lieutenant Colonel (O-5). While previous research has examined the

value of statistics training in the commercial logistics industry (Parker, Kent and Brown, 2001) and the perceived training transfer of LRO technical school (Hobbs, 2005), no specific academic research has been published regarding analytical skills needed by the LRO.

LITERATURE REVIEW

AF LRO Training

In 2002, the release of the first-ever LRO Career Field Education and Training Plan (CFETP) accompanied the creation of the LRO career field. The CFETP was intended to guide the way in which LROs received training. Both the 2002 CFETP and its 2005 update state it is the document used to "plan, manage and control training" within the career field (Department of the Air Force, 2002; 2005).

As the Air Force continued to adapt to the ever-changing expeditionary and fiscal environment, the Air Force transformation office (HQ AF/A4I) compared the different curriculums offered to the Logistics Readiness career field. Study recommendations included the continued development of a sustainment curriculum portfolio for the LRO career field (Department of the Air Force, 2007). The portfolio consists of several AFIT online courses including Enterprise Resource Planning and Activity-Based Costing.

Industry Training Literature

Academic literature has shown that knowledge of statistics is perceived to be valuable within business schools (Parker, Pettitjohn and Keillor, 1999) and among leaders of the transportation and logistics industry (Parker, Kent and Brown, 2001). Parker, Pettitjohn and Keillor (1999) found that at least 90% of undergraduate business schools required either one or two statistics classes, some of which were taught at the graduate level (Parker, Pettitjohn and Keillor, 1999).

Parker, Kent and Brown (2001) found that 86% of logistics and transportation executives considered statistics to be either supportive or critical to their operations. Furthermore, they found that there were five statistics techniques in particular that were considered most important: Probability, Sampling, Averages, Graphics, and Quality. These techniques considered important by industry leaders were different from those that were most commonly taught at the university level – descriptive statistics, probability distribution, hypothesis testing, and tables and charts (Parker, Pettitjohn and Keillor, 1999).

What should be done with this disconnect between what universities teach and what industry leaders consider important? One recommendation proposed by Parker, Kent and Brown (2001) was for education and industry leaders to communicate with one another to ensure that education providers are teaching the statistics techniques that are needed by industry. A second option would be for academics to proactively survey industry needs on their own and then modify their program curriculum to assure needs are being served.

The Importance of Analysis Within the Organization

Davenport (2007) studied 32 organizations that had made a commitment to quantitative, fact-based analysis including Amazon, Netflix and the Boston Red Sox. Three common traits of these successful organizations include widespread use of modeling and optimization, an enterprise approach, and senior executive advocates. Davenport points out that an organization wishing to compete on analytics must be willing to invest significantly in technology, accumulate massive stores of data and formulate company-wide strategies for managing data. As the Air Force invests significantly in technology and data storage through the Expeditionary Combat Support System (ECSS), it is especially important that it also formulates these strategies for managing data. Davenport (2007) notes that as an organization that competes on analytics, employees will require extensive training.

They need to know what data are available and all the ways the information can be analyzed; and they

must learn to recognize such peculiarities and shortcomings as missing data, duplication, and quality problems (Davenport 2007).

The following methodology works toward the purpose of examining the analytical knowledge needs of Air Force LROs and communicating these needs to those Air Force leaders who can guide career development.

METHODOLOGY

Procedures

Though no previous study has explored analytical skills and the LRO, many elements of the research are similar to those used by Parker, Kent and Brown (2001). Research began by identifying specific analytical skills which may be useful for the LRO. Items used by Parker, Kent, and Brown (2001) in their survey were included in a bank of potentially useful analytical skills for the LRO. A list of other statistics tools and a short description of each technique was compiled by consulting several statistics textbooks (Dixon and Massey, 1983; Devore and Peck, 2001; Field, 2005; and McClave, Benson, and Sincich, 2005).

Additionally, several quantitative and management textbooks were referenced to include other quantitative analytical techniques not categorized as statistics (Makridakis, Wheelwright, and Hyndman, 2003; Banks et al., 2005; Ragsdale, 2007). A list of 20 analytical tools was compiled from these sources along with a 4- to 16- word description of each technique (Table 1).

Two surveys were then developed. The first survey was designed to be answered by active-duty LROs in grades O1-O5. The second survey was designed to be answered by their supervisors. Both surveys were made up of four sections. The first collected basic demographic information, such as rank, major command (MAJCOM), and deployment history. The second section asked respondents to gauge their own degree of familiarity with each of the 20 analytical techniques. For LROs, the third section asked respondents to mark each of the analytical techniques they believe to be useful in their current position. For supervisors of LROs, the third section asked respondents to mark each of the analytical techniques they believe to be useful for the LROs they currently supervise. The fourth section asked respondents to assign a score on a scale of 1-10 for each analytical technique based on how useful they believed the technique is in the LRO position they fill or supervise (0=Not Familiar with the Technique; 1=Not At All Useful; 10=Absolutely Necessary to Perform Duties). For all sections of the survey which asked about analytical techniques, the 4- to 16- word description of each technique was written next to the technique name.

Each 65-item survey was developed with the guidance of an experienced academic professional familiar with survey-building procedures. The surveys were approved by the sponsoring office, converted into a web-based format and pilot tested among a small group of logistics officers for the purpose of gathering feedback. The first survey was developed for LROs to report which techniques they believed would be useful in the positions in which they are currently assigned. The second survey was developed for supervisors of LROs to report which analytical techniques they believed were important for the LROs who work for them.

A list of active-duty LROs in grades O1-O5, excluding those in student and special duty status, was obtained from the Air Force Personnel Center (AFPC). A similar list of LRO supervisors was not available due to computer system limitations. A survey invitation along with a link to the web-based survey was emailed to the 1,485 LROs. To gather data for the second survey, LROs were asked in their survey invitation to forward a copy of the invitation to their supervisors. After approximately 2 weeks, a follow-up email was sent to LROs requesting that they complete the survey.

TABLE 1
ANALYTICAL TECHNIQUES WITH DESCRIPTIONS

Title	Description
Descriptive Statistics	utilizing numerical and graphical methods to observe patterns, gather information and present information in a convenient form
Probability	logically determining likelihood of events
Statistical Sampling	proper data handling techniques
Estimating	parameters based on empirical data
Variation	measuring how data is dispersed
Averages	determining an expected value
Graphical Statistics	understanding pie charts, bar charts and histograms
Hypothesis Testing	a method for using sample data to decide between two competing claims about a population characteristic
Regression	explaining an output variable based on one or more inde pendent variables
Time-Series	observing trends and seasonality in viewing data in a time series
Forecasting	predicting future output values based on past trends or future independent variables
Quality	quantitatively assessing the quality of a good or service (e.g. Six Sigma)
Student's T-tests	comparing means between two groups
Analysis of Variance (ANOVA)	comparing means between three or more groups
Other Multivariate Techniques	comparing means multiple differences between groups
Decision Analysis	methods of evaluating alternatives based on selected criteria
Linear Programming	creating and solving optimization problems with linear objective functions and linear constraints
Simulation Techniques	imitating a real-world process or system over time
Queuing Theory	the study of waiting lines
Critical Path Method (CPM) / Program Evaluation and Review Technique (PERT)	developing and managing project schedules

Participants

Invitations were sent to 1,484 LROs, and, excluding Out-of-Office messages which specified that the respondent would return prior to the survey close date, 220 undeliverable, full mailbox, or invalid email address messages were received. Of the 1,264 LROs who had the opportunity to respond to the survey, 494 participated (excluding duplicate entries) for a response rate of 39.1%. The population size of LRO supervisors is unknown, but responses were received from a total of 85 participants.

Using methods described by Armstrong and Overton (1977), the researcher analyzed responses to both surveys for non-response bias. Armstrong and Overton (1977) propose that non-respondents are likely to respond most similarly to those who are last to return their completed surveys. The final wave of responses (N=124, 25%) from the first survey was compared with the first 370 responses. Likewise, responses from the last group of LRO supervisors to respond (N=28, 33%) were compared with the first group. For both surveys, no significant differences exist between mean responses of several selected items, and no non-response bias is believed to exist.

Methods

Percentages and mean score values for each technique were calculated, then differences were examined using the Wilcoxon rank-sum test for non-parametric independent samples. Because the data collected for these surveys is neither continuous nor normally distributed and because comparisons made for this research are between different groups of respondents, non-parametric independent sample tests are the appropriate method of analysis for measuring differences in these surveys (Field, 2005). JMP© statistical software calculated the rank sums and returned a significance value ($0<a<1$). Differences between means were considered significant at the 95% level ($a<.05$).

ANALYSIS OF RESULTS

All survey participants were asked to identify which of the 20 analytical skills they believed to be useful for their current position. Responses varied from 70.4% who identified Forecasting as a useful technique to only 10.5% who identified Student's T-tests as being useful. 5.7% of LROs believe that none of the listed techniques are useful. Most respondents identified Forecasting, Descriptive Statistics, Graphical Statistics, Averages, Quality, Probability, Time-Series and Decision Analysis as useful tools in their present position (Table 2).

TABLE 2
ALL LROS – PERCENT BELIEVE USEFUL

Technique	% Believe Useful
Forecasting	70.4%
Descriptive	70.0%
Graphics	68.8%
Averages	56.9%
Quality	53.6%
Probability	53.0%
Time Series	51.4%
Decision A	50.4%
Estimating	45.5%
Sampling	42.7%
Variation	34.4%
CPM	34.4%
Simulation	32.0%
Hypothesis Test	22.7%
Regression	20.2%
Queuing	17.0%
LP	15.4%
Other Multi V	12.8%
ANOVA	12.6%
Student T	10.5%
None Apply	5.7%

After identifying which techniques were useful in their present position, LROs assigned each technique a score from 1-10, (1 = Not at all Useful; 10 = absolutely necessary to perform duties). LROs gave the highest ratings to Graphical Statistics (7.44), Descriptive Statistics (6.77) and Forecasting (6.48) followed by Decision Analysis (6.05), Averages (6.02) and Quality (6.01). Results are listed in Table 3.

TABLE 3
ALL LROs – MEAN SCORES

Technique	Mean Score
Graphics	7.44
Descriptive	6.77
Forecasting	6.48
Decision A	6.05
Averages	6.02
Quality	6.01
Time Series	5.61
Probability	5.60
CPM	5.29
Estimating	5.24
Sampling	5.15
Simulation	4.67
Variation	4.53
Hypothesis T	4.17
Regression	3.85
LP	3.76
Queuing	3.49
Other Multi V	3.27
ANOVA	3.20

LRO's Views of Important Analytical Skills

An analysis was conducted based on company and field grade ranks. Second Lieutenants, 1st Lieutenants and Captains are Company Grade Officers (CGOs); Majors and Lieutenant Colonels are Field Grade Officers (FGOs). Of the LROs who responded to the survey, 272 (55.1%) are CGOs and 222 (44.9%) are FGOs (Table 4).

When asked to score each of the techniques, as shown in Table 4, both CGOs and FGOs rated Graphical Statistics, Descriptive Statistics and Forecasting as the most useful of the given analytical techniques to performing their duties. CGOs tended to score each individual technique higher than FGOs. Differences exist between perceived value of Probability, Simulation, Regression, ANOVA and Student's T-Test techniques. In each case, CGOs valued the technique higher than FGOs. Table 5 shows mean values for each category.

Further analysis was conducted to determine if LROs used analytical techniques differently based on their job classification. Data showed that 55.8% (829 of 1,485) of active-duty LROs are assigned to a Logistics Readiness Squadron, Aerial Port Squadron, Air Mobility Squadron or Contingency Response Wing. Respondents filling those operational positions equaled 56.7% (280 of 494). Responses of Operational LROs compared to others are shown in Table 6. Most respondents in both groups considered Forecasting, Descriptive Statistics, Graphics and Averages useful in their present position.

Some minor differences appear to exist between the two groups. In general, personnel assigned to an LRS or APS tend to score each technique higher. No significant differences exist between the highest scored items for both groups— Descriptive Statistics, Graphical Statistics and Forecasting. Higher scores from LROs assigned to an LRS or APS are statistically significant for Quality, Time Series, Critical Path Method, Simulation, Regression and Linear Programming (Table 7).

Company grade LROs are more likely to be assigned to operational units than field grade officers, and FGOs are more likely to be assigned to a staff position than CGOs. To compare the effect of the types of units to which LROs are assigned, we compare FGOs assigned to operational units

TABLE 4
COMPARISON OF PERCENTAGES (CGO/FGO)

Technique	All LROs - % Believe Useful	CGO - % Believe Useful	FGO - % Believe Useful
Forecasting	70.4%	70.96%	69.82%
Descriptive	70.0%	67.28%	73.42%
Graphics	68.8%	65.81%	72.52%
Averages	56.9%	57.35%	56.31%
Quality	53.6%	58.46%	47.75%
Probability	53.0%	58.46%	46.40%
Time Series	51.4%	52.57%	50.00%
Decision A	50.4%	49.26%	51.80%
Estimating	45.5%	43.75%	47.75%
Sampling	42.7%	44.85%	40.09%
Variation	34.4%	34.19%	34.68%
CPM	34.4%	34.19%	34.68%
Simulation	32.0%	34.93%	28.38%
Hypothesis Test	22.7%	24.26%	20.72%
Regression	20.2%	20.22%	20.27%
Queuing	17.0%	16.91%	17.12%
LP	15.4%	13.97%	17.12%
Other Multi V	12.8%	13.24%	12.16%
ANOVA	12.6%	12.87%	12.16%
Student T	10.5%	11.40%	9.46%
None Apply	5.7%	4.78%	6.76%

(N = 76) with all other FGOs (N=146) (Table 8). The analytical technique valued by most FGOs assigned to operational positions is Graphics. The technique valued by most other FGOs is Forecasting.

An analysis of the mean scores marked by FGOs revealed no major differences between operational and non-operational FGOs' perceptions of usefulness for the techniques. Field grade LROs assigned to an operational unit gave higher scores to both Quality and Queuing Theory. The differences were slightly significant at the 90% level (a=.10) (Table 9).

Further exploratory analysis was conducted comparing responses of LROs assigned to the Air Staff and all others. Air staff duties of budgeting and establishing policy may be thought of as more analytically intensive; however, responses from LROs assigned to the Air Staff did not differ significantly from all other LROs.

Additionally, analysis was conducted to compare responses of wholesale logistics LROs (those assigned to Air Force Materiel Command or the Defense Logistics Agency) with all other LROs.

TABLE 5
COMPARISON OF MEAN SCORES (CGO/FGO)

Technique	All LROs Mean Score	CGO Mean Score	FGO Mean Score	a
Graphics	7.44	7.10	7.86	.000
Descriptive	6.77	6.63	6.93	.078
Forecasting	6.48	6.62	6.31	.310
Decision A	6.05	6.03	6.06	.631
Averages	6.02	5.92	6.15	.081
Quality 6	.01	6.22	5.74	.092
Time Series	5.61	5.82	5.36	.126
Probability	5.60	5.91	5.21	.006
CPM	5.29	5.46	5.10	.283
Estimating	5.24	5.34	5.11	.395
Sampling	5.15	5.27	5.00	.325
Simulation	4.67	5.09	4.19	.001
Variation	4.53	4.55	4.50	.605
Hypothesis T	4.17	4.55	3.73	.001
Regression	3.85	4.11	3.57	.026
LP_ Score	3.76	3.85	3.65	.371
Queuing	3.49	3.64	3.31	.263
Other Multi V	3.27	3.49	3.01	.027
ANOVA	3.20	3.45	2.90	.016
Student T	3.19	3.47	2.87	.013

It was hypothesized that LRO duties within these two organizations may require greater usage of quality-related statistics for comparing reliability rates or greater usage of the critical path method for program management. No significant differences, however, were found.

A final exploratory analysis was conducted to compare responses of Installation Deployment Officers (IDOs) with all other LROs. One responsibility of an IDO is to manage the structure of the deployment processing line, a duty which might be assisted by Simulation, Queuing Theory or the Critical Path Method. Exploratory analysis revealed no statistically significant differences between IDOs and non-IDOs in their scoring of any of the 20 techniques.

Supervisors' Views of Analytical Skills

As a group, LROs believed that Graphical Statistics, Descriptive Statistics and Forecasting were the most useful analytical techniques in performing their duties. A sample of LRO Supervisors (N=88) responded with which analytical skills they believed to be useful for the LROs under their supervision or command. Overall, a greater percentage of supervisors tended to consider the techniques useful compared with LROs. Descriptive Statistics are considered useful by 81.8% of su-

TABLE 6
COMPARISONS OF PERCENTAGES (LRS/APS VS. ALL OTHERS)

Technique	All LROs - % Believe Useful	LRS/APS - % Believe Useful	All Others - % Believe Useful
Forecasting	70.4%	69.6%	71.5%
Descriptive	70.0%	71.4%	68.2%
Graphics	68.8%	71.1%	65.9%
Averages	56.9%	58.9%	54.2%
Quality	53.6%	57.9%	48.1%
Probability	53.0%	55.7%	49.5%
Time Series	51.4%	55.7%	45.8%
Decision A	50.4%	50.0%	50.9%
Estimating	45.5%	42.9%	49.1%
Sampling	42.7%	43.2%	42.1%
Variation	34.4%	32.5%	36.9%
CPM	34.4%	36.1%	32.2%
Simulation	32.0%	34.6%	28.5%
Hypothesis Test	22.7%	23.9%	21.0%
Regression	20.2%	19.3%	21.5%
Queuing	17.0%	16.8%	17.3%
LP	15.4%	14.3%	16.8%
Other Multi V	12.8%	13.9%	11.2%
ANOVA	12.6%	12.1%	13.1%
Student T	10.5%	8.9%	12.6%
None Apply	5.7%	3.6%	8.4%

pervisors compared with 70.0% of LROs. While Graphical Statistics are considered useful by 78.4% of supervisors compared with 68.8% of LROs (Table 10).

An analysis of the mean scores assigned to each technique revealed a continued trend of supervisors valuing these analytical techniques more than the LROs they supervise. Descriptive and Graphical Statistics were scored higher by supervisors at a statistically significant level (a=.02 and a =.04 respectively). These two techniques, however, receive the highest scores from both LROs and their supervisors. Variation (a=.085) and Queuing Theory (a =.081) are two other techniques in which supervisors' higher scores are statistically significant (Table 11).

Summary of Analysis

Though some differences exist as to the relative importance of several techniques, results from this study indicate that LROs and their supervisors agree that Descriptive Statistics, Graphical Statistics and Forecasting are the most important techniques. On the whole, supervisors of LROs believe the techniques are more important for LROs

TABLE 7
COMPARISONS OF MEAN SCORES (LRS/APS VS. ALL OTHERS)

Technique	Total Mean Score	LRS/APS Mean Score	All Others Mean Score	a
Graphics	7.44	7.50	7.39	.347
Descriptive	6.77	6.92	6.63	.849
Forecasting	6.48	6.84	6.16	.138
Decision A	6.05	6.29	5.82	.150
Averages	6.02	6.14	5.91	.966
Quality	6.01	6.50	5.55	.001
Time Series	5.61	6.11	5.16	.029
Probability	5.60	5.92	5.29	.066
CPM	5.29	5.87	4.78	.001
Estimating	5.24	5.16	5.31	.324
Sampling	5.15	5.28	5.02	.369
Simulation	4.67	5.15	4.22	.001
Variation	4.53	4.67	4.40	.180
Hypothesis T	4.17	4.59	3.77	.002
Regression	3.85	4.18	3.55	.006
LP	3.76	4.19	3.37	.002
Queuing	3.49	4.06	3.00	.000
Other Multi V	3.27	3.78	2.81	.000
ANOVA	3.20	3.67	2.77	.000
Student T	3.19	3.66	2.75	.000

than LROs believe themselves. CGOs value these analytical techniques more than FGOs for conducting their own duties.

Responses were surprisingly similar across ranks and organizations. No major differences existed between which techniques LROs and their supervisors believed to be important, though a greater percentage of supervisors tend to believe the techniques are useful. Descriptive and Graphical Statistics are very useful and relatively non-complex analytical tools. Viewing outputs from logistics information systems or explaining monthly metrics are two common ways for an LRO to use Descriptive and Graphical Statistics.

One surprising result from the survey was the high importance placed on Forecasting. In the Parker, Ken, Brown (2001) study, Forecasting was perceived to be less important than either Sampling or Quality. CGOs in our research consistently rated Forecasting in the top three most important techniques along with Descriptive and Graphical Statistics. Forecasting techniques can be more quantitatively rigorous than the other two, incorporating elements of Descriptive and Graphical Statistics as well as Regression, Linear Programming, Time-Series, Estimating, and Student's T-tests. Respondent's low assessment of these sub-components of Forecasting may indicate a gap between user competence and perceived usefulness.

TABLE 8
COMPARISON OF PERCENTAGES (OPERATIONAL FGOs VS ALL OTHER FGOs)

Technique	All FGOs - % Believe Useful	Operational FGOs - % Believe Useful	All Other FGOs - % Believe Useful
Graphics	73%	80%	68%
Descriptive	73%	78%	71%
Forecasting	70%	62%	74%
Averages	56%	58%	55%
Time Series	50%	51%	49%
Quality	48%	47%	48%
Decision A	52%	46%	55%
Estimating	48%	43%	50%
Probability	46%	42%	49%
Sampling	40%	42%	39%
CPM	35%	34%	35%
Variation	35%	30%	37%
Simulation	28%	24%	31%
Hypothesis Test	21%	18%	22%
Regression	20%	13%	24%
Queuing	17%	13%	19%
LP	17%	12%	20%
ANOVA	12%	11%	13%
Other Multi V	12%	11%	13%
Student T	9%	4%	12%
None Apply	7%	3%	9%

IMPLICATIONS, FUTURE RESEARCH AND LIMITATIONS

The research suggests a number of implications. Presently, there is no adequate quantitatively based training available to teach Forecasting techniques to all LROs. A 3-month graduate-level Forecasting course is taught in-residence at AFIT. The in-resident requirement precludes participation for most LROs. An online Forecasting familiarity course is also taught through AFIT On-line. The short (1 Continuous Learning Point credit) course is directed at informing students of the Enterprise Architecture (EA) more than teaching them how to use forecasting techniques. A more rigorous and quantitatively oriented Forecasting course could be developed and made available to all interested Air Force logisticians through either AFIT On-line or the Defense Acquisition University.

While this research was focused on DoD, and the Air Force in particular, it is felt that the results could be applicable to the logistician in the private sector also. The general functions of logistics are common regardless of the specific sector or industry in question, and the quantitative skills necessary to perform these functions efficiently would more than likely not differ significantly.

TABLE 9
COMPARISON OF MEAN SCORES (OPERATIONAL FGOs VS. ALL OTHER FGOs)

Technique	Mean Score - All FGOs	Mean Score - Operational FGOs	Mean Score - All Other FGOs	a
Graphics	7.86	8.20	7.67	.773
Descriptive	6.93	7.31	6.72	.306
Forecasting	6.31	6.31	6.31	.648
Averages	6.15	6.09	6.18	.495
Decision A	6.06	6.26	5.95	.645
Quality	5.74	6.28	5.45	.082
Time Series	5.36	5.50	5.29	.664
Probability	5.21	5.32	5.15	.690
Estimating	5.11	4.85	5.26	.294
CPM	5.10	4.83	5.25	.334
Sampling	5.00	4.97	5.02	.965
Variation	4.50	4.45	4.53	.832
Simulation	4.19	3.86	4.37	.339
Hypothesis T	3.73	3.70	3.75	.701
LP	3.65	3.74	3.59	.428
Regression	3.57	3.49	3.61	.839
Queuing	3.31	3.67	3.11	.089
Other Multi V	3.01	3.21	2.90	.217
ANOVA	2.90	3.11	2.78	.229
Student T	2.87	2.98	2.79	.397

Future Research

An exploratory study assessing demand for more quantitatively oriented online courses (Linear Programming, Simulation, Basic Statistics, Forecasting, and Regression) through either AFIT Online or the Defense Acquisition University could be useful. Identification of these courses would provide justification for course implementation, which provides the foundation for the analytical techniques required by LROs.

The types of analytical techniques considered for this study are of the "building block" variety. Future research could inquire about other techniques such as cost-benefit analysis or technical skills related to analysis (e.g. ability to query the Global Transportation Network; ability to use Microsoft Excel®'s built-in Solver software).

Limitations

This study focused on active duty United States Air Force officers. Their responses are from a military perspective where mission accomplishment is the goal with limited consideration for profit and return on investment. Responses from private sector organizations may weigh techniques used in finance and accounting more heavily. Additionally, the results may not be portable to other military services due their respective missions.

TABLE 10
COMPARISON OF PERCENTAGES
(LROs VS. SUPERVISORS)

Technique	LROs - % Believe Useful	Supervisors - % Believe Useful
Descriptive	70.0%	81.8%
Graphics	68.8%	78.4%
Forecasting	70.4%	68.2%
Averages	56.9%	63.6%
Quality	53.6%	60.2%
Probability	53.0%	54.5%
Estimating	45.5%	53.4%
Decision A	50.4%	52.3%
Time Series	51.4%	50.0%
Sampling	42.7%	48.9%
Variation	34.4%	47.7%
CPM	34.4%	45.5%
Hypothesis Test	22.7%	30.7%
Simulation	32.0%	27.3%
Queuing	17.0%	26.1%
Regression	20.2%	23.9%
LP	15.4%	21.6%
ANOVA	12.6%	20.5%
Other Multi V	12.8%	19.3%
Student T	10.5%	14.8%
None Apply	5.7%	9.1%

Conclusion

The overall purpose of this research was to determine which analytical techniques LROs and their supervisors believe are important in conducting LRO duties. Forecasting, Graphical Statistics and Descriptive Statistics are considered by both LROs and their supervisors to be the most important techniques. Given the reported importance of Forecasting, LROs may benefit from having the opportunity to learn quantitatively based Forecasting techniques.

With the upcoming implementation of ECSS, analytical skills are an increasingly necessary tool for Air Force logisticians. Coupled with leadership ability, LROs will be able to use these skills to lead the equipping and sustainment of our nation's warfighters.

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TABLE 11
COMPARISON OF MEAN SCORES (LROs VS. SUPERVISORS)

Technique	Mean Score LROs	Mean Score Supervisors	a
Graphics	7.44	8.19	.021
Descriptive	6.77	7.41	.047
Forecasting	6.48	6.30	.418
Averages	6.02	6.29	.319
Decision A	6.05	6.28	.600
Quality	6.01	6.17	.672
CPM	5.29	5.87	.126
Time Series	5.61	5.75	.628
Probability	5.60	5.73	.643
Estimating	5.24	5.63	.195
Sampling	5.15	5.40	.425
Variation	4.53	5.10	.085
Hypothesis T	4.17	4.41	.613
Simulation	4.67	4.30	.314
Queuing	3.49	4.08	.081
LP	3.76	3.90	.793
Regression	3.85	3.68	.540
Other Multi V	3.27	3.47	.746
ANOVA	3.20	3.46	.637
Student T	3.19	3.28	.831

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