

An Investigation into the Resources Shared Across the Programs of the Center for Local Government Technology

An Oklahoma State University

School of Industrial Engineering and Management

Senior Design Project Report

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Executive Summary

The Center for Local Government Technology (CLGT) provides training, education, and assistance to customer groups dedicated to serving the public. CLGT currently has six operating programs that offer a variety of services. In order to facilitate administrative work, CLGT employs five administrative and support staff and three student workers who perform various tasks, such as accounting, event planning, scheduling, etc., for these six programs. The costs of funding the staff positions are allocated to the programs based on the percentage of time that each staff member plans to dedicate to the six programs over the course of the year. In addition, the six programs have a common supply room with various office supply items, as well as a copier machine that all programs use. Although sharing resources saves overall costs for CLGT programs, the distribution of time spent on each program by staff members and the usage of office supplies has proven to be challenging to track. CLGT currently estimates the staff members' time dedicated to programs and the amount of office supplies used per program to determine the allocation of associated costs.

Historical data was gathered, numerous interviews were conducted, and statistical tools, such as using a three-point estimation method to generate a Beta distribution, were used to produce an accurate representation of the distribution of time dedicated to the six programs by each staff member. Using the individual staff members' distributions of time dedicated to the six programs, the total combined distribution of time dedicated to the six programs by CLGT support and administrative staff was determined. The following utilizations by program for CLGT were determined: LTAP 35.3%, Pilot/Escort 18.7%, ATAP 18.7%, TTAP 18.2%, CCAP 6.9%, and Transportation Intern Program 2.2%. The recommendation is to allocate the costs of the shared resources based on the analyses conducted and results produced. In particular, base the costs of support and administrative staff on the appropriate individual's analysis results and the costs of office supplies on the total combined distribution of time dedicated to the six programs by CLGT support and administrative staff. In addition, throughout the project, efficiency improvement opportunities were identified. The improvement areas include: continue to cross-train employees and increase website user friendliness, begin documenting best practices, standardize data entry methods in ACEware database, delegate additional tasks to student workers, and standardize the travel reimbursement request process.

By implementing the recommendations provided, CLGT can reduce the risk incurred by incorrectly estimating the staff members' time dedicated per program. In addition, a decrease in the time and effort required to complete tasks and an increase in the overall efficiency and effectiveness of administrative and support work can be realized by applying the efficiency improvements recommended.

1.0 INTRODUCTION

1.1 BACKGROUND

The Center for Local Government Technology (CLGT) is a public-service outreach program of the College of Engineering, Architecture, and Technology (CEAT) at Oklahoma State University. CLGT focuses its efforts on providing high-quality educational curricula, training, technical assistance, and customized services to various customer groups dedicated to serving the public. The customer groups include county officers and employees, tribal governments and agencies, municipal officers and employees, state and federal agencies, as well as, professional associations and organizations.

1.1.1 CLGT Program Information

Currently, CLGT conducts its operations through six different programs grouped in two categories: Transportation Programs and Ad Valorem Programs. The Transportation programs provide training, technical assistance, and initiative leadership on transportation-related issues. The Ad Valorem programs provide training, accreditation, technical assistance, and hardware and IT support to the County Assessor and the County Treasurer offices in Oklahoma. The following are the six programs operated within CLGT:

- Transportation Programs:
 - Local Technical Assistance Program (LTAP)
 - Southern Plains Tribal Assistance Program (SPTTAP)
 - Transportation Intern Program (TIP)
 - Pilot Escort Certification Program
- Ad Valorem Programs:
 - County Computer Assistance Program (CCAP)
 - Assessor Training and Accreditation Program (ATAP)

Within the transportation group, the LTAP program provides training and technical assistance to county and municipal governments that have a responsibility for the planning, construction, and maintenance of transportation systems. LTAP conducts over forty individual classes including a

core curriculum called the Roads Scholars. LTAP is funded through the Federal Highway Administration and the Oklahoma Department of Transportation.

The SPTTAP program provides training and technical assistance to all tribal governments in Oklahoma, Kansas, Texas, and Nebraska. This training is provided for tribal transportation and economic development projects. The training provided in this program includes classes, workshops, and on-site assistance specifically for tribal needs. SPTTAP is funded throughout the Federal Highway Administration.

CLGT places students from transportation related degree programs in summer internships with government agencies responsible for the maintenance, construction, and planning of local transportation systems through the Transportation Intern Program. Although student interns work directly under the supervision of a participating local government agency, they are paid as student employees of CLGT (Agency Application - http://clgtokstate.com/TIP_AGENCY.htm).

CLGT, in an agreement with the Oklahoma Department of Public Safety, certifies Pilot/Escort operators for the State of Oklahoma through the Pilot/Escort Certification Program. Pilots are required to escort permitted oversize and overweight trucks in Oklahoma. This program is fee-based and currently charges \$180 per person.

Within the Ad Valorem group, the CCAP program provides training, support, and assistance for computer software and hardware used for land parcel administration, property tax billing, collection, and apportionment used in the offices of the County Assessor and County Treasurer. CCAP is funded through an appropriation from the state legislature.

The ATAP staff provides education, training, and technical assistance to County Assessors, who appraise the value of real and personal property. County assessors are required to discover, list, appraise, and assess all residential, commercial, and agricultural property. ATAP accredits those required to attend the training through a Basic and Advanced Accreditation Program. Like the

CCAP program, ATAP is funded through an appropriation from the state legislature. ATAP also charges a registration fee for the courses it conducts.

1.1.2 CLGT SUPPORT AND ADMINISTRATIVE STAFF ROLES

The following are descriptions of the CLGT staff positions to provide a background on the different positions and types of work completed in the CLGT front office.

1.1.2.1 Administrative Assistant at CLGT

The Administrative Assistant at CLGT, when interviewed, grouped all tasks into three main categories: 1) Supervising the student workers, 2) ACEware database management, and 3) Assisting with Administrative Work.

The nature of the tasks performed in the first category (Supervising the student workers) focus on delegating and overseeing the work done by the student workers. Some examples of tasks that would fall into the first category are those such as developing student workers' weekly projects lists, and monitoring the student workers' activities progress.

With regard to the tasks pertaining to the second category, ACEware database management, the Administrative Assistant is responsible for carrying out various different database related activities such as building classes into the database, posting deposits, reconcile information, process registrations, among others.

In terms of the tasks belonging to the third category, assisting with Administrative Work, the tasks are mostly related to managerial and organizational activities. Some examples within this category would be answering phone calls and emails, keeping CLGT's staff calendars and room schedules, and requesting maintenance orders. The complete Administrative Assistant's list of tasks by category can be seen in Figure 1: Administrative Assistant Task List presented below.

Category	Task
Supervising Student Workers:	1) Book printing for classes.
	2) Setting up student workers' schedules.
	3) Setting up daily student workers' activity sheet (every morning).
	4) Developing student workers' weekly projects list (every Friday afternoons).
	5) Monitor student workers' activities progress (ensure that everything is done and closed).
ACEware Database Management:	6) Building classes in ACEware database.
	7) Post deposits into ACEware database.
	8) Correct, edit, add, or delete information in ACEware database.
	9) Create tabs for upcoming classes.
	10) Reconciliation of class attendance and class registration.
	11) Create manual confirmations through ACEware for people who didn't registered online.
	12) Process all registrations
Administrative:	13) Phone call answering/transferring.
	14) Answer emails.
	15) Administrative assistance for program managers.
	16) Keeping classes' files and books.
	17) Keeping CLGT's staff calendars.
	18) Keeping the room's schedules.
	19) Request maintenance work orders.
	20) Programs' monthly reports.
	21) Order programs' supplies.

Figure 1: Administrative Assistant Task List

1.1.2.2 Accounting Specialist at CLGT

The Accounting Specialist at CLGT, is responsible for almost every transaction for each program. This includes travel reimbursements, receivables, payables, and payroll. Although there are only six programs operating, the Accounting Specialist manages twelve program and permanent accounts throughout the year. In addition to program accounts, one of the accounts is a general CLGT Salary Account. The distribution of the twelve accounts per program is as follows:

TTAP	LTAP	Pilot/Escort	ATAP	CCAP	Salary Acct.
2	1	2	3	3	1

Table 1: Accounts per Program

The reason TTAP and Pilot/Escort have two accounts is they have additional functions that have separate funding sources. TTAP has one account for general use and one for a program called Safety Circuit Rider that provides local roadway safety education and training courses. Pilot/Escort has one account for general class use and one dedicated to planning and organizing the Annual American Public Works Association (APWA) Conference. CCAP and ATAP have an income account for the money received from classes and two general accounts where the money from government funding is located. The reason for two general accounts is that the Fiscal Year

(FY) 2015 accounts did not close at the end of the Fiscal Year, so both FY 2015 and FY 2016 are still open and active.

It can be noted that the Transportation Intern Program was not accounted for within the twelve accounts above. This is because the Intern Program only operates in the summer months. Therefore, the number of accounts managed increases in the summer reflecting the addition of the Transportation Intern Program and is dependent upon the Intern Program requirements that year. For example, typically only two accounts are added, but this past year, the program required six accounts because of the funding sources' stipulations.

In addition to accounting related tasks, the Accounting Specialist is frequently asked to complete various tasks, such as closing the CLGT office, checking whether doors have been locked, answering the phone, etc. The Accounting Specialist's task list is shown below in Figure 2: Accounting Specialist Task List. The orange highlighting indicates that the task is distributed among multiple programs.

Category	Task
Daily Activities	Backup ACEware
	Check email
	Process deposit in TouchNet - update AIRS
	Process Travel Reimbursement
	Pay invoice (NON-CVIs) - OK Corral
	Update Quickbook Entry
Tuesday/Thursday	Shut down CLGT
Monthly Activities	Process campus vendor invoice
	Process bi-weekly payroll
	Process monthly payroll
	Reconcile account - QuickBooks
	Approve p-card purchase
Yearly	New Fiscal budget
	Employment Action
Varies	Run errand

Figure 2: Accounting Specialist Task List

1.1.2.3 Specialist II at CLGT

The Specialist II at CLGT works on various tasks throughout the year. Most of his/her tasks are general and seasonal. This means that most of their effort is toward performing similar tasks for the six programs at specific times during year. The Specialist II's tasks can be divided into four

groups: Administrative, Class Activities, Meetings and Conferences, and CEAT Activities. The Administrative group consists of tasks such as taking inventory, supervising staff and students, creating student work schedules, approving travel claims, and managing the CLGT website. This group contains most of the Specialist II's tasks. These tasks are enumerated in Figure 3: Specialist II Task List below.

Category	Task
Administrative	Prepare & track & surplus office equipment inventory
	Prepare facilities inventory for OSU asset mgmt.
	Supervise work projects of front office staff and OSU students
	Track Leave & sign staff timesheets
	Prepare, discuss, & sign yearly appraisals
	Creates student work schedule, student project list, & hire new students
	Misc. - Building & phone work orders, Christmas Party, gift cards, office cards, etc.
	Schedule speakers for professional devl.
	Approves travel claims
	Approves bi-weekly payroll & monthly leave
	HR Activities-Hire personnel, update job descr., forms, Sr. Specialist & Career Dev., LTAP/TTAP
	Coordinates/organizes Chili Fest for United Way
	Manage CLGT website
	Meetings and Conferences
Attends Conferences/prep-NLTAPA, ACCO & CODA	
Attend & assist with APWA Conference, on-site visit, contract & monthly mtgs.	
Attend CLGT staff, manager, professional dev. Mtgs, Healthy Dept.	
Plan and assist with Safety Champion Conference	
Attend NHI Train the Trainer-CDL Presentation	
Class Activities	VTAP Job Descriptions & hire personnel & mtgs.
	Printing and preparation of class mat'ls -Pilot Escort Class
	Process credit for Defensive Driving manuals & brochures
	Revise/update CDL Videos w/TTAP Specialist
	Prepare & print handout of LTAP classes
	Attend/ assist with Surveying Class & other LTAP Classes
	Teach CDL Classes (5) & update materials
Teach TTAP CDL class	
CEAT Activities	Attend meetings - staff/faculty, marketing, HR
	Coordinates newsletter articles, CEAT Brochure
	Attends "leadership initiative" events, workshops, & required trng

Figure 3: Specialist II Task List

For the Class Activities group, the Special II's tasks consist of teaching classes and updating printed materials for the classes. CLGT provided past class schedule information in order to help determine the frequency for these tasks. The tasks in the Meetings and Conferences include going to yearly conferences that provided training on LTAP and TTAP program related activities. In the

CEAT Activities group, the Specialist II is in charge of constructing the CLGT newsletter articles and attending “leadership initiative” events.

1.1.2.4 Event Coordinator at CLGT

The Event Coordinator is in charge of performing a wide variety of administrative tasks, ACEware database management tasks, and program specific tasks for the TTAP, LTAP, Pilot Escort, and ATAP programs. In addition, the Event Coordinator serves as the main point of contact, planner and organizer of the American Public Works Association (APWA) and Oklahoma Water Environment Association (OWEA) Annual Conference.

The APWA and OWEA Annual Conference is a technical conference held in Tulsa, Oklahoma by the American Public Works Association Oklahoma Chapter. The purpose of the conference is to offer opportunities for professional development and networking. It is important to remark that the APWA and OWEA Annual Conference is part of the LTAP program, but given to the high amount of time spent by the Event Coordinator planning it, the APWA and OWEA Annual Conference was analyzed as an additional program.

The nature of the APWA and OWEA Annual Conference tasks performed by the Event Coordinator were, in essence, the logistics planning of the conference. In addition, the Event Coordinator was responsible for organizing, monitoring, and performing administrative tasks for the sake of the conference.

Nevertheless, it is important to point out that the tasks performed by the Event Coordinator for the TTAP program are solely devoted to ACEware database management activities, such as developing and modifying reports, and monitoring and adjusting data entries. The following table Figure 4: Event Coordinator Task List shows the Event Coordinator’s tasks in detail.

Category	Task
ACEware Database Management:	1) ACEware database maintenance.
	2) Develop and modify reports.
	3) Monitor and adjust data entry (resolving data entry inconsistencies).
	4) Provide assistance regarding ACEware related problems.
Pilot Escort Program:	5) Onsite registration.
	6) Prepare & notarize affidavits.
	7) Temporary and completion letter drafting.
	8) Keep and update the pilot escort certification website list.
	9) Answer students' questions by email or phone.
	10) Process class 'No Show' student paperwork.
	11) After classes, revise certification numbers, expiration dates and contact info as needed.
	12) Prepare student paperwork to send to Department of Public Safety.
	13) Process all credit card payments.
L TAP Program:	14) Serve as the APWA chapter administrator.
	15) Prepare APWA's board meeting notices.
	16) Transcribe APWA's board meetings notes.
	17) Answer emails and phonecalls regarding APWA.
ATAP Program:	18) Generate email invoices from ACEware for each class.
	19) Verify accuracy of students' information (email address, billing address, etc.) in ACEware.
APWA and OWEA Annual Conference:	20) Logistical planning.
	21) Attend planning meetings.
	22) Keep vendors and participants notified.
	23) Answer emails & phone calls.
	24) Process payments and make deposits.
	25) Prepare and update all conference reports and spreadsheets.
	26) Manage all details onsite.
	27) Prepare invoices for billing.
	28) Input participant, exhibit, sponsor & golf registration.

Figure 4: Event Coordinator Task List

1.1.2.5 CLGT Student Workers

CGLT includes the support of three student workers in their administrative staff. The main role of each student worker is to provide administrative and information technology assistance to the front office staff. It is important to mention that each of the student worker's work schedule is dependent on each student worker's university class schedule. In addition, two student workers are responsible for working 16 hours a week, while the other one is only responsible for working 14 hours a week.

Most of the tasks performed by the student workers are low variability tasks. Some examples of low variability tasks performed by the student workers are closing the office, conducting inventory

revisions, distributing mail, and answering phone calls and emails. The information technology tasks are quite variable, and their number of occurrences depend on the number of classes offered by CLGT, or on the amount of students enrolled in such classes. Please refer to Figure 5: Student Workers' Task List below to observe the tasks list developed for the student workers.

Category	Task
Administrative Assistance	1) Answer emails.
	2) Answer phone calls.
	3) Check all machines for paper and service as needed.
	4) Ensure there is a supply of each type of paper in front office.
	5) Monitor kitchen's refrigerator's stock inventory.
	6) Water plants.
	7) Clean, organize, and monitor inventory of the copy room.
	8) Open and distribute mail.
	9) Log in checks, stamp them, and make copies.
	10) Run errands (deposits, pick supplies, gas, etc.).
	11) Shredding and recycling activities.
	12) Progress status reports.
	13) Close office.
	14) Book printing for classes.
	15) Setup classrooms.
IT Assistance	16) Update ACEware as to match physical records.
	17) Post and add classes to CLGT website.
	18) Update CLGT website's features and information as needed.

Figure 5: Student Workers' Task List

1.1.2.6 Director at CLGT

The Director at CLGT acts as the point of contact for both the Program Managers and CEAT. They work on all programs and completes various tasks required by CEAT. When initially interviewing the Director, it was evident that the variability of the tasks posed a challenge. It was agreed upon that creating a task list for the Director would likely not capture everything that he/she does at CLGT. The Director decided that the team should first analyze the other Administrative and Support Staff and then report what the analysis showed. The Director's time distributions

were then based upon the program distribution of CLGT as a whole. This was because the Director directs and oversees everything that the other administrative and support staff do for the programs.

1.1.3 Problem Background

Each year, the programs prepare a budget for the following year that demonstrates their funding requirements. In the annual yearly budgets, programs provide detailed accounts of where they plan expenditures of every dollar. For example, the programs list the staff members needed in order to keep each activity within their program fully functioning. In addition to the name or position of the staff member, the amount of time they anticipate to dedicate to the program activities are required.

Because programs have similar task areas, such as accounting, scheduling, and marketing that generally do not require full time staff, there are advantages to hiring general administrative staff that help multiple programs. Some of the advantages include decreasing the time tasks take, reducing costs for programs, and the ability of Program Managers to have multiple points of contact in the front office. Staff specializing in certain areas can decrease task times. They are able to narrow their focus and increase their efficiency and effectiveness for that particular task area. In addition, they are able to save time by not training multiple people for the same task. For example, accounting requires training to learn how to use the university's purchasing programs, such as OK Corral. Therefore, if each program had one administrative staff member able to complete all of the task areas, such as accounting, all six staff members would have to attend the training. This would result in CLGT losing productivity from six staff members, instead of just one, due to training days.

CLGT is able to save costs by having five full-time administrative and support staff, including the Director of CLGT, which specialize in different areas and help multiple programs, instead of having a staff member for each of the six programs and a Director for the center. The ability of Program Managers to have multiple points of contact in the front office is important to keep all of the programs running efficiently. For example, if the dedicated administrative and support staff member for a particular program is sick and ends up having to take two weeks off, that program is

unable to complete the administrative work needed to keep the program fully functioning. By sharing resources, programs are able to continue functioning if one staff member takes a leave of absence, or is sick for a long period, or for other reasons.

While sharing resources is a great means for improving efficiencies and maximizing resource usage, in this particular scenario, it has proved to be somewhat challenging. The challenge lies in estimating the staff members' time dedicated to each program. Because CLGT offers many beneficial training courses, workshops, and accreditations for different programs, the office supplies used and time spent by each of the support and administrative staff on multiple programs has not been captured in detail. Consequently, this presents a challenge when planning the programs' budgets and funding that ensures charges and resource utilization are accurately matched.

2.0 CLGT CURRENT SITUATION

2.1 CURRENT SYSTEM

Currently, CLGT programs estimate the time spent by employees on each program based on personal recollection of the previous year. CLGT also distributes the cost of office supplies among the programs based on an approximation of supplies needed for classes and general use by employees. This is problematic because it causes uncertainty in regards to how precisely the resource costs and program budgets are aligned.

2.2 PROBLEM STATEMENT

As the project commenced, the goal was to quantify the time and effort spent by CLGT support and administrative staff and the amount of office supplies used on each program to better allocate costs. This quantification was expected to help assure that the charges and resources used are properly aligned for the shared resources' operations. In addition, throughout the project, the team sought out efficiency and effectiveness improvements to help stretch limited resources and increase the efficiency of CLGT shared service operations.

2.2.1 Project Scope

The project scope was defined to include:

- All shared resources used by the programs at CLGT. The project investigation was restricted to quantifying time spent and allocation of costs for each of the programs.
- Efficiency and effectiveness improvements to help increase the efficiency of any of CLGT shared resources.

3.0 CLGT PROJECT METHODOLOGY

3.1 INTENDED METHOD

Originally, the planned methodology to be employed consisted of five phases. The objectives of the phases remained the same throughout the project. The phases were defined in a way to achieve the project's goal systematically. This was important to determine the chronological order and specific periods in which the phases were to be completed. The five phases were: Initiate Project, Define Current Situation, Collect Data, Analyze Data, and Generate Alternatives.

3.1.1 Initiate Project

The objective of this phase was to set the project in motion. It was accomplished by establishing contact with CLGT and discussing their current situation, obtaining an overview of their operations, identifying their areas of opportunity, and determining availability for future meetings. Consequently, a proposal was developed to formalize and address the project's purpose statement, tentative methodology, scope, deliverables, possible benefits, risks, and risk mitigation actions. The identified risks and appropriate mitigation actions are described in the Project Proposal, which can be found in Appendix A: Project Proposal.

3.1.2 Define Current Situation

The main objective of this particular phase was to gain a complete understanding of CLGT programs' current situations by gathering data regarding staff members' varying tasks and their dependencies. The methods and techniques used for developing a qualitative understanding of CLGT operations consisted of carrying out literature reviews on CLGT and organizations with similar operations, conducting personnel interviews, and analyzing existing records from information management systems.

3.1.3 Collect Data

Once CLGT's current situation was documented, the amount and type of data to be collected, along with the data gathering methods and techniques to be utilized, were determined. Time

measurements were to be collected from the staff using a VBA-program created to collect time data. The VBA-program's purpose was to capture the time spent by each staff member on a particular program during a designated period. The user interface of the VBA-program is below in Figure 6: VBA Program User Interface.

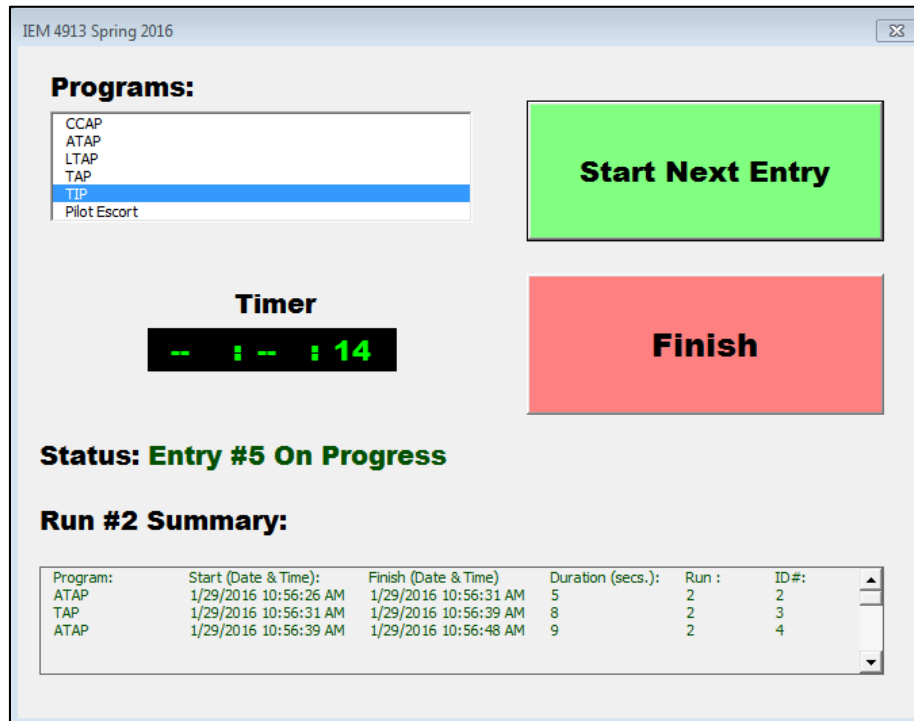


Figure 6: VBA Program User Interface

The way the program would work is the staff member would simply select the program they were beginning to work on and then click 'Start Next Entry.' This action would start the timer and log the information on the spreadsheet behind the user form. When the staff member wanted to switch to another program, they would simply repeat the previous actions or they could first click 'Finish' and then repeat the previous actions to start restart the timer. One of the main goals when creating the program was to keep the program as simple as possible and require the minimum amount of clicks.

Another fundamental aspect of this phase was to formally obtain information records from CLGT's management via a request for information document. The planned contents of such information records consisted of timesheets, previous years' program calendars, previous years'

shared resources cost allocation per program account, copier records, and previous years' program budgets.

3.1.4 Analyze Data

After the data-gathering phase terminated, the plan was to analyze the data in order to reach an informed conclusion regarding CLGT's shared resources' time allocation and usage situation. The data analytics plan included the use of:

- Descriptive statistics to quantify the staff members' times per program.
- Distribution fitting techniques to determine if each individual data set could be characterized by a given probability distribution.
- Variance assessment techniques to have a clear idea of the dispersion.
- Linear regression techniques and time series analysis to identify patterns or cyclical trends in the staff members' demands.
- Forecasting techniques to review the staff members' demand by program and CLGT as a whole.

3.1.5 Generate Alternatives

Once all data were thoroughly analyzed, mathematical models were to be developed to properly apportion the costs of the shared resources to the programs to ensure that charges and resource usage were accurately matched. Likewise, possible solution alternatives were to be formulated to help make CLGT's operations more efficient.

After thoroughly developing solution alternatives, they would be evaluated and then used to make final recommendations.

3.2 ACTUAL METHOD

The Initiate Project and Define Current Situation Phases were carried out as planned. As the project unfolded and the VBA-program was presented to CLGT management, it was concluded that due to the large amount of tasks each staff member performs and the high variability within

those tasks, utilizing the program would be counterproductive. Since the tasks needed for each program are very similar and staff are interrupted frequently throughout the day by phone calls and emails with requests for support for programs, it would be difficult to constantly remember to click and change between programs on the VBA-program. In addition, it was also concluded that the data collected by the VBA-program would not be representative of the staff members' time utilization over the whole year, but just for a couple of weeks. CLGT programs have varying seasonal demands. Therefore, two or three weeks in February and/or March would not be representative of the month of July, where the Intern program is operating, but the Pilot/Escort classes are a rare occurrence. CLGT staff concluded that the variability of tasks and interruptions would be impossible to capture. A new methodology was then created for the remaining phases of the project.

After the VBA-program based data collection method was discarded, it was decided to collect data by interviewing the staff members and obtaining records from information management systems. The general interviewing methodology followed during the study is described, in detail, in section 4.2 Interviews With Support and Administrative Staff.

3.2.1 Collect Data

The Collect Data phase was modified to incorporate verbal interviews to determine an appropriate allocation of staff members' time per program. A series of interviews were conducted to determine and list all of the tasks done by each of the staff members. The first round of interviews were devoted to understanding, in detail, the duties of each resource and breaking those duties into manageable tasks in preparation of gathering task time estimates and number of occurrences in the interviews to follow. Each interview was conducted with standardized questions and documents, which can be seen in Appendix D: Standardized Interview Documents. After task lists were developed, the lists were presented to the respective resource to get feedback regarding the lists' completeness so the task lists could be edited for accuracy. Once the task lists were edited and approved by the staff member, a second round interview was scheduled with each CLGT staff member in order to obtain a range of task time estimates. When the estimates of task times were approved by the appropriate staff member, a third round interview was conducted to determine the

frequency of task occurrence. The importance of using a series of interviews instead of just one is discussed below in section 3.2.1.1 Delphi Method.

In addition to collecting frequency of task occurrence during the third round interviews, the estimating of office supplies consumption per resource and program was discussed during these interviews. Subsequently, following the third round interviews, data files for each resource were created in order to organize the gathered data for further analysis. In addition to interviews, CLGT provided existing records, such as timesheets, class records, and program transaction details, to use in confirming the number of task occurrences for the analysis.

3.2.1.1 Delphi Method

In simple words, the Delphi method is a structured communication and interactive estimating method that relies on a panel of experts to iteratively answer questions and provide feedback about a given topic until a consensus is reached. In the project, the panel of experts were the staff members. The following image (Figure 7: Delphi Method) is a pictorial representation of the Delphi method. The main reason behind choosing the Delphi method as a data analysis and gathering strategy was due to the nature of the data gathered. If a closer look is taken at the collected data, one can notice that the task times and frequencies collected via interviews were based on memory and recollection. In contrast, the data collected from the information records were quantitative. The analysis of a mix of subjective and quantitative data made it very attractive to rely on the Delphi method. This was because the Delphi method uses a process of soliciting information from experts and adjusting it based on feedback, until a convergence of opinion is met (Rand, 2016). The Delphi method allowed the team to obtain precise estimates of the staff members' time spent on each program through a series of follow-up interviews that assured the staff members were satisfied with the results and these results reflected recalled and recorded data.

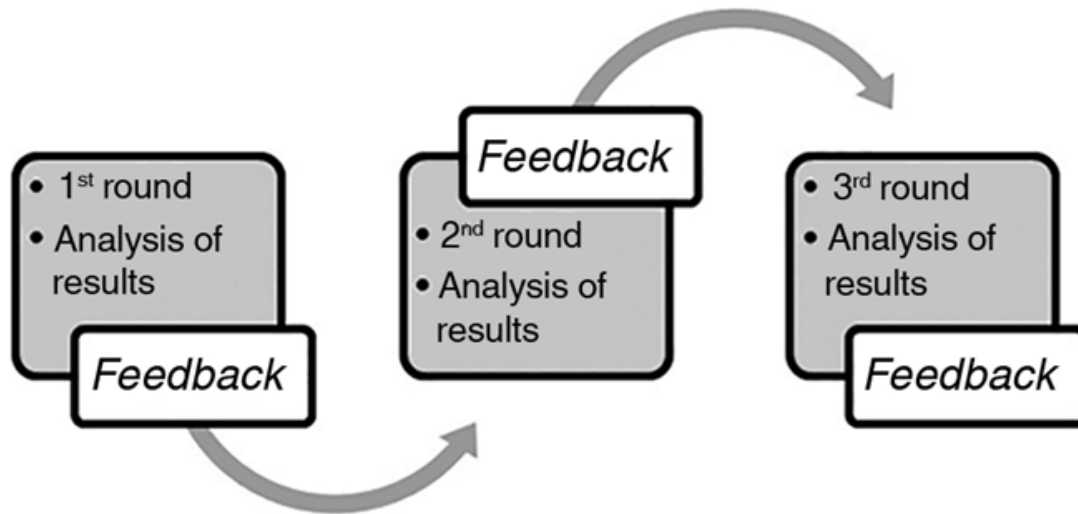


Figure 7: Delphi Method (Carvalho V, 2006)

3.2.2 Analyze Data

Once the data was gathered, it was analyzed to determine each staff members' time spent supporting each program. It was analyzed by using the existing records and adjustments provided by the staff members. The analysis used an iterative process to first determine tasks, their time of completion, and their frequency of task occurrence. Then the time of completion for tasks were multiplied by their associated frequency of task occurrence to determine the amount of time spent supporting each program. The method in which this was done varied by staff member. It was dependent on the nature of the task – if the task was program specific or was distributed across multiple programs, if the task depended on number of students per class or number of classes, etc.

It is important to mention that, while analyzing the staff members' data input and reviewing the interview notes, the team began to spot opportunities to suggest value-adding efficiency improvements. In addition, as the data was analyzed and the demand on staff members' time and their utilization patterns in support of programs became more evident, the staff members' time allocation to support each of the programs began to emerge. Additional questions were developed to refine and gather specific information that would validate what the data analysis was uncovering.

3.3 PROJECT SCHEDULE MODIFICATIONS

A schedule was created for use in managing the project until completion. This schedule can be seen in Appendix A: Project Proposal.

As the project progressed, the data collection approach was adjusted as discussed previously, which affected the project schedule and timeline. Initially, the plan was to gather data over a two-week period through the VBA-program that would time the resources working for specific programs. However, once this collection method was introduced to CLGT, it was determined that this method was not acceptable because it would be unable to accurately capture the variability and seasonality of tasks. Other possible methods were discussed and in person interviews were selected as the main data collection method to be employed. The schedule was then adjusted to reflect the change in data collection plans. Although tasks were added and deleted, the overall timeline remained relatively the same length. However, after scheduling and conducting the first round of staff interviews, better estimates were developed for the process of scheduling and interviewing staff. Additionally, once the first staff interview was conducted, the initial goal of collecting both tasks and task time estimates in the first interview had to be reevaluated because it was found that staff members needed additional time to fully recollect their role at CLGT. Additional interviews were then required to gather the time data needed to allow the staff members to take their time in recollecting the tasks they perform and the time that tasks take. Giving the staff members additional time also relieved them of the pressure of having to recall every single detail at that moment in the interview. Therefore, additional time was added to the project timeline to reflect these changes. The adjusted calendar is shown below in Figure 8: Adjusted Project Schedule.

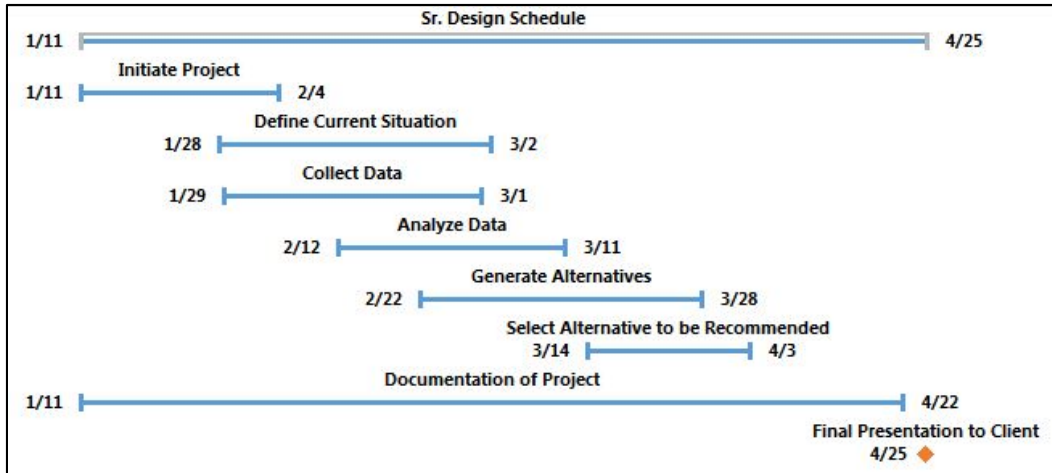


Figure 8: Adjusted Project Schedule

In comparing the Anticipated Project Schedule to the Adjusted Project Schedule, the main difference to note is the amount of time and overlap of the phases. With the adjustments made to the methodology, additional time was needed to conduct interviews and analyze interview data. The Adjusted Project Schedule allowed for greater overlap in project phases. This was to allow the team to return to the previous phase if new information was discovered or CLGT staff clarified information. In addition, the Delphi Method includes continuously verifying and adjusting the task list and time estimates with experts, which took more time than originally planned. Therefore, to allow for this iterative process, the schedule was adjusted to give the phases more time and allowing them to overlap with one another. Although the length of each phase increased, with the allowed overlap of phases, the project was still on track to finish by April 25.

4.0 DATA GATHERED

4.1 RESOURCE SHARING LITERATURE REVIEWS

Initially, a review was conducted on a previously completed Senior Design project for an organization with a similar need of defining proportion of utilization. This was done in order to gain familiarity with methods of approach that would or would not work when attempting to apportion effort across programs. The review revealed that accuracy was gained through calculating an average task time through gathering three-point estimates. Literature reviews were also included to identify interview techniques that had proven success in extracting data through verbal interviews. In addition, literature reviews of best practices and industrial engineering principles were researched to identify ways in which CLGT could improve operations by increasing the efficiency and effectiveness in completing tasks. These literature reviews helped generate an approach to the problem of determining resource utilizations and successfully finding different alternatives to the solution.

4.1.1 Interview Techniques

Once it was determined that the majority of the data would have to be gathered via verbal interview, interview techniques with proven success were researched. Professional opinion from Dr. Kolarik, Syam Antony on the Industrial Advisory Board, and Dr. Nazemetz were also gathered. Each source stressed the importance of allocating adequate time to prepare the interview agenda, building a rapport with the interviewee, documenting information gathered during the interview, and reviewing the information discussed to check for accuracy. In addition to addressing the major components of the interview, eight general guidelines were followed, which are below in Figure 9: Interview Guidelines .

1. First and foremost, establish the tone of the interview.
2. Let the interviewee know the reason for the interview and why he or she was selected to be interviewed.
3. Stress that the interviewee's knowledge and opinions are important, and will aid in the analysis process.
4. Gain the interviewee's trust and cooperation early on, and maintain it throughout.
5. Establish what will happen to the information gathered.
6. Determine any areas of confidentiality or restricted information.
7. Let the interviewee know that candor and honesty will be valued and that nothing will be published or passed on until it has been reviewed and verified by the interviewee.
8. Firmly establish that there are no negative consequences to being interviewed.

Figure 9: Interview Guidelines (Modell, 2007)

4.1.2 Best Practices

In interviewing CLGT staff members, it was found that processes were often undocumented and execution sequences varied by staff member completing them. By documenting the best method to complete a task and continuously working to improve processes, CLGT staff members can work to reduce the time needed to complete tasks and reduce the amount of errors that might occur throughout processes. In addition to improving processes completed by more than one staff member, cross-training can also result from proper documentation of best practices. This is because sufficient documentation would allow an employee to read the process and then complete the task. With continued practice and training, the staff member can become efficient and effective in completing the tasks and can use continuous improvement to continue to increase their productivity.

In addition to proper documentation, a staff member can communicate best practices through demonstrating new or proven techniques to complete tasks. Another way to communicate best practices is to hold a meeting or an informal discussion with the purpose of disseminating and discussing the methods or techniques staff members use to complete their day-to-day tasks. Often when best practices are shared through demonstration or verbal communication, the discussion of the process can bring about ways to improve it that the teacher of the task may have never thought about (Fazey, 2004).

By documenting, demonstrating, or discussing best practices, tasks that require a ‘passing of the torch’ can be analyzed for redundant or duplicate work. Each staff member should take the time to explain their part of the process to ensure that there are not any repeated steps by different staff members.

4.1.3 Lean Principles

Industrial engineering principles were researched, particularly Lean Principles, that CLGT can utilize to reduce time needed to complete tasks and errors in completing tasks. Eleven principles were found that are useful in looking at the organization as a system and working towards creating a more effective Lean Office (Hajek, 2010). The eleven principles are:

1. Lean begins with a committed leadership team – leaders are the foundation of Lean efforts. They create a vision and strategy to achieve goals.
2. A Lean office requires metrics and goals – change is difficult to measure without metrics and teams need clear, measurable goals.
3. A Lean office has standardized processes that are followed by everyone – without standards, improvement is difficult.
4. A Lean office uses Five S (5S) – effective offices are organized and uncluttered. Place things where they make the most sense.
5. A Lean office has minimal Work-in-Process (WIP) – eliminating WIP decreases lead-time, reduces inconsistencies, and eliminates waste.
6. A Lean office strives for flow – ability to have work move start to finish without having to wait.
7. Demand is well understood in a Lean office – understand when demand might increase and be properly prepared.
8. A Lean office uses a daily management system – takes expected demand and matches that to the staffing.
9. A Lean office is visual – management, teamwork, and communication are easier when work is visible and understood.
10. A Lean office runs on communication and teamwork – responsiveness and flexibility increase productivity.

11. A Lean office has a continuous improvement culture – everyone believes in reducing waste and making improvements daily.

4.1.3.1 Five S (5S)

One important Lean principle, the fourth of the eleven previously listed, is the use of a Five S (5S) philosophy. The 5S principles originated in Japan and are a mantra designed to facilitate a quality work environment (Quality Essentials: A Reference Guide from A to Z, 2004). Although 5S philosophies were originally intended for manufacturing environments, they are easily transferable to office environments (Earley, n.d.). The elements of 5S include:

1. Sort – Remove all unnecessary clutter from workspaces. Only items used on a daily basis should remain on the desk.
2. Straighten – Organize remaining items in a logical manner. For example, file paperwork needed often closer than paperwork needed less often.
3. Shine – Maintain a clean work area.
4. Standardize – Create standard processes to complete tasks. Schedule regular cleaning and organizing.
5. Sustain – Become self-disciplined in applying 5S principles.

Successful implementation of 5S principles can result in many benefits. A few benefits include reducing the time to find certain items, performing the most efficient way of completing tasks, and enhanced image to customers, employees, and management.

4.2 INTERVIEWS WITH SUPPORT AND ADMINISTRATIVE STAFF

Each staff member was interviewed, as well as asked for all existing data related to frequency of task occurrence, with the goal of capturing the current situation at CLGT. When attempting to gather accurate time estimates from the staff, limitations were found. Second and third round interviews were necessary to gather accurate time estimates. Within these rounds of interviews, adjustments and re-adjustments were made in order to refine the estimates for accuracy.

Standardized documents, as seen in Appendix D: Standardized Interview Documents, were used when interviewing the staff.

4.2.1 Limitations

After the initial round of interviews concluded, it was evident that additional interviews would be necessary. This was because of two main reasons. The first being that staff members had difficulty recollecting the various activities they might do throughout the year for each program. Adding the need to quantify the time spent on each activity was an additional difficult undertaking. Therefore, the plan of conducting one interview to collect all of the necessary information changed to three separate interviews as to give the staff members more time to thoroughly think through their work activities.

The second reason was that the staff seemed slightly apprehensive to the idea of having to list everything they do and attach a time to it. Once this was noticed, rapport and relationships were built with the staff members by fully explaining each step of the process and the ultimate goal of the project – determine their distribution of time per program, not assess whether they were spending their time wisely.

4.2.2 First Round Interview: Task Lists

In the first round interviews, the objective was to gather a general task list from each staff member. A task list was generated for each staff member during the interviews. As a way to simplify the task lists, categories were used to organize and help staff to comprehensively develop the task lists. Once the lists were compiled, they were sent to the appropriate staff member for review, correction, and verification. An example of a task list with categories is in Figure 10: Administrative Assistant Task List below. This task list was created for the Administrative Assistant at CLGT.

Category	Task
Supervising Student Workers:	1) Book printing for classes.
	2) Setting up student workers' schedules.
	3) Setting up daily student workers' activity sheet (every morning).
	4) Developing student workers' weekly projects list (every Friday afternoons).
	5) Monitor student workers' activities progress (ensure that everything is done and closed).
ACEware Database Management:	6) Building classes in ACEware database.
	7) Post deposits into ACEware database.
	8) Correct, edit, add, or delete information in ACEware database.
	9) Create tabs for upcoming classes.
	10) Reconciliation of class attendance and class registration.
	11) Create manual confirmations through ACEware for people who didn't registered online.
	12) Process all registrations
Administrative:	13) Phone call answering/transferring.
	14) Answer emails.
	15) Administrative assistance for program managers.
	16) Keeping classes' files and books.
	17) Keeping CLGT's staff calendars.
	18) Keeping the room's schedules.
	19) Request maintenance work orders.
	20) Programs' monthly reports.
	21) Order programs' supplies.

Figure 10: Administrative Assistant Task List

4.2.3 Second Round Interview: Task Time Estimates

When the staff member approved his/her task list, a second round interview was conducted with the appropriate staff member to gather time estimates for each task. The process of collecting time estimates was based upon a project management technique, Program Evaluation Review Technique (PERT) that uses a beta distribution to generate a realistic probability distribution of task time estimates. The rationale behind using a beta distribution was that using three estimates to establish a range generally yields a better overall estimate and would be easier to think about the times tasks could take, rather than using a single-point estimate. The estimates gathered were for the average amount of time the tasks could take. For example, if the same task was completed for different programs, the time estimates gathered were based on the average time that task requires for any program. Figure 11: Administrative Assistant Time Estimates below shows an example of data that was collected during a second round interview. To remain consistent, this data is for the Administrative Assistant at CLGT, as well.

Category	Task	Optimistic (hrs./month)	Most Likely (hrs./month)	Pessimistic (hrs./month)
Supervising Student Workers:	1) Book printing for classes.	0.75	1.75	6.75
	2) Setting up student workers' schedules.	0.25	0.5	1
	3) Setting up daily student workers' activity sheet (every morning).	8.25	9.25	13
	4) Developing student workers' weekly projects list (every Friday afternoons).	1.5	2	3.75
	5) Monitor student workers' activities progress (ensure that everything is done and closed).	15	16.5	20.75
ACEware Database Management:	6) Building classes in ACEware database.	5.5	6.5	8.5
	7) Post deposits into ACEware database.	8.5	9.25	10.5
	8) Correct, edit, add, or delete information in ACEware database.	22.75	24.75	28
	9) Create tabs for upcoming classes.	0.25	0.75	1.5
	10) Reconciliation of class attendance and class registration.	9.5	10.25	12.25
	11) Create manual confirmations through ACEware for people who didn't registered online.	3.75	4.5	6
	12) Process all registrations	22.75	24.75	28
Administrative:	13) Phone call answering/transferring.	11.25	12	14.25
	14) Answer emails.	7.5	8.25	9.75
	15) Administrative assistance for program managers.	3.75	4.5	6
	16) Keeping classes' files and books.	3.75	4.5	6
	17) Keeping CLGT's staff calendars.	2.25	3	4.5
	18) Keeping the room's schedules.	2.25	3	4.5
	19) Request maintenance work orders.	0.75	1.75	3.25
	20) Programs' monthly reports.	0.75	1.75	3.25
	21) Order programs' supplies.	0.75	2.5	4

Figure 11: Administrative Assistant Time Estimates

4.2.4 Third Round Interview: Task Frequency

Once the appropriate staff member verified the task time estimates they previously provided, the frequency of task occurrence for each task was collected in a third round interview. The first priority of establishing task frequency of occurrence was to determine if the task was applicable to the program, meaning that the task was completed for a certain program. For example, a staff member may complete task #1 for TTAP and not ATAP and then vice versa for task #2. Due to the varying nature of task types, the frequencies were dependent on numerous different factors. Some of the frequencies depended upon data such as: number of classes, number of students per class, travel records, accounting records, etc. Tasks that were not completed on a normal basis were initially recorded with an asterisk and their frequencies were later estimated using the historical data provided by CLGT. An example of the data collected in the third round interviews is in Figure 12: Administrative Assistant Task Frequencies. The example uses the Administrative Assistant at CLGT. The dashes indicate that the task does not apply for the given program.

TASK ID#	TTAP	LTAP	Pilot Escort	Transportation Intern	ATAP	CCAP
1	3/month	5/month	2/month	-	2/month	-
2	daily	daily	daily	-	daily	-
3	daily	daily	daily	-	daily	-
4	4/month	4/month	4/month	-	4/month	-
5	daily	daily	daily	-	daily	-
6	daily	daily	daily	-	daily	-
7	-	-	daily	-	daily	-
8	daily	daily	daily	-	daily	-
9	4/month	4/month	4/month	-	4/month	-
10	daily	daily	daily	-	daily	-
11	daily	daily	daily	-	daily	-
12	daily	daily	daily	-	daily	-
13	daily	daily	daily	-	daily	-
14	daily	daily	daily	-	daily	-
15	daily	daily	daily	1/month	daily	1/month
16	daily	daily	daily	-	daily	-
17	4/month	4/month	4/month	-	4/month	-
18	4/month	4/month	4/month	-	4/month	-
19	2/month	2/month	2/month	-	2/month	2/month
20	1/month	1/month	-	-	-	-
21	2/month	2/month	2/month	-	2/month	-

Figure 12: Administrative Assistant Task Frequencies

4.3 EXISTING RECORDS

Existing information records were requested in order to gain a more concrete and objective understanding of CLGT’s shared resources’ utilization per program. The records requested were class schedules, accounting records, past time sheets, and the supplies list and other documents related to office supplies. This information aided in verifying the accuracy of the previously analyzed data. In addition, the information records helped map out the seasonality of each program’s demands for services patterns, as well as for developing each of the staff members’ task frequency of occurrence per program per month.

4.3.1 Class Schedules

Once time estimates were obtained from the staff, training class schedules were requested in order to verify when past classes occurred throughout the year. The training class schedules for courses provided by the CLGT administrative staff were used to help develop frequencies of task

occurrences and refine time spent estimates that depended on the type of class and the number of students attending. For example, the student workers' utilization for the Pilot/Escort program increased whenever a class was scheduled because one of their tasks is to print the class materials. Therefore, the amount of time utilized for the Pilot/Escort program depended not only on if there was a class scheduled, but also on the number of Pilot/Escort students that needed materials printed. The class schedule data used can be found on the attached CD under the name 'CLGT Class Schedules.'

4.3.2 Accounting Records for Each Account

In order to analyze the number of occurrences of the Accounting Specialist's tasks for the 2015 calendar year, Transaction Details of the program accounts were obtained. The records used can be found on the attached CD under the name 'Transaction Reports.' Because ATAP primarily uses its Income Account for its transactions, the 'Income Transaction by Detail' was the primary source for ATAP's number of task occurrences. Both FY'15 and FY'16 were analyzed for the programs in order to capture the transactions for the entire 2015 calendar year because the Fiscal Years started in either July or October depending on the program. In addition to identifying the Accounting Specialist's number of task occurrences, the Transaction Details showed the number of travel reimbursements processed, which were used to quantify the Specialist II's task – 'Approve Travel Claims' – frequency.

The manner in which accounting records were used was by counting each transaction related to a certain task. For example, the task 'Pay Invoices through OK Corral' were all of the transactions in the Quickbooks file with a record number consisting of an R followed by eight numbers. The total number of transactions per program per month were recorded according to the associated task as shown in Figure 13: Accounting Specialist Transaction Data. The '1' indicates that the Program had one Invoice in OK Corral for that month.

OK Corral - NON CVIs												
Program/Mth	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15
ATAP												
CCAP									1			
Pilot/Escort				1	1						1	
LTAP			1		1	1						
TTAP		1				1	1				1	
Safety Cir.												
APWA				1		1	1		1			

Figure 13: Accounting Specialist Transaction Data

Once all transactions were analyzed, the number of occurrences data was quantified for tasks that required record keeping in Quickbooks completed by the Accounting Specialist at CLGT for the 2015 calendar year. This quantification was used to estimate the total time dedicated to programs by multiplying the number of occurrences by the amount of time estimated to complete the tasks.

4.3.3 Past Time Sheets

Only two of the staff members keep or previously kept timesheets, the Administrative Assistant and the Event Coordinator at CLGT. The Administrative Assistant's timesheets were for the months of July through December during 2015 and for January 2016. The Event Coordinator's timesheets were for January through March and May through October of 2014. The use of these records served two main purposes in this study:

1. To verify and validate the accuracy of staff members' program time distributions previously determined through interviews that estimated the task times and number of occurrences during interviews.
2. To assess the program's utilization of staff members as a seasonal basis and incorporate this seasonality into the task's time estimate per program per month.

Figure 14: Event Coordinator Time Sheet Analysis shows an example of the analysis results for the Event Coordinator's time sheet for the month of February 2014. The image portrays the month's totals, descriptive statistics, and seasonality indexes per program. The top six rows show the results of estimating the program support time estimated through the interviewing process. The bottom row, February Seasonality Indexes, is the actual time spent per program by the staff member based on the data from the February 2014 timesheet. The reader should compare the

values of Weight vs. February Seasonality Indexes. The reason CLGT is blank in the actual timesheet data, February Seasonality Indexes, is because the Event Coordinator did not account for general work done for CLGT, but only for specific programs by dividing the general work between the programs evenly.

February 2014 Summary							
	ATAP	CLGT	ESCORT	LTAP	TTAP	CONFERENCE	Total
Total Hours Worked (hrs./month)	15.50	21.00	50.00	32.50	6.00	22.00	147.00
Mean (hrs./day)	0.82	1.11	2.63	1.71	0.32	1.16	7.35
Standard Deviation (hrs./day)	0.67	0.69	2.94	0.89	0.25	0.85	3.34
Mode (hrs./day)	1.00	1.29	1.00	2.00	0.50	1.00	1.00
Median (hrs./day)	1.00	1.29	1.00	2.00	0.50	1.00	1.00
Weight	0.11	0.14	0.34	0.22	0.04	0.15	1.00
February Seasonality Indexes:	0.13	-	0.37	0.25	0.07	0.18	1.00

Figure 14: Event Coordinator Time Sheet Analysis

4.3.4 Supplies List and Related Documents

In order to determine a distribution of supplies for each program, a list of the supplies that needed to be analyzed, as well as past copier documentation, was obtained. The supplies list contained both office and kitchen supplies to be analyzed. This information was used to understand the supplies being used by employees and to determine a distribution of supplies per program based on usage. The copier documentation provided by the CLGT administrative staff showed the amount of copies a certain program used throughout the year. The list of supplies can be seen in Figure 15: CLGT Supply List. The copier information provided can be seen in Figure 16: CLGT Copier Usage for January 2015 through January 2016.

Copy Acct - 15Jan2016

Book Reproduction/Office Supplies Inventory				Kitchen/Paper Goods Inventory			
Item	Amount needed in stock	How many left?	Need to order?	Item	Amount needed in stock	How many left?	Need to order?
Book Reproduction Supplies				Pop*-(Except Diet Dr. Pepper & Mt. Dew)			
Black 1" binders	6 boxes			Bottled Water *	5-24 cases		
White 1" binders	6 boxes			Coffee - Regular Roast	7		
Blue 1" binders	6 boxes			Coffee filters (12 cup)	100		
Red 1" binders	6 boxes			Sugar (packets)	1 box		
Copy paper	10 boxes			Splenda (packets)	1 box		
Color copier paper	2 boxes			Sweet & Low	1 box		
Toner for Canon & Sharp copiers**	1 each			Coffee creamer	1		
Toner for HP Color Printer	1 each			Stir sticks	1 box		
Colored Copy Paper-Orange, Green, Blue, Pink	2 reams			Plastic knives	50		
Office Supplies				Plastic forks	50		
3-Hole copy paper	5 reams			Plastic spoons	50		
Scantrons	100			Large paper plates	50		
Table Tents	500			Small paper plates	50		
Pencils-Pentel Clickers, Lead (.7) & Erasers	5			Paper bowls	50		
Pens-G2 Pilot Ultra Fine Red/Black	2 boxes			Styrofoam cups (12 oz.)	250		
Yellow Highlighters/Black Markers	4 boxes			Styrofoam cups (8 oz.)	250		
Paper clips-Regular & Jumbo	2 boxes						
Binder Clips-Mini, Small, Medium & Large	2 boxes			Paper Towels	5 rolls		
Staples	2 boxes			Napkins	1 package		
Post-it Notes - 3/8" X 1 7/8"	12 pads			Kleenex	5 boxes		
Post-it Notes - 3" X 3" (Regular & pop-up)	12 pads			Dishwashing liquid	1		
Post-it Notes - 3" X 5"	12 pads			Hand soap	2		
File folders-Ltr & Legal	3 boxes			Plastic containers - Large	2		
Hanging file folders-Letter	2 boxes			Plastic containers - Medium	2		
Expandable file folders-Letter 3 1/2" & 5 1/4"	3 boxes			Plastic containers - Small	2		
Expandable file folders-Legal 3 1/2"	2 boxes			Storage bags - Gallon Size	2 boxes		
Legal pads & Jr. Legal pads	36 pads			Storage bags - Quart Size	2 boxes		
Inter-Dept envelopes	2 boxes			Storage bags - Sandwich	2 boxes		
Clasp/Self-seal envelopes	2 boxes			Aluminum Foil	1		
Batteries: Size AAA, AA, C, D & 9 volt	12			Plastic Wrap	1		
Computer Monitor Wipes	2 boxes						

**Toner for Canon & Sharp w/lease agreement

*If a class/classes are scheduled at CLGT, more water and pop may be needed.

Figure 15: CLGT Supply List

The list shown above is an example of the list used by students to assess the amount of supplies in the storage room. If the amount of a certain supply item in the storage room is less than 'Amount needed in stock,' the students mark the amount that needs to be ordered.

	Total B/W	Total Color	Grand Total
APWA	681	285	966
ATAP	210094	2220	212314
CCAP	1167	35	1202
Maintenance	165	202	367
Conference	300	10	310
Escort	5093	44	5137
LTAP	62745	5639	68384
RTAP	0	0	0
TTAP	38822	5959	44781
All Programs:	319067	14394	333461

Figure 16: CLGT Copier Usage for January 2015 through January 2016

5.0 DATA NOTIONS, DECISIONS, AND ANALYSIS

For simplicity and to facilitate the understanding of the analysis procedures utilized, this section has been broken down into three subsections: 5.1 Nature of the Data Gathered, 5.2 Analysis Decisions, and 5.3 Data Analysis Process. In addition, this section contains a series of examples that illustrate the logic followed to reach the final results.

5.1 NATURE OF THE DATA GATHERED

In order to understand the approach taken regarding the data analysis process, it is necessary to recognize the sources and reconciliation of the collected data. As already mentioned, data was compiled from two sources: interviews of experts (staff members) and historical records.

The data collected through the three interview rounds consisted of the staff members' task lists, task time estimates, and task frequency estimates. Due to the fact that such estimates were developed through expert judgment and appraisal, this type of data was subjective. Due to the data's subjective nature, it was logical to choose the Delphi method as the analysis technique to be employed for seeking accurate estimates. It is important to recognize the importance of its iterative nature. In each Delphi method iteration, experts were interviewed, the obtained data was analyzed, and the analysis results were adjusted and reviewed by both the team and the appropriate expert. This was used as a method to verify the gathered data and results found. By relying on the Delphi method, the subjective data was transformed into relatively precise estimates.

On the other hand, the data obtained from the historical management information records were mostly quantitative, and because of this, it could be analyzed more objectively and conclusively. The analysis of this data was helpful as the team and staff reconciled the inputs to determine any staff members' utilization seasonality by program, and develop more accurate standard work units for the task time estimates. Nonetheless, it is important to note that the amount of quantitative data available for each staff member varied widely, affecting the amount of subjective and historical data used to estimate support efforts spent by each of the staff members.

5.2 ANALYSIS DECISIONS

After understanding the nature of the data gathered, the principles to be followed in order to conduct the data analysis were decided upon. The main decision was to use a three-point versus a one-point estimate when gathering task time estimates. Using three estimates to establish a range generally yields a better estimate and is easier to think about the maximum, average, and minimum times that tasks could take, rather than a single-point estimate. It was then decided that all task time estimates followed a Beta distribution. The previous decision was based on the fact that the Beta distribution is very flexible and can be used to not only describe the variability observed across the time estimates given by the staff members, but it can also describe the staff members' subjectivity when estimating. For example, a staff member might not be entirely sure that a given task would take 3 hours. He or she may think that three hours is the most likely value, but it could take longer or shorter. Therefore, a Beta distribution would be suitable for describing such a particular situation.

Once the three-point estimation method was selected to collect the estimates, the three values needed to estimate each of the task times were the optimistic, most likely, and pessimistic times. The three estimates were defined as follows:

- **Optimistic Time:** This time represents the estimated duration of the shortest 5% of the task execution time.
- **Most Likely Time:** This is the time needed to complete the task under typical working conditions, in other words, this time is the time the task is most likely to take.
- **Pessimistic:** This represents the time by which 95% of the task occurrence would be completed.

It was clear that the data analysis had to rely on a fundamental theoretical basis – the Central Limit Theorem. In simple words, the Central Limit Theorem states that the distribution of the sum of a relatively large number of independent variables will be approximately normal regardless of the underlying distribution. This refers to the fact that if the expected values or variances of all the Beta distributed tasks are summed, the obtained results can be described as normal distribution parameters (mean and variance). Computing a mean and variance was important for the project as this allowed confidence intervals to be developed to address the variability within each of the

staff members' support time for each program. A confidence interval is simply an interval estimate with a specific level of confidence that the interval estimate will contain the true value of the parameter being estimated. A confidence level of 90% was chosen for the calculation of the confidence intervals for the mean. Statistically this means that the estimate of program utilization of a staff member has no more than a 10% chance of being outside the confidence interval. In the following subsection, the use of the assumptions and the Central Limit Theorem will become more evident as the process used to reach the final results are explained in further detail.

The final assumption made was that all staff members' time must be accounted for in the estimates. This assumption was taken into account due to the fact that all interviewed staff members claimed to have little-to-no forced idle time, making idle time negligible when determining each of the staff members' utilization by program. Additionally, if idle time did exist, it would still need to be allocated to the programs to fully cover all of the staffs' salaries through program funding.

5.3 DATA ANALYSIS PROCESS

It is important to begin this section by explaining that due to the nature of the data gathered, the high variability of task types performed by each staff member, and the iterative nature of the estimation process, every staff member's time spent per program was analyzed in a different way. With that said, the following description of the conducted analysis process has been divided into two general analysis process overviews.

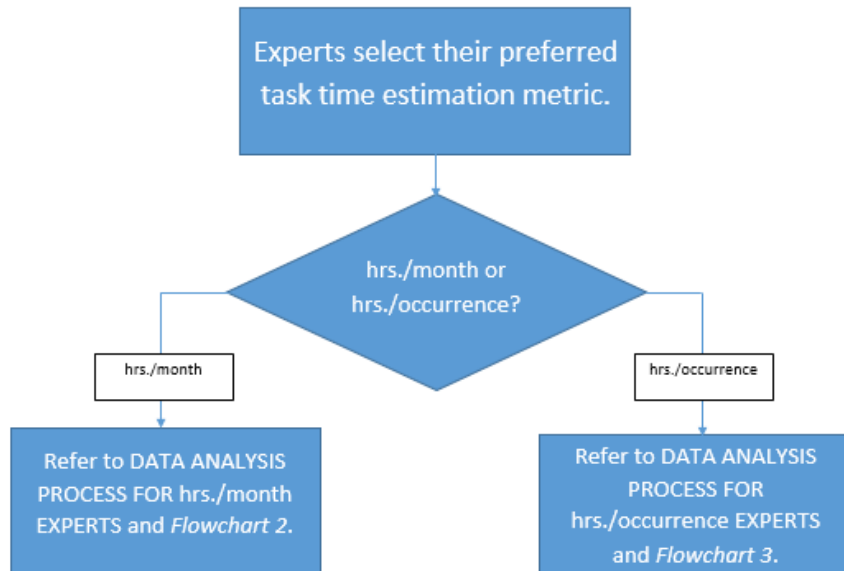


Figure 17: Flowchart 1 – Metric Decision

In summary, four out of seven experts preferred to use hrs./month as their task time estimation metric. These experts were the three Student Workers and the Administrative Assistant. The reason why these experts chose hrs./month was due to the fact that their tasks are performed consistently each month. However, the program demand of each task fluctuates on a monthly basis, meaning that while the time devoted to a task remains fairly constant throughout the month, the allocation of that task’s time per program varies widely depending on the month.

In contrast, three out of the seven analyzed experts preferred to estimate the time based on individual tasks rather than the total time spent per month on one task. Such experts were the Accounting Specialist, the Event Coordinator, and the Specialist II. The reason that the Accounting Specialist preferred hrs./occurrence is because the majority of his/her tasks deal with university processes, such as travel reimbursements, p-card purchases, Campus Vendor Invoices, etc. For example, it was easier to think of the time spent completing one travel reimbursement instead of the total time spent over the course of a month completing multiple travel reimbursements. In addition, the Accounting Specialist had transaction records that provided data on the number of travel reimbursements, p-card purchases, Campus Vendor Invoices, etc. per month for the 2015 calendar year. Therefore, having the time spent per occurrence was essential to finding the total time spent per month on tasks because the number of travel reimbursements,

p-card purchases, etc. per month were multiplied by the amount of time each task required. As for the Event Coordinator and the Specialist II, the majority of their tasks are not performed on a monthly basis and are highly variable based on program. In addition, many of their tasks are seasonal and only occur once or twice a year. By allowing the task time to be estimated based on occurrence, rather than a monthly basis, made it easier for these experts to estimate the time spent on each task.

5.3.1 Data Analysis Process for Hrs./Month Based Estimates

The following flowchart shows the iterative process and logic implemented in order to determine the time utilization estimates by program on a monthly and yearly basis for each of the experts (staff members) who chose to use hrs./month as the metric for the task time estimates.

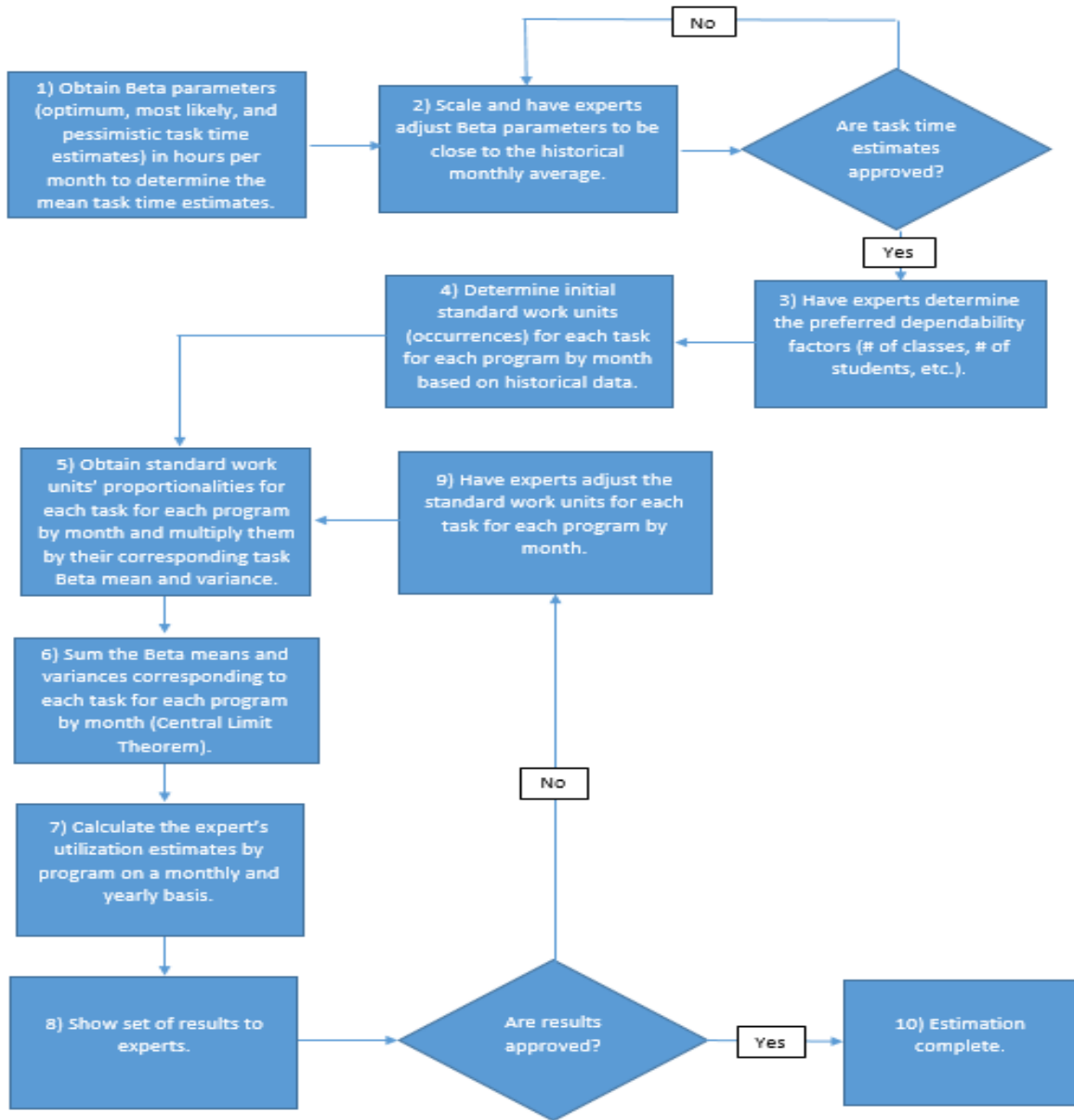


Figure 18: Flowchart 2 – hrs./month Based Estimates Analysis Process

The following subsections will explain each step of the previous flow chart in sequential order. It is important to point out that this process is intuitive and non-algorithmic, it is simply an overview of the general methodology followed in order to obtain each of the expert's time utilization estimates per program on a monthly and yearly basis. Please note that this process varied widely depending on the expert with whom it was being implemented. In addition, it is important to point

out that the worked out examples presented in the following subsections refer to the analysis performed for the Administrative Assistant.

Step 1: Obtain Beta Parameters

The first step of the process was concerned with obtaining Beta distribution parameters in order to calculate the Beta expected values and variances. The parameters under consideration were the optimistic (5th percentile) task time estimate, the most likely (50th percentile) task time estimate, and the pessimistic (95th percentile) task time estimate. It is important to notice that the time estimates were given in hours per month (hrs. / month), meaning that each estimate accounted for the total time spent by an expert performing a given task over the course of a month. The Beta means and variances for each task were calculated using the following formulas:

$$(1) \quad \text{Beta Mean}_i = \frac{(\text{Optimistic}_i + 4 * \text{Most Likely}_i + \text{Pessimistic}_i)}{6}$$

$$(2) \quad \text{Beta Variance}_i = \left(\frac{(\text{Pessimistic}_i - \text{Optimistic}_i)}{6} \right)^2$$

Where:

Beta Mean_i = Beta expected value of task i

Beta Variance_i = Beta variance of task i

Example:

Task	Optimum (hrs./month)	Most Likely (hrs./month)	Pessimism (hrs./month)	Expected Value E[X]	Variance V[X]
1) Book printing for classes.	0.75	1.75	6.75	2.42	1.00
2) Setting up student workers' schedules.	0.25	0.5	1	0.54	0.02
3) Setting up daily student workers' activity sheet.	8.25	9.25	13	9.71	0.63
4) Developing student workers' weekly projects list .	1.5	2	3.75	2.21	0.14
5) Monitor student workers' activities progress .	15	16.5	20.75	16.96	0.92
6) Building classes in ACEware database.	5.5	6.5	8.5	6.67	0.25
7) Post deposits into ACEware database.	8.5	9.25	10.5	9.33	0.11
8) Correct, edit, add, or delete information in ACEware database.	22.75	24.75	28	24.96	0.77
9) Create tabs for upcoming classes.	0.25	0.75	1.5	0.79	0.04
10) Reconciliation of class attendance and class registration.	9.5	10.25	12.25	10.46	0.21
11) Create manual confirmations through ACEware for people who didn't registered online.	3.75	4.5	6	4.63	0.14
12) Process all registrations	22.75	24.75	28	24.96	0.77
13) Phone call answering/transferring.	11.25	12	14.25	12.25	0.25
14) Answer emails.	7.5	8.25	9.75	8.38	0.14
15) Administrative assistance for program managers.	3.75	4.5	6	4.63	0.14
16) Keeping classes' files and books.	3.75	4.5	6	4.63	0.14
17) Keeping CLGT's staff calendars.	2.25	3	4.5	3.13	0.14
18) Keeping the room's schedules.	2.25	3	4.5	3.13	0.14
19) Request maintenance work orders.	0.75	1.75	3.25	1.83	0.17
20) Programs' monthly reports.	0.75	1.75	3.25	1.83	0.17
21) Order programs' supplies.	0.75	2.5	4	2.46	0.29

Figure 19: Expected Value and Variance Example

Taking a closer look at Figure 19: Expected Value and Variance Example, it can be seen that the first column represents the task number “i,” while the second, third, and fourth columns represent the optimistic, most likely, and pessimistic time estimates for each task “i.” In order to calculate the Beta mean and variance for each task “i,” the required values were inserted into equations (1) and (2). For example, in order to calculate the Beta mean and variance for task 15 in Figure 19: Expected Value and Variance Example, the following values were used:

$$i = 15$$

$$\text{Optimistic}_{15} = 3.75 \text{ hrs./month}$$

$$\text{Most Likely}_{15} = 4.5 \text{ hrs./month}$$

$$\text{Pessimistic}_{15} = 6 \text{ hrs./month}$$

$$\text{Beta } E[x]_{15} = \frac{(3.75 \text{ hrs./month} + 4 \cdot 4.5 \text{ hrs./month} + 6 \text{ hrs./month})}{6} = 4.63 \text{ hrs./month}$$

$$\text{Beta } V[x]_{15} = \left(\frac{6 \text{ hrs./month} - 3.75 \text{ hrs./month}}{6} \right)^2 = 0.14 \text{ hrs.}^2/\text{month}^2$$

Therefore, the example shows that the administrative assistant spends 4.63 hrs./month, on average, assisting program managers.

Step 2: Scale and Have Experts Adjust Task Time Estimates

Due to the fact that the initial task time estimates provided by the experts were in some cases out of proportion, the values needed to be further adjusted by the experts. For example, let us assume that the historical records show that a given expert worked, on average, 160 hrs./month and that this expert agreed with that amount. In some instances, after summing the initial Beta mean task time estimates provided by the experts in hours per month, the total amount could be as large as two times higher than the value the expert and the historical records stated the expert typically worked. Therefore, the task time estimates were scaled to meet the historical data expected value, and the results were presented to the expert in order for him/her to review and adjust them accordingly. It is important to note that this step was iterated several times until a consensus was met with the experts concerning the Beta means adding up to resemble a value similar to the one found using the historical records.

Step3: Have Expert Determine the Dependability Factors for Each Task

This particular step dealt with the experts choosing the factors that determined the initial standard work units for each particular task. In summary, this step consisted of having the experts establish what key parameter or set of parameters they preferred to use in order to determine the amount of standard work units that were devoted to a particular task. For instance, if the amount of time spent on a given task depended on the number of students served during the month, then the standard work units for that task would be derived based on the number of students who had enrolled in that month. The following table shows the Administrative Assistant's task list with related dependencies.

Task	Comments/Observations
1) Book printing for classes.	Depends on expert's judgement.
2) Setting up student workers' schedules.	Depends on expert's judgement.
3) Setting up daily student workers' activity sheet.	Depends on expert's judgement.
4) Developing student workers' weekly projects list .	Depends on expert's judgement.
5) Monitor student workers' activities progress .	Depends on expert's judgement.
6) Building classes in ACEware database.	Depends on the number of classes per month.
7) Post deposits into ACEware database.	Depends on the number of students per month.
8) Correct, edit, add, or delete information in ACEware database.	Depends on the number of students per month.
9) Create tabs for upcoming classes.	Depends on the number of classes per month.
10) Reconciliation of class attendance and class registration.	Depends on the number of students per month.
11) Create manual confirmations through ACEware for people who didn't register online.	Depends on the number of students per month.
12) Process all registrations	Depends on the number of students per month.
13) Phone call answering/transferring.	Depends on expert's judgement.
14) Answer emails.	Depends on expert's judgement.
15) Administrative assistance for program managers.	Depends on expert's judgement.
16) Keeping classes' files and books.	Depends on the number of classes per month.
17) Keeping CLGT's staff calendars.	Depends on expert's judgement.
18) Keeping the room's schedules.	Depends on expert's judgement.
19) Request maintenance work orders.	Already given.
20) Programs' monthly reports.	Depends on expert's judgement.
21) Order programs' supplies.	Depends on expert's judgement.

Figure 20: Dependencies per Task (hrs./month)

Step 4: Develop Initial Standard Work Units for Each Task for Each Program by Month

The main objective of this step was to determine initial standard work units' for each task for each program by month. The purpose of this step was to determine values that corresponded to the dependability factors given for each task. For the tasks that were dependent on the number of students or number of classes, the initial standard work units' directly used the number of students and number of classes found on the historical records. The tasks whose standard work units' depended on the expert's judgement were obtained from the interview-collected data. In order to help clarify the logic behind this step, the following figure shows the initial standard work units' for task 1 (Book printing for classes), task 6 (Building classes in ACEware database), and task 10 (Reconciliation of class attendance and class registration) for each program by month. In addition, the figure also shows the historical data of the number of students and number of classes for each program by month. Please note that task 1 is dependent on expert's judgement, task 6 is dependent on the number of classes per month, and task 10 is dependent on the number students per month.

TTAP Standard Work Units Per Month												
TASK ID#	January	February	March	April	May	June	July	August	September	October	November	December
1	2	2	5	5	3	3	3	5	0	3	1	6
6	2	2	5	5	3	3	4	6	0	12	1	6
10	50	25	56	101	30	84	98	124	0	70	108	87
TTAP HISTORICAL DATA												
students/month	50	25	56	101	30	84	98	124	0	70	108	87
classes/month	2	2	5	5	3	3	4	6	0	12	1	6
LTAP Standard Work Units Per Month												
TASK ID#	January	February	March	April	May	June	July	August	September	October	November	December
1	3	4	8	5	5	5	4	4	3	8	6	5
6	5	4	8	5	5	5	2	4	4	8	7	5
10	140	209	130	166	112	93	29	57	84	245	174	142
LTAP HISTORICAL DATA												
students/month	140	209	130	166	112	93	29	57	84	245	174	142
classes/month	5	4	8	5	5	5	2	4	4	8	7	5
ATAP Standard Work Units Per Month												
TASK ID#	January	February	March	April	May	June	July	August	September	October	November	December
1	2	3	5	2	3	1	1	1	2	2	2	2
6	2	3	5	1	3	1	1	1	1	3	2	2
10	37	97	117	27	68	28	57	61	11	129	77	97
ATAP HISTORICAL DATA												
students/month	37	97	117	27	68	28	57	61	11	129	77	97
classes/month	2	3	5	1	3	1	1	1	1	3	2	2
Pilot Escort Standard Work Units Per Month												
TASK ID#	January	February	March	April	May	June	July	August	September	October	November	December
1	1	2	1	1	1	2	1	1	3	2	1	1
6	1	2	1	1	1	2	1	1	3	2	1	1
10	43	53	46	26	30	52	26	48	40	71	47	44
Pilot Escort HISTORICAL DATA												
students/month	43	53	46	26	30	52	26	48	40	71	47	44
classes/month	1	2	1	1	1	2	1	1	3	2	1	1

Figure 21: Standard Work Units by Task per Program per Month

As it can be understood by looking at the previous figure, one can observe that the standard work units for task 10 (in green) are equal to the number of students' historical data, while the standard work units for task 6 (in blue) are equal to the number of classes' historical data. The values in yellow came directly from the interview-collected data and correspond to the expert's initial judgement.

Step 5: Obtain Standard Work Units' Proportionalities and Multiply Them by Their Corresponding Beta Means and Variances

This step simply consisted of dividing each standard work unit per task for each program by month by the sum of the standard work units for each task per program corresponding to a given month. For better understanding, the formula used is presented below, followed by an example reusing tasks 1, 6, and 10.

$$(3) \quad \text{Proportionality}_{i,j,k} = \frac{\text{Standard Work Units}_{i,j,k}}{\sum_{k=1}^{\# \text{ of programs}} \text{Standard Work Units}_{i,j,k}}$$

Where:

$\text{Proportionality}_{i,j,k}$ = Proportionality factor of task i in month j corresponding to program k

$\text{Standard Work Units}_{i,j,k}$ = Proportionality factor of task i in month j corresponding to program k

Example:

Please refer to the figures below to follow the rationale behind this example.

TTAP Standard Work Units Per Month												
TASK ID#	January	February	March	April	May	June	July	August	September	October	November	December
1	2	2	5	5	3	3	3	5	0	3	1	6
6	2	2	5	5	3	3	4	6	0	12	1	6
10	50	25	56	101	30	84	98	124	0	70	108	87
LTAP Standard Work Units Per Month												
TASK ID#	January	February	March	April	May	June	July	August	September	October	November	December
1	3	4	8	5	5	5	4	4	3	8	6	5
6	5	4	8	5	5	5	2	4	4	8	7	5
10	140	209	130	166	112	93	29	57	84	245	174	142
ATAP Standard Work Units Per Month												
TASK ID#	January	February	March	April	May	June	July	August	September	October	November	December
1	2	3	5	2	3	1	1	1	2	2	2	2
6	2	3	5	1	3	1	1	1	1	3	2	2
10	37	97	117	27	68	28	57	61	11	129	77	97
Pilot Escort Standard Work Units Per Month												
TASK ID#	January	February	March	April	May	June	July	August	September	October	November	December
1	1	2	1	1	1	2	1	1	3	2	1	1
6	1	2	1	1	1	2	1	1	3	2	1	1
10	43	53	46	26	30	52	26	48	40	71	47	44
Totals												
TASK ID#	January	February	March	April	May	June	July	August	September	October	November	December
1	8	11	19	13	12	11	8	12	7	16	10	15
6	10	11	19	12	12	11	8	12	8	25	11	14
10	270	384	349	320	240	257	210	290	135	515	406	370

Figure 22: Standard Work Units Totals

After looking at Figure 22: Standard Work Units Totals, it can be seen that the sum of the values for task 1 in January (in orange) result in the dark green value. Following is the mathematical representation of this operation:

$$\sum_{k=1}^4 \text{Standard Work Units}_{1,January,k} = 2 + 3 + 2 + 1 = 8$$

TTAP Standard Work Units Proportionalities Per Month												
TASK ID#	January	February	March	April	May	June	July	August	September	October	November	December
1	0.25	0.18	0.26	0.38	0.25	0.27	0.34	0.43	0.00	0.17	0.08	0.41
6	0.20	0.18	0.26	0.42	0.25	0.27	0.50	0.50	0.00	0.48	0.09	0.43
10	0.19	0.07	0.16	0.32	0.13	0.33	0.47	0.43	0.00	0.14	0.27	0.24
LTAP Standard Work Units Proportionalities Per Month												
TASK ID#	January	February	March	April	May	June	July	August	September	October	November	December
1	0.38	0.36	0.42	0.38	0.42	0.45	0.41	0.35	0.36	0.53	0.58	0.34
6	0.50	0.36	0.42	0.42	0.42	0.45	0.25	0.33	0.50	0.32	0.64	0.36
10	0.52	0.54	0.37	0.52	0.47	0.36	0.14	0.20	0.62	0.48	0.43	0.38
ATAP Standard Work Units Proportionalities Per Month												
TASK ID#	January	February	March	April	May	June	July	August	September	October	November	December
1	0.25	0.27	0.26	0.15	0.25	0.09	0.12	0.11	0.27	0.15	0.21	0.17
6	0.20	0.27	0.26	0.08	0.25	0.09	0.13	0.08	0.13	0.12	0.18	0.14
10	0.14	0.25	0.34	0.08	0.28	0.11	0.27	0.21	0.08	0.25	0.19	0.26
Pilot Escort Standard Work Units Proportionalities Per Month												
TASK ID#	January	February	March	April	May	June	July	August	September	October	November	December
1	0.13	0.18	0.05	0.08	0.08	0.18	0.13	0.12	0.36	0.15	0.12	0.08
6	0.10	0.18	0.05	0.08	0.08	0.18	0.13	0.08	0.38	0.08	0.09	0.07
10	0.16	0.14	0.13	0.08	0.13	0.20	0.12	0.17	0.30	0.14	0.12	0.12

Figure 23: Proportionalities by Task per Program per Month

Figure 23: Proportionalities by Task per Program per Month represents the standard work units' proportionalities by month, these proportionalities were obtained by using equation (3). The procedure to get the value (in orange) for $Proportionality_{1,January,TTAP}$ is presented below:

$$\text{Standard Work Units}_{1,January,TTAP} = 2$$

$$\sum_{k=1}^4 \text{Standard Work Units}_{1,January,k} = 8$$

$$Proportionality_{1,January,TTAP} = \frac{2}{8} = .25$$

Once all the proportionalities corresponding to each standard work unit for each task for each program by month were calculated, each proportionality was multiplied by its corresponding task expected value and variance. This was done in order to estimate the proportion of time the expert devoted to performing a particular task for each program in a given month. The mentioned operations are represented mathematically through the next equations:

$$(4) \quad \text{Beta } E[x]_{i,j,k} = Proportionality_{i,j,k} * \text{Beta Mean}_i$$

$$(5) \quad \text{Beta } V[x]_{i,j,k} = \text{Proportionality}_{i,j,k} * \text{Beta Variance}_i$$

Where:

$\text{Beta } E[x]_{i,j,k}$ = Beta expected value of task i in month j corresponding to program k

$\text{Beta } V[x]_{i,j,k}$ = Beta variance of task i in month j corresponding to program k

The following example puts equations (4) and (5) into practice.

Example:

TASK ID #	Expected Value E[X]	Variance V[X]										
1	2.42	1.00										
6	6.67	0.25										
10	10.46	0.21										
TTAP Beta Expected Values Per Month												
TASK ID#	January	February	March	April	May	June	July	August	September	October	November	December
1	0.60	0.44	0.64	0.93	0.60	0.66	0.82	1.04	0.00	0.41	0.21	0.99
6	1.33	1.21	1.75	2.78	1.67	1.82	3.33	3.33	0.00	3.20	0.61	2.86
10	1.94	0.68	1.68	3.30	1.31	3.42	4.88	4.47	0.00	1.42	2.78	2.46
TTAP Beta Variance Per Month												
TASK ID#	January	February	March	April	May	June	July	August	September	October	November	December
1	0.25	0.18	0.26	0.38	0.25	0.27	0.34	0.43	0.00	0.17	0.08	0.41
6	0.05	0.05	0.07	0.10	0.06	0.07	0.13	0.13	0.00	0.12	0.02	0.11
10	0.04	0.01	0.03	0.07	0.03	0.07	0.10	0.09	0.00	0.03	0.06	0.05
LTAP Beta Expected Values Per Month												
TASK ID#	January	February	March	April	May	June	July	August	September	October	November	December
1	0.91	0.88	1.02	0.93	1.01	1.10	1.00	0.84	0.88	1.28	1.40	0.83
6	3.33	2.42	2.81	2.78	2.78	3.03	1.67	2.22	3.33	2.13	4.24	2.38
10	5.42	5.69	3.90	5.43	4.88	3.78	1.44	2.06	6.51	4.98	4.48	4.01
LTAP Beta Variance Per Month												
TASK ID#	January	February	March	April	May	June	July	August	September	October	November	December
1	0.38	0.36	0.42	0.38	0.42	0.45	0.41	0.35	0.36	0.53	0.58	0.34
6	0.13	0.09	0.11	0.10	0.10	0.11	0.06	0.08	0.13	0.08	0.16	0.09
10	0.11	0.11	0.08	0.11	0.10	0.08	0.03	0.04	0.13	0.10	0.09	0.08
ATAP Beta Expected Values Per Month												
TASK ID#	January	February	March	April	May	June	July	August	September	October	November	December
1	0.60	0.66	0.64	0.37	0.60	0.22	0.28	0.26	0.66	0.36	0.51	0.41
6	1.33	1.82	1.75	0.56	1.67	0.61	0.83	0.56	0.83	0.80	1.21	0.95
10	1.43	2.64	3.51	0.88	2.96	1.14	2.84	2.20	0.85	2.62	1.98	2.74
ATAP Beta Variance Per Month												
TASK ID#	January	February	March	April	May	June	July	August	September	October	November	December
1	0.25	0.27	0.26	0.15	0.25	0.09	0.12	0.11	0.27	0.15	0.21	0.17
6	0.05	0.07	0.07	0.02	0.06	0.02	0.03	0.02	0.03	0.03	0.05	0.04
10	0.03	0.05	0.07	0.02	0.06	0.02	0.06	0.04	0.02	0.05	0.04	0.06
Pilot Escort Beta Expected Values Per Month												
TASK ID#	January	February	March	April	May	June	July	August	September	October	November	December
1	0.30	0.44	0.13	0.19	0.20	0.44	0.31	0.28	0.88	0.36	0.29	0.19
6	0.67	1.21	0.35	0.56	0.56	1.21	0.83	0.56	2.50	0.53	0.61	0.48
10	1.67	1.44	1.38	0.85	1.31	2.12	1.29	1.73	3.10	1.44	1.21	1.24
Pilot Escort Beta Variance Per Month												
TASK ID#	January	February	March	April	May	June	July	August	September	October	November	December
1	0.13	0.18	0.05	0.08	0.08	0.18	0.13	0.12	0.36	0.15	0.12	0.08
6	0.03	0.05	0.01	0.02	0.02	0.05	0.03	0.02	0.09	0.02	0.02	0.02
10	0.03	0.03	0.03	0.02	0.03	0.04	0.03	0.03	0.06	0.03	0.02	0.02

Figure 24: Time Estimates Beta Expected Values by Task per Program per Month

In order to obtain the values in orange and gray, the following values were inserted into equations (4) and (5).

$$\text{Proportionality}_{1, \text{January}, \text{TTAP}} = .25$$

$$\text{Beta Mean}_1 = 2.42 \text{ hrs./month}$$

$$\text{Beta } E[x]_{1, \text{January}, \text{TTAP}} = .25 * 2.42 \text{ hrs./month} = .6 \text{ hrs./month}$$

$$\text{Beta Variance}_1 = 1 \text{ hrs./month}$$

$$\text{Beta } V[x]_{1, \text{January}, \text{TTAP}} = .25 * 1 \text{ hrs./month} = .25 \text{ hrs./month}$$

Step 6: Sum the Beta Means and Variances Corresponding to Each Month and Program

In order to execute this particular step, the Central Limit Theorem was invoked by simply summing the expected values and variances for each task per month in a given program. The mathematics behind this step are shown in the following formulas:

$$(6) \text{ Normal } E[x]_{j,k} = \sum_i^{\text{number of tasks}} \text{Beta } E[x]_{i,j,k}$$

$$(7) \text{ Normal } V[x]_{j,k} = \sum_i^{\text{number of tasks}} \text{Beta } V[x]_{i,j,k}$$

Where:

Normal $E[x]_{j,k}$ = Normal expected value for month j corresponding to program k

Normal $V[x]_{j,k}$ = Normal variance for month j corresponding to program k

Beta $E[x]_{i,j,k}$ = Beta expected value of task i in month j corresponding to program k

Beta $V[x]_{i,j,k}$ = Beta variance of task i in month j corresponding to program k

Example:

Please refer to Figure 25: Total Expected Time Value per Month and Figure 26: Total Time Variance per Month to observe the logic used in this example.

LTAP Task Time Expected Value Per Month												
TASK ID#	January	February	March	April	May	June	July	August	September	October	November	December
1	0.99	0.88	1.02	0.93	1.01	1.10	1.03	0.84	0.88	1.28	1.40	0.83
2	0.10	0.13	0.13	0.13	0.13	0.13	0.21	0.12	0.05	0.13	0.11	0.12
3	1.83	2.37	2.37	2.37	2.37	2.37	3.85	2.15	0.98	2.26	1.98	2.16
4	0.42	0.55	0.55	0.55	0.55	0.55	0.89	0.50	0.19	0.53	0.46	0.50
5	3.20	4.15	4.15	4.15	4.15	4.15	6.73	3.75	1.72	3.94	3.46	3.78
6	2.7	2.4	2.8	2.6	2.8	3.0	2.8	2.3	2.4	3.5	3.9	2.3
8	10.8	13.6	9.3	12.1	11.6	9.0	5.9	4.6	13.6	11.9	9.6	8.9
9	0.3	0.4	0.3	0.4	0.4	0.3	0.2	0.1	0.4	0.4	0.3	0.3
10	4.6	5.7	3.9	5.1	4.9	3.8	2.5	1.9	5.7	5.0	4.0	3.7
11	2.0	2.5	1.7	2.3	2.2	1.7	1.1	0.9	2.5	2.2	1.8	1.6
12	11.0	13.6	9.3	12.1	11.6	9.0	5.9	4.6	13.6	11.9	9.6	8.9
13	2.36	3.06	3.06	3.06	3.06	3.06	4.95	2.78	1.25	2.92	2.57	2.80
14	1.61	2.09	2.09	2.09	2.09	2.09	3.38	1.90	0.86	2.00	1.76	1.91
15	0.87	1.13	1.12	1.12	1.12	1.12	1.81	1.02	0.47	1.08	0.95	1.03
16	1.89	1.68	1.95	1.78	1.93	2.10	1.97	1.60	1.68	2.44	2.69	1.58
17	0.60	0.78	0.78	0.78	0.78	0.78	1.26	0.71	0.27	0.74	0.66	0.71
18	0.60	0.78	0.78	0.78	0.78	0.78	1.26	0.71	0.27	0.74	0.66	0.71
19	0.28	0.37	0.37	0.37	0.37	0.37	0.60	0.34	0.11	0.36	0.31	0.34
20	0.71	0.92	0.92	0.92	0.92	0.92	1.30	1.00	0.08	0.80	0.91	0.92
21	0.47	0.61	0.61	0.61	0.61	0.61	0.99	0.56	0.18	0.59	0.52	0.56
Totals	47.39	57.74	47.22	54.24	53.35	46.98	48.64	32.53	47.21	54.63	47.64	43.65

Figure 25: Total Expected Time Value per Month

LTAP Task Time Variance Per Month												
TASK ID#	January	February	March	April	May	June	July	August	September	October	November	December
1	0.41	0.36	0.42	0.38	0.42	0.45	0.43	0.35	0.36	0.53	0.58	0.34
2	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
3	0.12	0.15	0.15	0.15	0.15	0.15	0.25	0.14	0.06	0.15	0.13	0.14
4	0.03	0.04	0.04	0.04	0.04	0.04	0.06	0.03	0.01	0.03	0.03	0.03
5	0.17	0.22	0.22	0.22	0.22	0.22	0.36	0.20	0.09	0.21	0.19	0.20
6	0.10	0.09	0.11	0.10	0.10	0.11	0.11	0.09	0.09	0.13	0.15	0.09
8	0.33	0.42	0.29	0.37	0.36	0.28	0.18	0.14	0.42	0.36	0.29	0.27
9	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.02	0.02	0.02	0.02
10	0.09	0.11	0.08	0.10	0.10	0.08	0.05	0.04	0.11	0.10	0.08	0.07
11	0.06	0.08	0.05	0.07	0.07	0.05	0.03	0.03	0.08	0.07	0.05	0.05
12	0.34	0.42	0.29	0.37	0.36	0.28	0.18	0.14	0.42	0.36	0.29	0.27
13	0.05	0.06	0.06	0.06	0.06	0.06	0.10	0.06	0.03	0.06	0.05	0.06
14	0.03	0.04	0.04	0.04	0.04	0.04	0.06	0.03	0.01	0.03	0.03	0.03
15	0.03	0.03	0.03	0.03	0.03	0.03	0.06	0.03	0.01	0.03	0.03	0.03
16	0.06	0.05	0.06	0.05	0.06	0.06	0.06	0.05	0.05	0.07	0.08	0.05
17	0.03	0.04	0.04	0.04	0.04	0.04	0.06	0.03	0.01	0.03	0.03	0.03
18	0.03	0.04	0.04	0.04	0.04	0.04	0.06	0.03	0.01	0.03	0.03	0.03
19	0.03	0.03	0.03	0.03	0.03	0.03	0.06	0.03	0.01	0.03	0.03	0.03
20	0.07	0.09	0.09	0.09	0.09	0.09	0.12	0.10	0.01	0.08	0.09	0.09
21	0.06	0.07	0.07	0.07	0.07	0.07	0.12	0.07	0.02	0.07	0.06	0.07
Totals	2.04	2.37	2.12	2.29	2.29	2.14	2.35	1.59	1.84	2.42	2.24	1.91

Figure 26: Total Time Variance per Month

In order to get the values highlighted in yellow (Figure 25: Total Expected Time Value per Month and Figure 26: Total Time Variance per Month), the values in green were summed by using equations (8) and (9) respectively.

$$Normal E[x]_{March,LTAP} = \sum_{i=1}^{21} Beta E[x]_{i,March,LTAP} = 47.22 \text{ hrs./month}$$

$$Normal V[x]_{March,LTAP} = \sum_{i=1}^{21} Beta V[x]_{i,March,LTAP} = 2.12 \text{ hrs.}^2/\text{month}^2$$

In addition to calculating the normal expected value and variance, the upper and lower confidence intervals corresponding to each month per program were calculated. The following formulas were used to perform these calculations:

$$(8) UCL_{j,k} = Normal E[x]_{j,k} + Z_{0.90} * \sqrt{Normal V[x]_{j,k}}$$

$$(9) LCL_{j,k} = Normal E[x]_{j,k} - Z_{0.90} * \sqrt{Normal V[x]_{j,k}}$$

Where:

UCL_{j,k} = Upper confidence limit for month j corresponding to program k

LCL_{j,k} = Lower confidence limit for month j corresponding to program k

Normal E[x]_{j,k} = Normal expected value for month j corresponding to program k

Normal V[x]_{j,k} = Normal variance for month j corresponding to program k

Z_{0.90} = 90% z – score value = 1.645

It is important to notice that the z-score value (*Z_{0.90}*) indicates how many standard deviations ($\sqrt{Normal V[x]_{j,k}}$) an element is away from the mean (*Normal E[x]_{j,k}*).

Example:

The following example demonstrates the procedure used in order to calculate the upper and lower confidence intervals for each month per program. Please refer to the next figure (Figure 27: Upper and Lower Confidence Intervals for LTAP Time per Month) in order to help understand the logic used in this calculation.

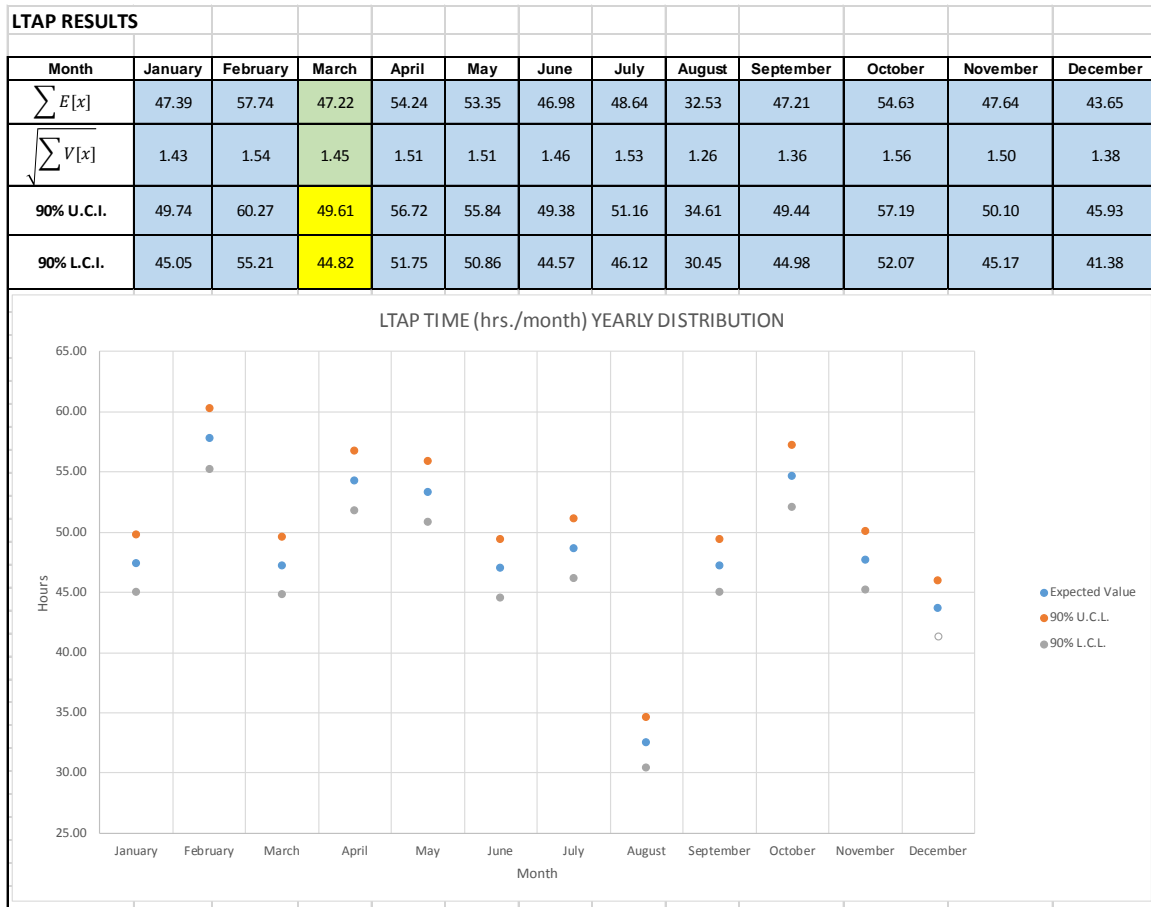


Figure 27: Upper and Lower Confidence Intervals for LTAP Time per Month

In order to obtain the 90% upper and lower confidence interval values for the month of March corresponding to the LTAP program, the following values were inserted into equations (10) and (11):

$$\text{Normal } E[x]_{\text{March,LTAP}} = 47.22 \text{ hrs./month}$$

$$\text{Normal } V[x]_{\text{March,LTAP}} = 1.45 \text{ hrs./month}$$

$$Z_{0.90} = 1.645$$

$$90\% \text{ UCL}_{\text{March,LTAP}} = 47.22 \text{ hrs./month} + 1.645 * 1.45 \text{ hrs./month} = 49.61 \text{ hrs./month}$$

$$90\% \text{ LCL}_{\text{March,LTAP}} = 47.22 \text{ hrs./month} - 1.645 * 1.45 \text{ hrs./month} = 44.82 \text{ hrs./month}$$

Step 7: Calculate the Expert's Time Spent Per Program on a Monthly and Yearly Basis

In order to calculate the monthly percent of time spent per program, the total time spent on that program during a specified month was divided by the total time the staff member worked that month.

The equation is as follows:

$$(12) \quad \text{Monthly Percent Utilization}_{j,k} = \frac{\text{Normal } E[x]_{j,k}}{\sum_{k=1}^{\text{number of programs}} \text{Normal } E[x]_{j,k}} * 100\%$$

Where:

*Monthly Percent Utilization*_{j,k} = percent of time in month j spent on program k

*Normal E[x]*_{j,k} = Normal expected value for month j corresponding to program k

Example:

In the example below, the time dedicated to LTAP in March was divided by the total time worked in March to find the percent of time the staff member was utilized by LTAP in March. In Figure 28: LTAP Results – Expected Values, Variance, and Confidence Intervals, the value highlighted in green is the monthly expected value of the time spent working on LTAP activities in March. This value was divided by the sum of the values in Figure 29: CLGT Program Results - Expected Values highlighted in yellow, which represent the total time the expert dedicated per program in March.

*Administrative Assistant Monthly Percent Utilization*_{March,LTAP}

$$= \frac{47.22}{(31.1 + 47.22 + 28.65 + 0.05 + 48.38 + 0.22)} * 100\% = 30.3\%$$

LTAP RESULTS												
Month	January	February	March	April	May	June	July	August	September	October	November	December
$\sum E[x]$	47.39	57.74	47.22	54.24	53.35	46.98	48.64	32.53	47.21	54.63	47.64	43.65
$\sqrt{\sum V[x]}$	1.43	1.54	1.45	1.51	1.51	1.46	1.53	1.26	1.36	1.56	1.50	1.38
90% U.C.I.	49.74	60.27	49.61	56.72	55.84	49.38	51.16	34.61	49.44	57.19	50.10	45.93
90% L.C.I.	45.05	55.21	44.82	51.75	50.86	44.57	46.12	30.45	44.98	52.07	45.17	41.38

Figure 28: LTAP Results – Expected Values, Variance, and Confidence Intervals (hours)

TTAP RESULTS												
Month	January	February	March	April	May	June	July	August	September	October	November	December
$\sum E[x]$	40.62	23.73	31.10	41.70	28.59	42.18	37.33	42.27	35.81	34.58	31.92	35.52

LTAP RESULTS												
Month	January	February	March	April	May	June	July	August	September	October	November	December
$\sum E[x]$	47.39	57.74	47.22	54.24	53.35	46.98	48.64	32.53	47.21	54.63	47.64	43.65

PILOT ESCORT RESULTS												
Month	January	February	March	April	May	June	July	August	September	October	November	December
$\sum E[x]$	30.49	31.51	28.65	25.98	28.85	38.50	30.13	40.07	36.93	34.81	35.90	29.66

TRANSPORTATION INTERN RESULTS												
Month	January	February	March	April	May	June	July	August	September	October	November	December
$\sum E[x]$	0.00	0.00	0.05	0.05	0.05	0.05	0.05	0.05	0.00	0.00	0.00	0.00

TTAP RESULTS												
Month	January	February	March	April	May	June	July	August	September	October	November	December
$\sum E[x]$	36.85	42.43	48.38	33.45	44.57	27.70	39.30	40.52	35.64	31.41	39.96	46.60

CCAP RESULTS												
Month	January	February	March	April	May	June	July	August	September	October	November	December
$\sum E[x]$	0.24	0.22	0.22	0.22	0.22	0.22	0.21	0.21	0.13	0.21	0.22	0.21

Figure 29: CLGT Program Results - Expected Values (hours)

In order to calculate the yearly utilization per program, a similar procedure was followed. First, the total time spent per program per year was found by summing the monthly totals previously found. Next, all of the programs' yearly totals for that staff member were added to find the total time worked for the year. To find the percent utilization per program per year, a program's yearly total was divided by the total time worked.

The equation is as follows:

$$(10) \text{ Yearly Percent Utilization}_k = \frac{\sum_{i=1}^{\# \text{ of months}} \text{Normal}E[x]_{j,k}}{\sum_{j=1}^{\# \text{ of months}} \sum_{k=1}^{\# \text{ of programs}} \text{Normal}E[x]_{j,k}} * 100\%$$

Where:

$\text{Yearly Percent Utilization}_k = \text{Yearly percent utilization of program } k$

$\text{Normal } E[x]_{j,k} = \text{Normal expected value for month } j \text{ corresponding to program } k$

For example, the time worked on LTAP each month, shown in Figure 30: LTAP Results - Expected Values, was summed to find the total time spent by the staff member on LTAP for the year. The time spent per program for year by the staff member is shown in Figure 31: Program Results - Total Time Spent per Program.

LTAP RESULTS

Month	January	February	March	April	May	June	July	August	September	October	November	December
$\sum E[x]$	47.39	57.74	47.22	54.24	53.35	46.98	48.64	32.53	47.21	54.63	47.64	43.65

Figure 30: LTAP Results - Expected Values (hours)

Program	Total hrs./year
TTAP	425.35
LTAP	581.22
PILOT/ESCORT	391.48
INTERN	0.30
ATAP	466.82
CCAP	5.33

Figure 31: Program Results - Total Time Spent per Program

LTAP’s yearly total was then divided by the total time worked by the Administrative Assistant on all programs for the year.

$$\text{Yearly Percent Utilization for LTAP} = \frac{581.22}{(425.35 + 581.22 + 391.48 + 0.30 + 466.82 + 5.33)} * 100\%$$

$$\text{Administrative Assistant Yearly Percent Utilization for LTAP} = 31.1\%$$

Step 8: Show Set of Results to Experts

The purpose of this step was to demonstrate the first analysis iteration’s results to the experts. After doing so, the experts provided feedback in terms of certain parameters that needed modification, leading the team to step 9. After performing three to four standard work units’ adjustment iterations per expert, the experts approved the obtained analysis results leading the team to step 10.

Step 9: Have Experts Adjust the Standard Work Units for Each Task for Each Program by Month

This step consisted of adjusting the standard work units based on the expert’s feedback in order to increase or decrease the expert’s utilization estimates per program. Performing this step meant that steps 5 through 8 would have to be reiterated with the adjusted standard work units. If Figure 21: Standard Work Units by Task per Program per Month is compared with the following figure (Figure 32: Final Iteration Standard Work Units Estimates by Task per Program by Month), one can see the changes that the initial standard work units went through.

TTAP Standard Work Units Per Month												
TASK ID#	January	February	March	April	May	June	July	August	September	October	November	December
1	2	2	5	5	3	3	3	5	0	3	1	6
6	2	2	5	5	3	3	3	5	0	3	1	6
10	55	25	56	101	30	84	71	110	0	95	93	87
TTAP HISTORICAL DATA												
students/month	50	25	56	101	30	84	98	124	0	70	108	87
classes/month	2	2	5	5	3	3	4	6	0	12	1	6
LTAP Standard Work Units Per Month												
TASK ID#	January	February	March	April	May	June	July	August	September	October	November	December
1	3	4	8	5	5	5	4	4	3	8	6	5
6	3	4	8	5	5	5	4	4	3	8	6	5
10	98	209	130	166	112	93	51	57	67	257	147	142
LTAP HISTORICAL DATA												
students/month	140	209	130	166	112	93	29	57	84	245	174	142
classes/month	5	4	8	5	5	5	2	4	4	8	7	5
ATAP Standard Work Units Per Month												
TASK ID#	January	February	March	April	May	June	July	August	September	October	November	December
1	2	3	5	2	3	1	1	1	2	2	2	2
6	2	3	5	2	3	1	1	1	2	2	2	2
10	37	97	117	48	68	28	57	75	22	103	83	120
ATAP HISTORICAL DATA												
students/month	37	97	117	27	68	28	57	61	11	129	77	97
classes/month	2	3	5	1	3	1	1	1	1	3	2	2
Pilot Escort Standard Work Units Per Month												
TASK ID#	January	February	March	April	May	June	July	August	September	October	November	December
1	1	2	1	1	1	2	1	1	3	2	1	1
6	1	2	1	1	1	2	1	1	3	2	1	1
10	34	53	46	26	30	52	38	65	35	85	58	51
Pilot Escort HISTORICAL DATA												
students/month	43	53	46	26	30	52	26	48	40	71	47	44
classes/month	1	2	1	1	1	2	1	1	3	2	1	1

Figure 32: Final Iteration Standard Work Units Estimates by Task per Program by Month

The values in red observed in Figure 32: Final Iteration Standard Work Units Estimates by Task per Program by Month, represent the values that changed throughout the various iterations, relative to the values in Figure 21: Standard Work Units by Task per Program per Month.

Step 10: Estimation Complete

Once the experts approved the obtained utilization estimates, meaning that such estimates were as accurate as they deemed possible, the estimation analysis was finally complete. Following the completion of determining the individual staff member's monthly and yearly utilization, the monthly and yearly CLGT utilization per program could be calculated.

5.3.2 Data Analysis Process for Hrs./Occurrence Based Estimates

The following flowchart, shows the iterative process and logic implemented by the team in order to determine the time utilization estimates by program on a monthly and yearly basis for each of the experts who chose to use hrs./occurrence as the metric for their task time estimates.

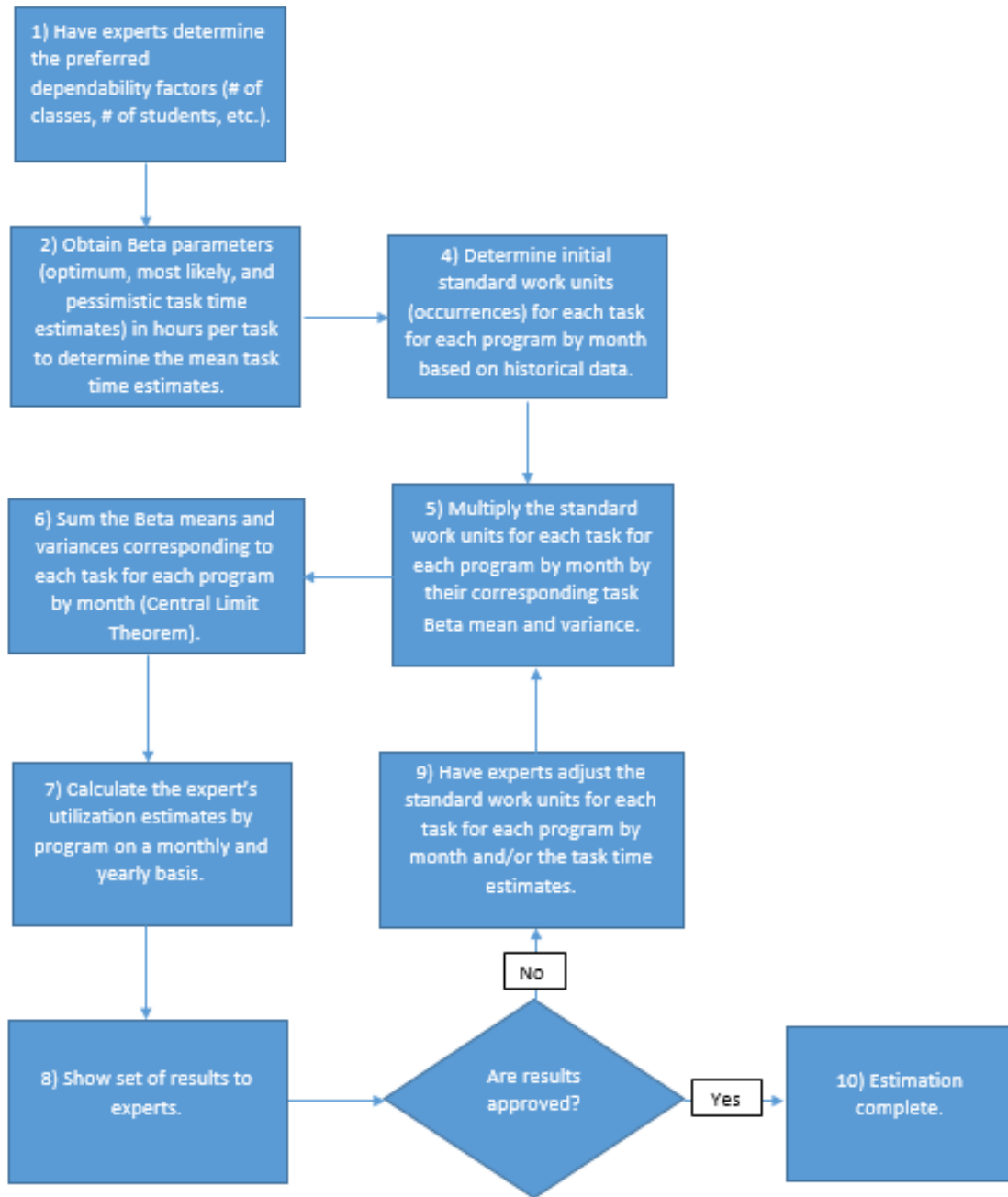


Figure 33: Flowchart 3 – hrs./occurrence Based Estimates Analysis Process

The following subsections will explain steps 1, 5, and 9 of the previous flowchart (Figure 33: Flowchart 3 – hrs./occurrence Based Estimates Analysis Process). The remaining steps' procedures are identical in nature to the steps encountered in Flowchart 2, and therefore have already been explained. In addition, it is important to mention that the worked out examples

presented in the following subsections refer to the utilization by program estimation analysis performed for the Event Coordinator.

Step 1: Have the Experts Determine the Preferred Dependability Factors

This step is almost identical to step 3 of Flowchart 2, the only difference is the sequential order in which they appear in their corresponding analysis process flow diagrams. In order to conduct the data analysis process for the hrs./occurrence experts, it was necessary to have the experts determine the dependability factors for each of the tasks so that it was easier for them to further provide initial task time estimates. Below is a table showing the dependencies for each task the Event Coordinator at CLGT performed.

Task	Comments/Observations
1) ACEware database maintenance.	Expert's judgement.
2) Develop and modify reports.	Expert's judgement.
3) Monitor and adjust data entry (resolving data entry inconsistencies).	Expert's judgement.
4) Provide assistance regarding ACEware related problems.	Expert's judgement.
5) Onsite registration.	hrs. / class
6) Prepare & notarize affidavits.	hrs. / class
7) Temporary and completion letter drafting.	hrs. / class
8) Keep and update the pilot escort certification website list.	hrs. / month
9) Answer students' questions by email or phone.	hrs. / day
10) Process class 'No Show' student paperwork.	hrs. / class
11) After classes, revise certification numbers, expiration dates and contact info as needed.	hrs. / class
12) Prepare student paperwork to send to Department of Public Safety.	hrs. / day
13) Process all credit card payments.	hrs. / class
14) Serve as the APWA chapter administrator.	Expert's judgement.
15) Prepare APWA's board meeting notices.	Expert's judgement.
16) Transcribe APWA's board meetings notes.	Expert's judgement.
17) Answer emails and phonecalls regarding APWA.	Expert's judgement.
18) Generate email invoices from ACEware for each class.	hrs. / class
19) Verify accuracy of students' information (email address, billing address, etc.) in ACEware.	hrs. / class
20) Logistical planning.	Expert's judgement.
21) Attend planning meetings.	hrs. / meeting (two times a month)
22) Keep vendors and participants notified.	hrs. / day
23) Answer emails & phone calls.	hrs. / day
24) Process payments and make deposits.	hrs. / day
25) Prepare and update all conference reports and spreadsheets.	hrs. / day
26) Manage all details onsite.	hrs. / day (days of conference)
27) Prepare invoices for billing.	Expert's judgement.
28) Input participant, exhibit, sponsor & golf registration.	hrs. / day (until conference)

Figure 34: Dependencies per Task (hrs./occurrence)

If one takes a close look at Figure 34: Dependencies per Task (hrs./occurrence), it can be concluded that there are three factors a task could depend on: the number of classes instructed per month, the number of students served per month, and the expert's judgement. Knowing these dependencies was crucial to determine the standard work units for which each mean task time estimate was going to be multiplied by.

Step 5: Multiply the Standard Work Units for Each Program by Month by Their Corresponding Task Beta Mean and Variance

After all the initial standard work units for each task per program per month were determined via step 4 (Determine standard work units for each task for each program by month based on historical records), each standard work unit was multiplied by its corresponding task Beta mean and variance. The previous operation was employed by using the next equations:

$$(11) \quad \text{Beta } E[x]_{i,j,k} = \text{Standard Work Units}_{i,j,k} * \text{Beta Mean}_i$$

$$(12) \quad \text{Beta } V[x]_{i,j,k} = \text{Standard Work Units}_{i,j,k} * \text{Beta Variance}_i$$

Where:

Beta $E[x]_{i,j,k}$ = Beta expected value of task i in month j corresponding to program k

Beta $V[x]_{i,j,k}$ = Beta variance of task i in month j corresponding to program k

Please refer to the following example and figures (Figure 35: Expected Values and Variances (hrs./occurrence), Figure 36: Initial Standard Work Units by Task per Month per Program, and Figure 37: Initial Task Time Estimates Expected Values and Variances by Task per Program per Month) to observe how the previous equations were put into practice.

Example:

Task	E[x]	V[x]
1) ACEware database maintenance.	1.08	0.03
2) Develop and modify reports.	2.58	0.34
3) Monitor and adjust data entry .	3.50	0.25
4) Provide assistance regarding ACEware related problems.	0.75	0.03
14) Serve as the APWA chapter administrator.	1.88	0.04
15) Prepare APWA's board meeting notices.	1.50	0.11
16) Transcribe APWA's board meetings notes.	3.50	0.06
17) Answer emails and phonecalls regarding APWA.	0.79	0.02

Figure 35: Expected Values and Variances (hrs./occurrence)

LTAP Initial Task Standard Work Units Per Month												
TASK ID#	January	February	March	April	May	June	July	August	September	October	November	December
1	5	4	8	3	5	5	2	4	4	8	7	5
2	5	4	8	3	5	5	2	4	4	8	7	5
3	5	4	8	3	5	5	2	4	4	8	7	5
4	5	4	8	3	5	5	2	4	4	8	7	5
14	5	4	8	3	5	5	2	4	4	8	7	5
15	5	4	8	3	5	5	2	4	4	8	7	5
16	5	4	8	3	5	5	2	4	4	8	7	5
17	5	4	8	3	5	5	2	4	4	8	7	5
Classes / Month	5	4	8	5	5	5	2	4	4	8	7	5

Figure 36: Initial Standard Work Units by Task per Month per Program

LTAP Initial Task Beta Expected Values Per Month												
TASK ID#	January	February	March	April	May	June	July	August	September	October	November	December
1	5.42	4.33	8.67	3.25	5.42	5.42	2.17	4.21	4.55	8.67	7.58	5.42
2	12.92	10.33	20.67	7.75	12.92	12.92	5.17	10.05	10.85	20.67	18.08	12.92
3	17.50	14.00	28.00	10.50	17.50	17.50	7.00	13.62	14.70	28.00	24.50	17.50
4	3.75	3.00	6.00	2.25	3.75	3.75	1.50	2.92	3.15	6.00	5.25	3.75
14	9.38	7.50	15.00	5.63	9.38	9.38	3.75	7.29	7.88	15.00	13.13	9.38
15	7.50	6.00	12.00	4.50	7.50	7.50	3.00	5.84	6.30	12.00	10.50	7.50
16	17.50	14.00	28.00	10.50	17.50	17.50	7.00	13.62	14.70	28.00	24.50	17.50
17	3.96	3.17	6.33	2.38	3.96	3.96	1.58	3.08	3.33	6.33	5.54	3.96
LTAP Initial Task Beta Variance Per Month												
TASK ID#	January	February	March	April	May	June	July	August	September	October	November	December
1	0.14	0.11	0.22	0.08	0.14	0.14	0.06	0.11	0.12	0.22	0.19	0.14
2	1.70	1.36	2.72	1.02	1.70	1.70	0.68	1.32	1.43	2.72	2.38	1.70
3	1.25	1.00	2.00	0.75	1.25	1.25	0.50	0.97	1.05	2.00	1.75	1.25
4	0.14	0.11	0.22	0.08	0.14	0.14	0.06	0.11	0.12	0.22	0.19	0.14
14	0.22	0.17	0.35	0.13	0.22	0.22	0.09	0.17	0.18	0.35	0.30	0.22
15	0.56	0.44	0.89	0.33	0.56	0.56	0.22	0.43	0.47	0.89	0.78	0.56
16	0.31	0.25	0.50	0.19	0.31	0.31	0.13	0.24	0.26	0.50	0.44	0.31
17	0.08	0.06	0.13	0.05	0.08	0.08	0.03	0.06	0.07	0.13	0.11	0.08

Figure 37: Initial Task Time Estimates Expected Values and Variances by Task per Program per Month

If we take a look at Figure 36: Initial Standard Work Units by Task per Month per Program, we can see that LTAP initial tasks' standard work units per month values are equal to the number of classes instructed in the corresponding month (values in dark green), due to the previously

determined task dependency factors. Nonetheless, in order to obtain the values in dark orange and dark yellow, the following values from Figure 35: Expected Values and Variances (hrs./occurrence) and Figure 36: Initial Standard Work Units by Task per Month per Program were plugged into equations (11) and (12).

$$\text{Standard Work Units}_{4, \text{March}, \text{LTAP}} = 8$$

$$\text{Beta Mean}_4 = .75 \text{ hrs.}$$

$$\text{Beta Variance}_4 = .03 \text{ hrs.}^2$$

$$\text{Beta } E[x]_{4, \text{March}, \text{LTAP}} = 8 * .75 \text{ hrs.} = 6 \text{ hrs.}$$

$$\text{Beta } V[x]_{4, \text{March}, \text{LTAP}} = 8 * .03 \text{ hrs.}^2 = .22 \text{ hrs.}^2$$

The difference between step 5 of Flowchart 3 and step 5 of Flowchart 2 is that in Flowchart 2 the Beta means and variances for each task were multiplied by the standard work units' proportionalities instead of being multiplied directly by the standard work units like in Flowchart 3. That was because step 5 in Flowchart 2 spread the task time estimate of the total hours devoted to task in a month across all the programs depending on the standard work units' proportionalities. In contrast, step 5 in Flowchart 3 multiplied each task time in hours per task by the amount of times that given task occurred in a month for each program.

Step 9: Have Experts Adjust the Standard Work Units per Task for Each Program per Month and/or the Task Time Estimates

By showing the first set of results to the experts, they were able to review and verify the results' accuracy. If the experts deemed the results inaccurate, they adjusted either the standard work units or the task time estimates in hours per task. This step was of fundamental importance for the data analysis process because it marked the initial step of each iteration. On average, each hours per task expert required three to four adjustment iterations in order to reach consensus on the accuracy of their utilization by program estimates. Below is a comparison between the initial set of standard work units for each task per program per month corresponding to LTAP, and the final set of the same parameters.

LTAP Initial Task Standard Work Units Per Month												
TASK ID#	January	February	March	April	May	June	July	August	September	October	November	December
1	5	4	8	3	5	5	2	4	4	8	7	5
2	5	4	8	3	5	5	2	4	4	8	7	5
3	5	4	8	3	5	5	2	4	4	8	7	5
4	5	4	8	3	5	5	2	4	4	8	7	5
14	5	4	8	3	5	5	2	4	4	8	7	5
15	5	4	8	3	5	5	2	4	4	8	7	5
16	5	4	8	3	5	5	2	4	4	8	7	5
17	5	4	8	3	5	5	2	4	4	8	7	5
Classes / Month	5	4	8	5	5	5	2	4	4	8	7	5
LTAP Final Task Standard Work Units Per Month												
TASK ID#	January	February	March	April	May	June	July	August	September	October	November	December
1	4	3	2	3	0.4	2	3	4	4	5	3	3
2	4	3	2	3	1	1	3	2	2	2	3	3
3	4	1	2	3	0.5	2	3	4	3	4	2	2
4	4	3	3	3	0.5	2	3	4	4	2	3	4
14	5	3	2	3	0.3	1	3	3	3	4	5	4
15	4	2	3	3	0.5	5	3	3	2	4	5	4
16	4	2	2	3	0.5	1	3	2	2	4	7	5
17	3	2	2	2	1	2	3	2	2	2	3	2
Classes / Month	5	4	8	5	5	5	2	4	4	8	7	5

Figure 38: Final Iteration Standard Work Units Estimates by Task per Program by Month

The red cells are the values that were changed by the experts during the readjustment iterations in order to create a more accurate representation of their time spent on different tasks. The adjustment iterations were conducted until the experts accepted that the obtained utilization estimates by program were as representative and accurate as they could be.

5.3.3 Obtain Monthly and Yearly CLGT Utilization per Program

The CLGT monthly utilization per program was calculated by finding the average value of the staff members' percent utilization for a specific month. The equation using the example of CLGT's LTAP March utilization is as follows:

$$(14) \quad CLGT \text{ Monthly Percent Utilization}_{j,k} = \frac{\sum_{i=1}^{\# \text{ of Resources}} \text{Resource Hours}_{i,j,k}}{\sum_{i=1}^{\# \text{ of Resources}} \sum_k^{\# \text{ of programs}} \text{Total Hours}_{i,j,k}}$$

Where:

$CLGT \text{ Monthly Percent Utilization}_{j,k}$ = CLGT utilization for month j corresponding to program k

$\text{Resource Hours}_{i,j,k}$ = Total hours worked by resource i in month j corresponding to program k

An example using

CLGT Program Shared Resources Utilization Demand Per Month												
Program	January	February	March	April	May	June	July	August	September	October	November	December
LTAP	36.0%	39.8%	36.3%	41.8%	45.4%	31.8%	40.5%	30.3%	34.7%	34.0%	30.2%	25.0%

Figure 39: CLGT Monthly Percent Utilization is presented below:

Student Workers (Tristan & Michael)												
Program	January	February	March	April	May	June	July	August	September	October	November	December
LTAP	43.05	34.48	37.02	42.96	-	-	-	28.27	38.14	34.51	45.00	33.33
Event Coordinator												
Program	January	February	March	April	May	June	July	August	September	October	November	December
LTAP	60.87	36.17	33.37	47.53	8.07	31.71	47.34	44.27	43.43	49.30	64.53	54.96
APWA	16.87	26.08	50.25	60.01	102.11	29.09	40.23	9.25	17.40	9.74	7.25	7.25
Administrative Assistant												
Program	January	February	March	April	May	June	July	August	September	October	November	December
LTAP	47.47	57.84	47.29	54.32	53.44	47.05	48.71	32.58	47.26	54.71	47.71	43.72
Student Worker (Nickole)												
Program	January	February	March	April	May	June	July	August	September	October	November	December
LTAP	15.90	14.00	14.95	17.71	15.86	13.84	7.85	11.48	15.31	14.25	17.88	13.60
Accounting Specialist												
Program	January	February	March	April	May	June	July	August	September	October	November	December
LTAP	34.98	36.73	31.06	20.00	24.55	19.67	9.38	20.05	17.45	27.18	29.05	18.36
APWA	5.66	10.26	19.96	28.65	15.51	8.36	17.99	8.07	6.79	4.88	4.55	5.90
Specialist II												
Month	January	February	March	April	May	June	July	August	September	October	November	December
LTAP	76.91	118.67	70.55	79.13	96.11	71.57	110.08	100.07	104.90	90.31	37.68	32.46
Totals												
Month	January	February	March	April	May	June	July	August	September	October	November	December
LTAP	301.73	334.23	304.45	350.31	315.65	221.28	281.58	254.04	290.69	284.87	253.66	209.57
CLGT Program Shared Resources Utilization Demand Per Month												
Program	January	February	March	April	May	June	July	August	September	October	November	December
LTAP	36.0%	39.8%	36.3%	41.8%	45.4%	31.8%	40.5%	30.3%	34.7%	34.0%	30.2%	25.0%

Figure 39: CLGT Monthly Percent Utilization

As it can be seen, the values in green were summed and then divided by the value in orange, which represents the total hours worked by all staff members during March.

$$CLGT \text{ Monthly Percent Utilization}_{March,LTAP} = \frac{(37.2 + (33.37 + 50.25) + 47.29 + 14.95 + (31.06 + 19.96) + 70.55) \text{ hrs./month}}{838.52 \text{ hrs./month}}$$

$$CLGT \text{ Monthly Percent Utilization for LTAP in March} = 36.3\%$$

Please note that in this section's example, the APWA hours for the Event Coordinator and the Accountant were added with the LTAP hours since APWA is a portion of LTAP. Following is the equation utilized to calculate the CLGT yearly percent utilization by program.

$$(15) \quad CLGT \text{ Yearly Percent Utilization } _k = \frac{\sum_{j=1}^{\# \text{ of months}} Total \text{ Resource Hours } _{j,k}}{\sum_{j=1}^{\# \text{ of months}} \sum_{k=1}^{\# \text{ of programs}} Total \text{ Resource Hours } _{j,k}}$$

Where:

$CLGT \text{ Yearly Percent Utilization } _k = CLGT \text{ yearly utilization corresponding to program } k$

$Total \text{ Resource Hours } _{j,k} = Total \text{ hours spent by a shared resource in month } j \text{ corresponding to program } k$

An example of the calculation is below. Figure 40: CLGT Yearly Percent Utilization shows the yearly utilization percentages. As discussed, APWA was added to LTAP.

CLGT Yearly Percent Utilization for LTAP

$$= \frac{(301.73 + 334.23 + 304.45 + 350.31 + 315.65 + 221.28 + 281.58 + 254.04 + 290.69 + 284.87 + 253.66 + 209.57) \text{hrs./month}}{9631.89 \text{hrs./month}}$$

$$CLGT \text{ Yearly Percent Utilization for LTAP} = .3532 * 100\% = 35.32\%$$

Totals	January	February	March	April	May	June	July	August	September	October	November	December	Totals	Percentage
TTAP	169.49	99.83	148.84	187.77	111.23	114.47	148.05	184.44	107.01	158.95	148.95	171.49	1750.50	18.17%
LTAP	301.73	334.23	304.45	350.31	315.65	221.28	281.58	254.04	290.69	284.87	253.66	209.57	3402.06	35.32%
PILOT/ESCORT	140.64	168.05	130.97	118.15	100.20	158.45	98.57	173.79	219.98	167.95	166.67	161.10	1804.53	18.73%
INTERN	11.86	11.36	14.82	11.37	20.09	31.68	18.08	14.52	14.15	13.64	22.59	27.83	212.01	2.20%
ATAP	158.27	169.07	180.33	118.77	110.22	116.59	115.99	155.66	142.59	152.60	185.39	191.21	1796.70	18.65%
CCAP	56.56	56.35	59.10	52.15	37.44	52.34	32.57	56.09	64.24	60.58	61.31	77.38	666.09	6.92%
Totals	838.55	838.88	838.52	838.52	694.82	694.82	694.84	838.54	838.66	838.59	838.57	838.58	9631.89	100.00%

Figure 40: CLGT Yearly Percent Utilization

As it can be observed, all the values in green were summed and then divided by the value in orange, which represents the sum of the total hours worked across all 6 programs for the year.

5.3 CLGT DISTRIBUTION RESULTS

After analyzing the data provided by the staff members, the distribution of their time spent on each program was determined.

5.3.1 Student Worker Results

At CLGT, there are three student workers employed throughout the year. The student workers work on five different programs: CCAP, ATAP, PILOT/ESCORT, LTAP, and TTAP. In the data analysis and results, the three student workers were split into two different analyses. Two workers,

were grouped into the same analysis because they work the same amount of time per week and complete the same tasks. The third worker had a separate analysis because she worked additional hours each week and completed similar, but not the same tasks. Another reason as to why there were two different analyses for student workers was that the first two workers do not work in the summer, but the third does. The student workers are the only employees who do not work full time. The following Figure 41: First Group of Student Workers' Yearly Usage per Program Results shows the results for the grouped students' distribution of time spent on each program over a year.

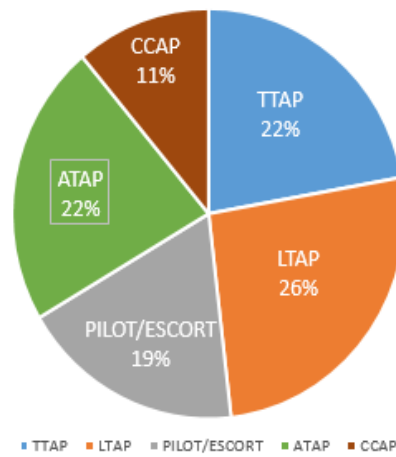


Figure 41: First Group of Student Workers' Yearly Usage per Program Results

Figure 42: Grouped Student Workers' Monthly Results shows the distribution of demand of each program per month.

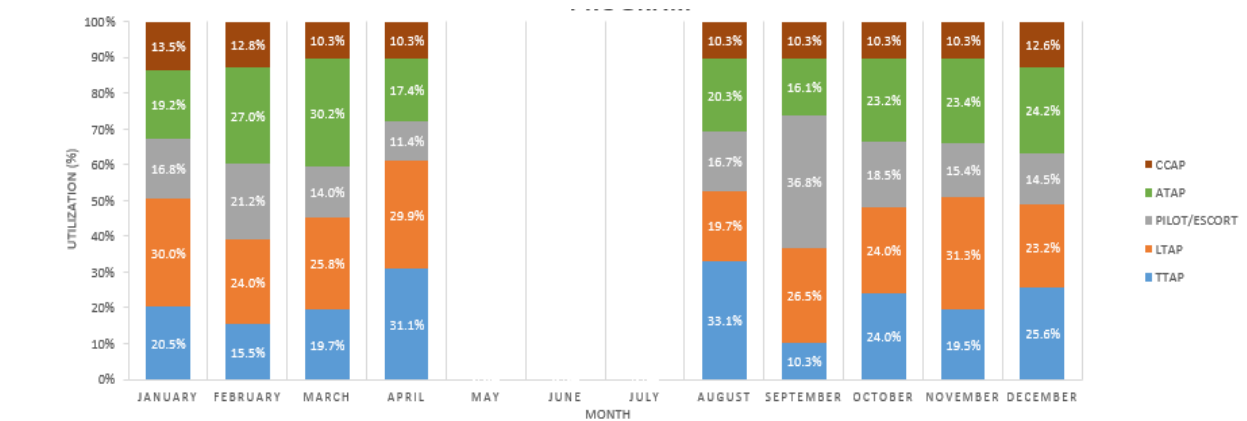


Figure 42: Grouped Student Workers' Monthly Results

Figure 43: Single Student Worker's Yearly Results shows the single student worker's distribution of time spent on each program over a year.

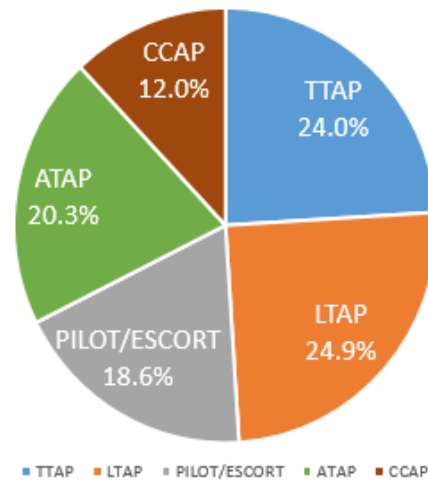


Figure 43: Single Student Worker's Yearly Results

Figure 44: Single Student Worker's Monthly Results shows the single student worker's distribution of program demand per month over the year.

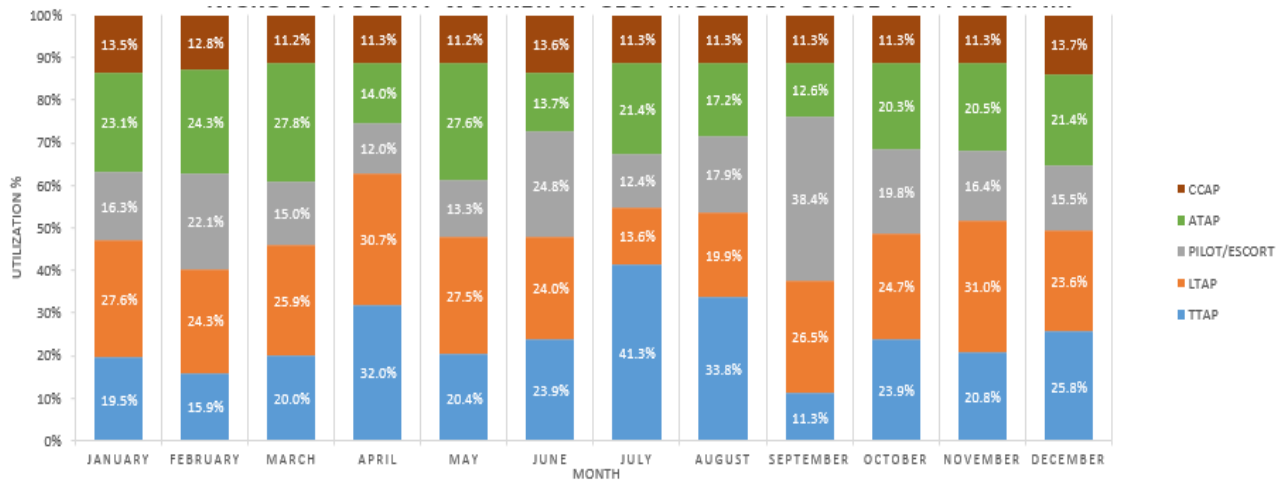


Figure 44: Single Student Worker's Monthly Results

Something to be noted is the similarity of the distribution of time spent per program over the year of both student worker analyses. This shows that although the two categories completed different types of tasks, the time distributions across programs remained fairly consistent for student workers.

5.3.2 CLGT Event Coordinator Results

The Event Coordinator at CLGT works on four different programs: ATAP, PILOT/ESCORT, LTAP, and TTAP. In general, the APWA program is considered to be a part of the LTAP program. However, the distinction was made because the Event Coordinator was paid with APWA funds. Figure 45: Event Coordinator’s Yearly Results and Figure 46: Event Coordinator’s Monthly Results show the results for the CLGT Event Coordinator’s time spent on each program.

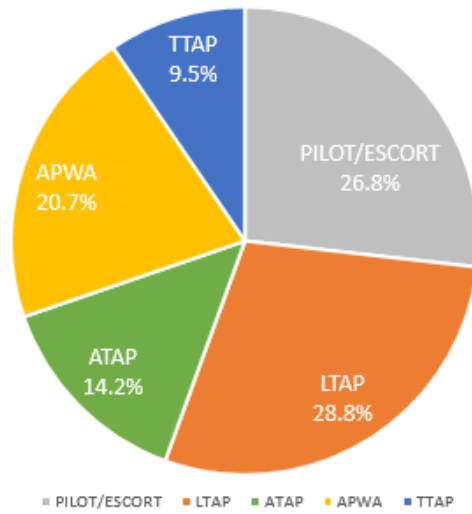


Figure 45: Event Coordinator’s Yearly Results

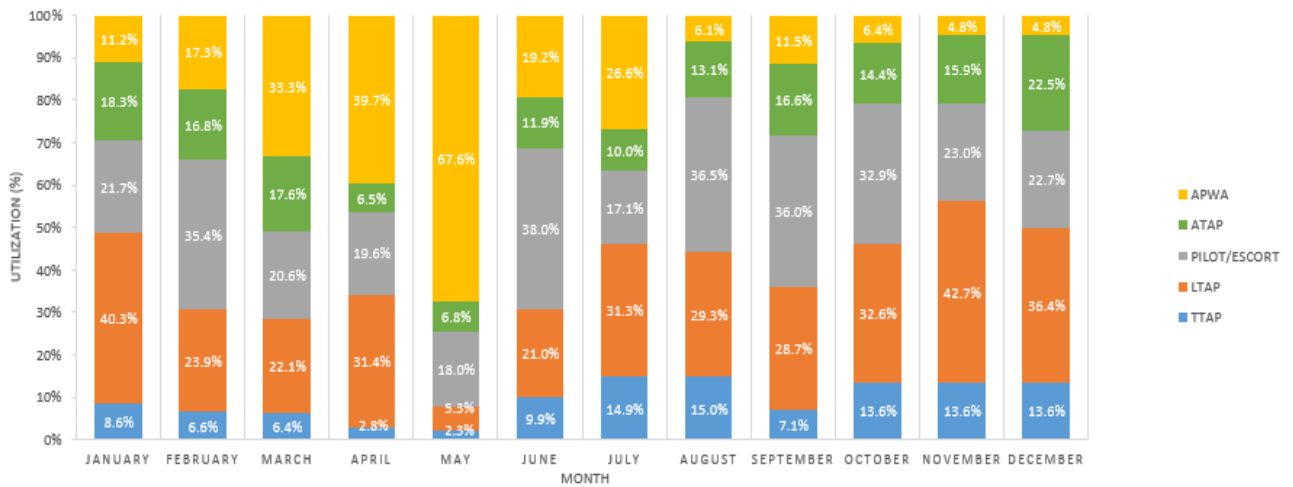


Figure 46: Event Coordinator’s Monthly Results

One trend to note is the increase in time spent on APWA beginning in January and steadily increasing until May, which is when the conference takes place.

5.3.3 CLGT Administrative Assistant Results

The CLGT Administrative Assistant mainly worked on the ATAP, PILOT/ESCORT, LTAP, and TTAP programs with a task for CCAP occurring infrequently. The results of the analysis on CLGT's Administrative Assistant are shown in Figure 47: Administrative Assistant's Yearly Results and Figure 48: Administrative Assistant's Monthly Results.

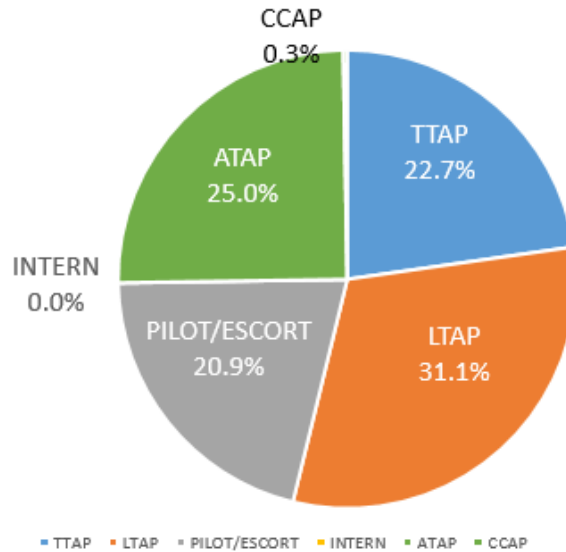


Figure 47: Administrative Assistant's Yearly Results

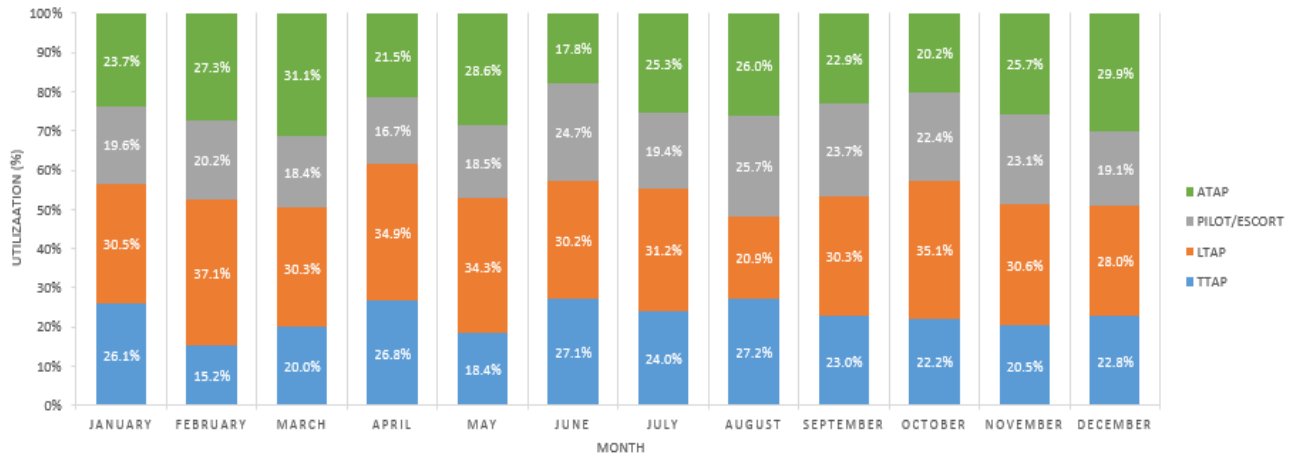


Figure 48: Administrative Assistant’s Monthly Results

5.3.4 CLGT Accounting Specialist Results

The Accounting Specialist at CLGT worked on every program. However, as discussed, the analysis of the Accounting Specialist was based on accounts by using transaction reports. Therefore, because APWA and Safety Circuit Rider had distinct accounts, their distribution of time spent were analyzed separately. The results of the Accounting Specialist’s analysis of time spent distributed across programs is shown in Figure 49: Accounting Specialist’s Yearly Results and Figure 50: Accounting Specialist’s Monthly Results.

Accounting Specialist at CLGT Yearly Usage Per Program

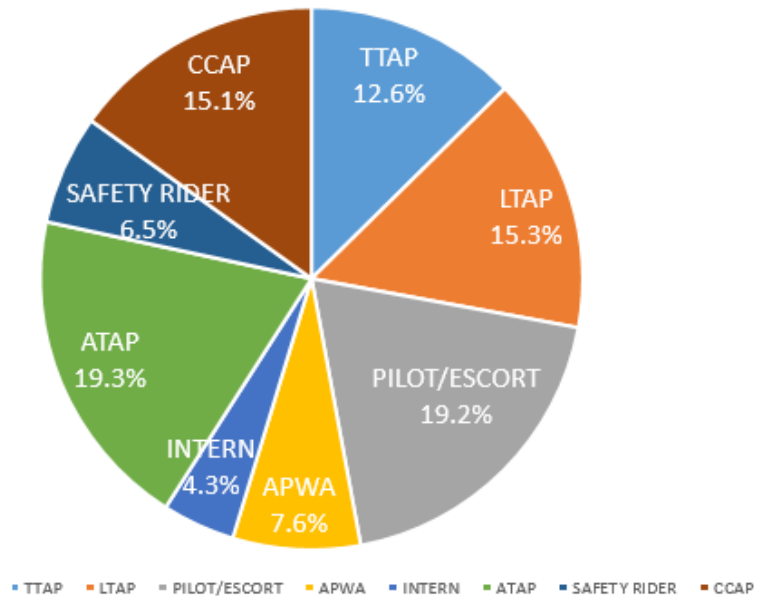


Figure 49: Accounting Specialist's Yearly Results

ACCOUNTING SPECIALIST AT CLGT MONTHLY USAGE PER PROGRAM

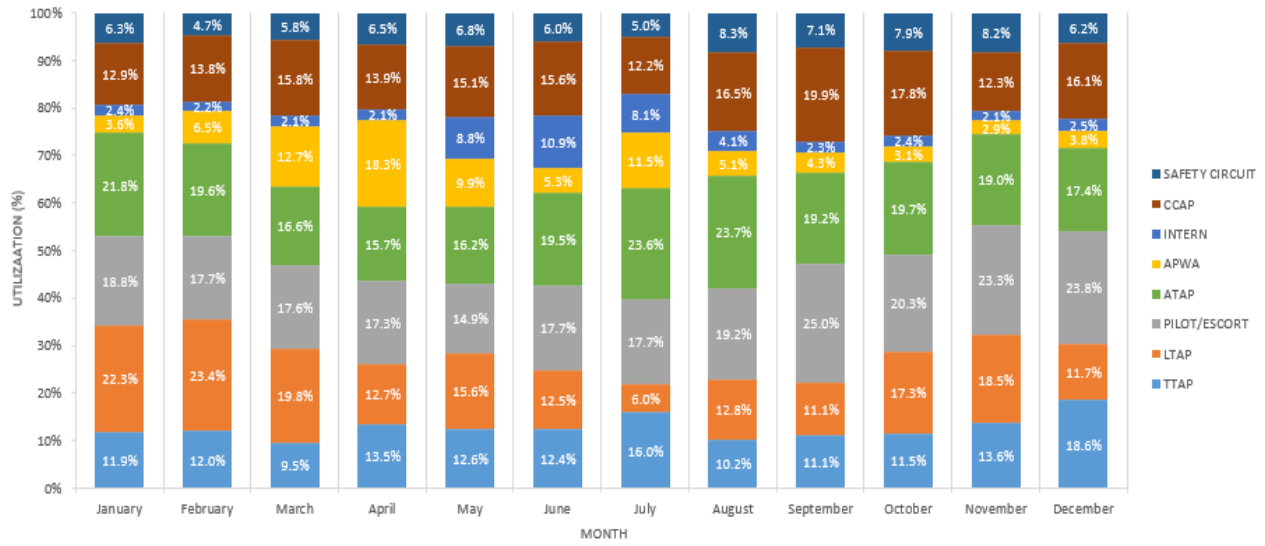


Figure 50: Accounting Specialist's Monthly Results

5.3.5 CLGT Specialist II Results

CLGT Specialist II works on all six programs. According to the results in Figure 51: Accounting Specialist’s Yearly Results and Figure 52: Accounting Specialist’s Monthly Results, LTAP accounts for half of the resource’s time.

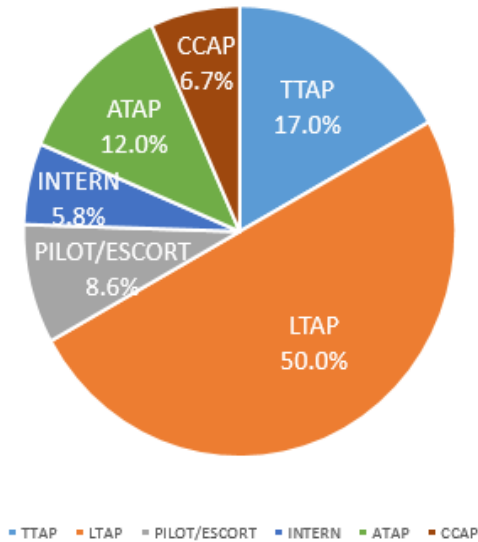


Figure 51: Accounting Specialist’s Yearly Results

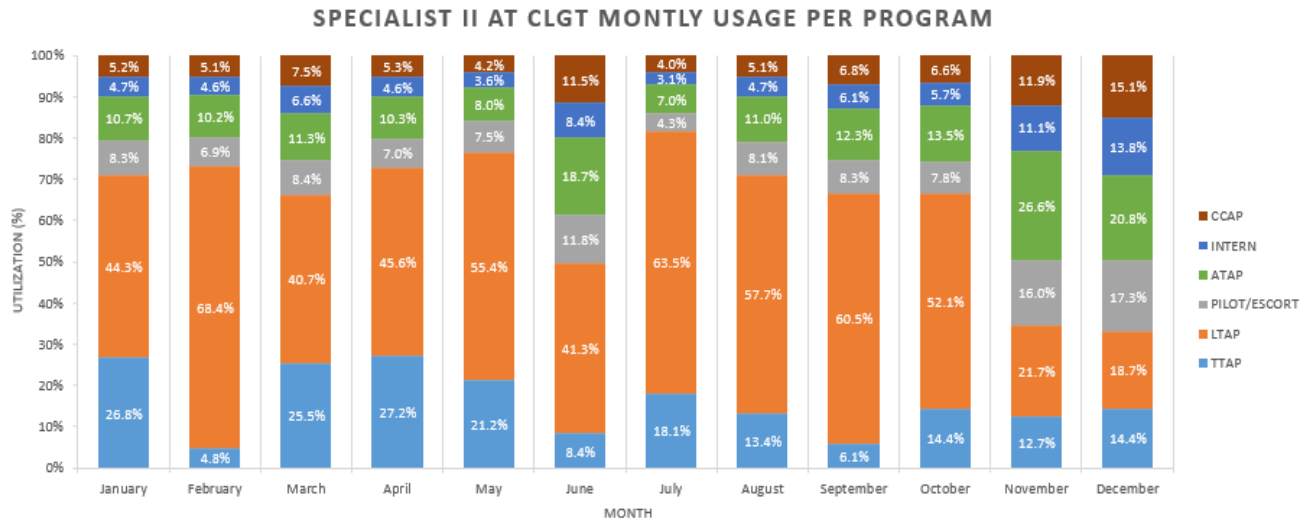


Figure 52: Accounting Specialist’s Monthly Results

5.3.6 CLGT Combined Results

The CLGT’s overall combined distribution for the year is shown in Figure 53: CLGT Yearly Results. Figure 54: CLGT Monthly Results shows the monthly distributions of time spent per program. These distributions take into account full time and part time workers.

CLGT PROGRAM DISTRIBUTION

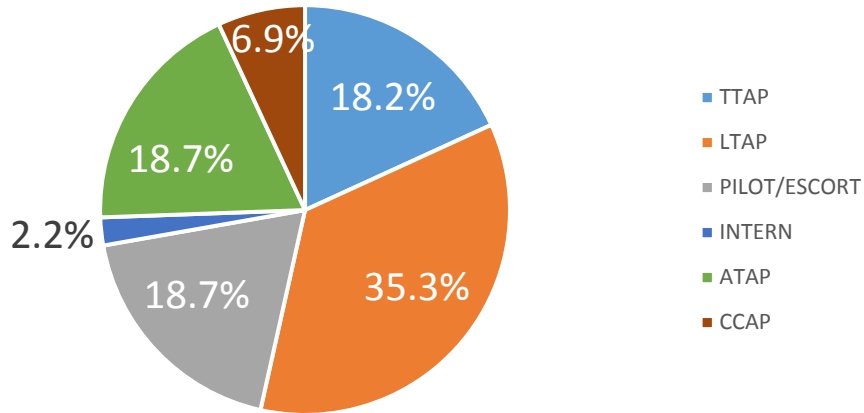


Figure 53: CLGT Yearly Results

CLGT PROGRAM DEMAND PER MONTH



Figure 54: CLGT Monthly Results

6.0 IDENTIFY ALTERNATIVES TO RESOURCE DISTRIBUTIONS

The following section includes the alternatives that were identified in order equitably allocate resource charges, both administrative and support staff and office supplies. The alternatives are listed below:

Support and Administrative Staff	Continue use of current allocations.
	Use distributions of time that staff members spend on each program found through analysis.
	Use time sheets to track the time staff members work on each program.
	Utilize VBA-program to track staff members' activities with greater precision.
Office Supplies	Continue current method of allocating office supply costs.
	Use CLGT's distribution of time spent on programs, as a whole, to allocate costs of office supplies.
	Record the supplies taken by programs by writing them in a book kept in the supply room and have student workers transfer data to an Excel file.
	Utilize a VBA-program on a computer placed in the supply room to record supplies taken by each program.
	Programs purchase supplies and keep them separated.

Table 2: Project Team's Alternatives

6.1 SUPPORT AND ADMINISTRATIVE STAFF DISTRIBUTIONS

Alternatives were identified that would be able to capture the support and administrative staff members' utilization for each program. Problems and benefits were assessed for each alternative in order to determine a recommendation.

6.1.1 Continue Use of Current Allocations

A simple solution to identifying the proper allocation of administrative and support staff costs is to continue to use the current allocations. As previously discussed, the current allocations are based off estimates made by the staff and the director. There is no clear process and allocation

estimates vary by year. CLGT can assume that the current method of allocating costs for staff members' time based on staff members' percentage estimations is logical and correct.

The time that it would take for the CLGT to continue their current process for estimating is relatively no time. The problem that arises is the high risk involved with being incorrect. Not only would programs either not be paying enough or paying too much, but because LTAP and TTAP are cost reimbursable contracts, the reporting of the amount of time spent by staff members on these programs is contractually obligated to be accurate.

6.1.2 Use the Distributions Found Through Analysis

The next alternative is to base funding allocations on the results found through the analyses of the support and administrative staff's utilization. The results of the analyses were discussed in the previous section. The analysis took a substantial amount of time to account for the uncertainty in estimations. In particular, one problem that arose was having to re-adjust time estimations multiple times in order to account for a full working year. For example, some of the task time estimates given from the staff for a given month equaled well over 160 hours per month which is the standard working time. In order to account for a standard working month, the staff's time estimates were revisited by both the team and the staff in order to scale down the time. The time was scaled to fall within a range of 140-180 hours per month.

Since the analysis was based on CLGT staff estimations and historical data, it is reasonable to conclude that the data gathered through detailed interviews and historical data analysis accurately represents the staff's time distributions. The CLGT staff can use this data with confidence to determine each staff member's time dedicated to a program. The Excel files, located in the attached CD, that were created can also be reused in order to input future information to determine the future distribution of time dedicated to programs by staff members.

The time to complete the data analysis from the team was an average of 25 hours per resource. This time included interviewing staff members, constructing task lists, making readjustments, and conducting data analysis. The time was calculated by referring to the timesheets kept by each team

member. The risk for this alternative would be moderate since there is more accuracy in the time allocations. Thus, the risk for the contract is lowered. However, it is important to note that in the future, CLGT could use the Excel worksheets used in the data analysis to input their own occurrences or standard work units in order to determine future allocations.

6.1.3 Tracking Time with Timesheets

The use of timesheets is another good alternative for determining the distribution of time spent by CLGT staff because allocations could be calculated using historical data. The staff can record their time at the end of the day on designated timesheets. There are two staff members who currently use timesheets. Therefore, the use of timesheets could be easily adopted by the rest of the staff.

Using timesheets could also be considered counterproductive for the staff members if too much time is spent manually recording the time spent on each program. Additionally, it would take more time, and memory, if the staff member had to recollect on what they did throughout the day at the end of the day, than it would using the VBA-program since it would require writing on paper or using an Excel file rather than simply clicking a button when they switched programs.

The time for a resource to use timesheets was calculated to be 44 hours per resource per year. This time was calculated by conducting five timed test runs with a team member. The team member was asked to account for their time for the whole day on a timesheet and it took an average of ten minutes to complete. The risk associated with this alternative was considered to be at a low risk for the contract because of the higher accuracy. Keeping timesheets would result in having a representation of the time distribution without the uncertainty of estimations. Since two resources currently use time sheets, it would be quick and relatively easy to implement for the rest of the staff.

6.1.4 VBA Time Tracking Program

The use of the VBA-program would accurately capture the allocation of time spent on each program with a simple click of a button. CLGT staff would need computers that have Microsoft Excel. At the end of each day, the staff would have their daily and overall percentage of time dedicated to each program calculated and stored.

The main problem with the VBA-program was that it might be counterproductive for the staff members. The staff members could be interrupted by phone calls, impromptu meetings, emergencies, etc. and forget to click on the corresponding program. The staff, in general, have to multi-task and work on several different programs at one time, which is difficult to capture using the VBA-program. The staff would then worry about documenting time per program during these daily interruptions, which in turn could slow them down or cause them to think about the process of logging their work instead of doing the actual work. However, the VBA-program would provide an accurate reflection of the time distributed per program because it records actual data, which would allow the allocations to not be based on estimations.

The time calculated to use the VBA program was 40 hours per resource per year. The process used to determine this amount of time was by conducting a timed test run. It took an average of 0.33 minutes or 20 seconds to switch from one program to another program. The team assumed a worst case scenario in which a resource would switch between all programs that pertain to the resource. For example, a student worker works on only five programs. So for each task, the student worker is assumed to switch five times on the VBA program. The team recognized that a resource would work on only 25% of his/her tasks each day, and this number was given during interviews. For example, the student worker mentioned above would only work on 4.5 tasks per day. The number of tasks and programs were then multiplied for each resource and summed up to equal a total of 27.29 minutes. 27.29 minutes is considered to be the average number of switches per day for each resource. That number was then multiplied by 0.33 minutes. It was then converted into hours per year.

The risk associated with this alternative was considered to be low. This is because the VBA program would be more accurate in recording actual data, thus lowering the risk of the allocations being incorrect.

6.2 OFFICE SUPPLIES DISTRIBUTIONS

CLGT staff currently store all office supplies in a supply closet. In order to allocate the costs of supplies for each program, a list of alternatives were developed that can be used to either track future use of or retroactively look at the use of office supplies.

6.2.1 Continue Current Method of Allocating Office Supplies Costs

The current method of allocating office supplies costs is based on copier records and classes that occurred since the last order was made. The copier records are extremely accurate because the program has to record on the copier system whenever they make copies. However, the charges for copies are only for buying paper, toner, and binders. The remaining supply costs are based on the Administrative Assistant's best judgement of the use of supplies by programs taking into account the amount of classes that have occurred since the last order was made. This use of estimation can lead to inaccurate charges to programs since they are based on best judgement.

By continuing this current method, it would take relatively no time for the Administrative Assistant to estimate office supply allocation. However, it would pose a high risk for the office supplies, since there is a high uncertainty in those estimations.

6.2.2 Use CLGT Resource Distribution for the Distribution of Supplies

This particular alternative would be to simply base the distribution of office supplies on the combined CLGT support and administrative staff distribution, as seen in Figure 53: CLGT Yearly Results. The distributions developed in the project provide basic estimates of time and effort done by the staff members. Therefore, since supplies seem to be highly correlated with time and effort of tasks, the distributions provide a basic estimate of supply usage by program.

Basing the distribution of office supplies on the CLGT distribution would not take any time or effort since the analysis was already conducted. The risk for this office supplies alternative would be a moderate risk because of the assumption that program usage of office supplies correlates to distribution of time and effort. However, this correlation does not account for classes that take up more time while requiring less office supplies. The risk can be lowered when taking this information into consideration.

6.2.3 Track Supplies by Logging Information in a Book

Another option would be to have a binder in the supply room that programs and staff members can log all necessary information, such as program name, office supply name, and amount taken, to track the use of office supplies. This would result in accurately accounting for program usage of office supplies. At a designated time during the week, a student worker can take that information and log it into an Excel sheet created with the purpose of determining equitable allocations of office supplies costs. The Excel sheet would be able to print reports of supplies needed and/or the breakdown of usage by program.

One problem that could prevent accurate allocations of costs is if employees do not log the supplies that they use. The recording of office supplies used would have to be mandated or the allocations will not be accurate.

The time it would take to log supplies in a book was calculated to be 25 hours per resource per year. This was done by conducting timed test runs similar to the ones previously discussed. The risk associated with the allocation of office supplies would be lowered. This is because the office supplies allocation would be more accurate because the actual usage will be tracked.

6.2.4 Track Supplies Through a Computer Program

If there is a need for more precision, the supplies can be tracked through a computer program. This computer program would log each time a program or staff member used an item from the supplies list. The employee would select the program, office supply name, and the amount taken. The

program would then record that information to not only keep track of supplies taken, but also inform users of when items need to be reordered. When the students or staff are determining what should be reordered, they can select a button that says 'Print Report.' The report would include the amount needed to restock each item and the percentage of use by each program. It is important to note that it would not be beneficial to log each time a person uses a packet of sugar or bottled water for their own personal use. However, if classes use these supplies, it would be beneficial to base the distribution of costs on the number of classes given throughout the year. The computer program would then be able to accurately capture all the office supplies that have been consumed.

One problem that could prevent accurate allocations of costs is employees not logging the supplies that they use. The use of the computer program would have to be mandated or the reports will not be accurate.

The time it would take to use a VBA program to track supplies was calculated to be 28 hours per resource per year. This was calculated by assuming that it would take about 12 seconds to click on the VBA program and assuming a worst case scenario where a staff member would log all 64 supplies each day. The risk associated with this alternative would lower as well since it would be more accurate than estimating.

6.2.5 Keeping Supplies Separated by Program

It may also be beneficial for each program to buy their own supplies and keep them separate from others so that there is no need for tracking. However, this could lead to programs "borrowing" another program's supplies, if they happen to run out of an item and forget to reorder by the time that they need it. One way to solve that problem would be to record when someone borrows a certain item, which would take less time and effort than logging all of the supplies.

By keeping the supplies separated by program, the time and effort dedicated to tracking the usage of office supplies would significantly decrease. It is at a low risk alternative because the programs are responsible for purchasing their own supplies and could not get charged for another program's usage.

7.0 RECOMMENDATIONS

There are two areas of recommendations: Resource Distribution Recommendations and Efficiency Improvement Opportunities. The recommendations are listed below in Table 3: Project Team's Recommendations.

Resource Distribution Recommendations	<i>For Current Use</i>	Use staff distributions found through the analyses.
	<i>For Future Use</i>	Track staff's time through use of time sheets for future allocations.
Efficiency Improvement Opportunities	<i>For Current Use</i>	Emphasize use of cross-training.
	<i>For Current Use</i>	Continue to update Website to increase user-friendliness.
	<i>For Future Use</i>	Document best practices at CLGT.
		Standardize data entry methods in ACEware database.
<i>For Future Use</i>	Delegate more tasks to student workers.	
<i>For Future Use</i>	Standardize travel reimbursement request process.	

Table 3: Project Team's Recommendations

7.1 RESOURCE DISTRIBUTION RECOMMENDATIONS

The recommendations related to the distribution of shared resources for current use rely on the use of the analyses completed to determine each staff member's distribution of program utilization. In the future, the recommendation is to utilize timesheets in order to have more accurate estimations of staff members' time dedicated per program.

7.1.1 Use Administrative and Support Staff Distributions Found Through Analysis

The main recommendation is to allocate the time staff members spend on each program based on the distributions found through the analysis. It is reasonable to conclude that the distribution generated is an accurate representation of time spent by each staff member. This is because the

distributions are based on historical data, such as transaction records, course offerings, and number of students, as well as verified time estimations from the staff members.

7.1.2 Use CLGT Distribution Analysis for Distribution of Supplies

As previously discussed in 6.2.2 **Use CLGT Resource Distribution for the Distribution of Supplies**, basing the distribution of office supplies on the CLGT distribution would be a viable option. From the information gathered through interviews and supplies lists', it is reasonable to conclude that the supplies are highly correlated to the time and effort of staff members completing program tasks. This recommendation was selected because of the nature of the supplies' list. It would be difficult to log each time a person used certain items, such as sugar packets, forks and knives, cups, etc. Basing it on CLGT distribution would eliminate the need to track supplies and would provide a reasonable distribution of cost of supplies for each program.

7.1.3 Track Staff Member Time Spent per Program through Timesheets

In the long term, if more accuracy is needed, a recommendation would be to track staff members' time spent working on program tasks using timesheets. The use of timesheets would result in accurate historical data that could be used to determine equitable allocations of staff members' time spent per program. Although using the timesheets would require more time per year than using the VBA program, the team found this difference to be minimal. The preferences of the staff members and director were also taken into consideration when selecting this alternative.

7.2 EFFICIENCY IMPROVEMENT OPPORTUNITIES

During the course of the project, efficiency and effectiveness improvement opportunities were sought out to help stretch limited resources and increase the efficiency of CLGT. The following sections discuss the areas of possible efficiency improvement opportunities.

7.2.1 Cross-Train Administrative and Support Staff

It would be beneficial to continually emphasize cross-training for CLGT staff. Cross-training can mitigate risks by giving employees the flexibility to respond to different types of work demands. While some tasks are unique and require certain certifications to complete, most CLGT operations, such as ACEware database management, administrative tasks, event scheduling, etc., would benefit from cross-training. Cross-training would be able to improve CLGT in five main areas. The five main areas are durability, agility, flexibility, efficiency, and teamwork and are discussed below (Cancialosi, 2014):

- Durability – When one member is ill or on vacation, cross-training will help ensure that the business will not suffer during the member’s absence by providing other trained workers for the job.
- Agility – Cross-training will provide professional development to employees where they will have the opportunity to grow in their skill sets and uncover hidden skills as well. Employees can use this to also advance in the organization which can in turn benefit the CLGT.
- Flexibility – CLGT would be better equipped to deliver service to customers in times of disruption or transition. As discussed previously, employees would have the flexibility to respond to different work demands.
- Efficiency – Cross-training will also provide a fresh set of eyes to a process that was once only done by one staff member. This is important because having more people trained to do a certain task means that there is also more perspectives on how to improve such tasks.
- Teamwork – Cross-training can give employees the opportunity to build relationships with new team members or people that they might have never worked with.

A cross-training table has been created for CLGT support and administrative staff. The table in Figure 55: Cross-Training Template shows each staff member’s level of expertise for a specified group of tasks.

	1 familiar	2 trained and can fill in	3 specialized						
	ACEware Database Mgmt	Supervising Student Workers	Accounting Activities	Attend Meetings and Conferences	Class Activities (Teaching)	Prepare materials for Classes	CEAT Activities	IT Assistance	Administrative Assistance
Student Workers	1					2	1	3	2
Administrative Assistant	3	3		1		2			3
Accounting Specialist	2	1	3			1			3
Specialist II		2		3	3	2	3		3
Event Coordinator	3			3		1		1	1
Director	1	1		3	3	2	3	2	3

Figure 55: Cross-Training Template

The level of expertise was determined through interviews with the staff members and by analyzing their tasks. It is important to note that these values were based on estimates and can be changed by CLGT staff. The goal for this matrix is to have three level 2 or 3 blocks in each column. That is, it would be best to have at least three people trained or specialized in a task in order to be able to fill in if more than one person is sick or out of the office. The cross-training table can help the supervisors recognize areas where to delegate training and assign tasks to staff members.

7.2.2 Increase Website User Friendliness

Before and during the project, the CLGT website was used to gather certain information about CLGT programs and services. It was noticed that some of the links were outdated or redirected to pages that were not functioning properly. An efficiency improvement for the project would be to revise the website so that all users would be able to easily access information and therefore reduce the number of questions asked to support and administrative staff. As the project unfolded, the team learned that the student workers were already working on updating the CLGT website. This would be an area to emphasize continuous improvement for the CLGT.

7.2.3 Document Best Practices

As previously discussed in section 4.1.2 Best Practices, CLGT staff members can work to improve efficiencies and decrease time needed to complete tasks by documenting best practices.

Best practices ensure that employees follow a certain method to complete tasks. It is necessary to provide documentation of best practices so that all employees, old and new, have access to the information. Below in Table 4: Best Practices Documentation is an example of a template that can be used by staff members to document best practices.

Title of “Best Practice”	Date
<p>Description of “Best Practice”</p> <ul style="list-style-type: none"> • Provide a short description of the best practice. • What was the problem being addressed? • What population will this best practice affect? 	
<p>Implementation of “Best Practice”</p> <ul style="list-style-type: none"> • Who were the key implementers and collaborators? • What resources were needed? • What were the main activities? 	
<p>Benefits</p> <ul style="list-style-type: none"> • Describe the benefits that derived from implementing the best practice? • What was the impact? 	
<p>Problems That Might Arise with “Best Practice”</p> <ul style="list-style-type: none"> • Discuss the problems that were experienced by employees • Discuss preventable measures 	
<p>Further Reading</p> <ul style="list-style-type: none"> • Provide a list of references that may help the reader understand how it benefits other organizations if applicable 	

Table 4: Best Practices Documentation

For CLGT, implementing best practices can be accomplished by holding meetings and discussing how to accomplish certain tasks. For example, topics could include:

- Defining ACEware data entry standards for all fields that require typing.
- Mapping low-variability administrative and ACEware related tasks processes.
- Establishing key performance indicators in order to measure and monitor the performance of any given processes relative to a pre-established goals.
- Defining critical success factors (work elements that should always go well in order to ensure continuous success for the organization).
- Develop linear responsibility chart or RACI (Responsible, Accountable, Consulted, and Informed) matrix in order to summarize and establish who is responsible for what regarding the completion of certain tasks as it is displayed in Figure 56: Linear Responsibility Chart.

RACI Matrix					
TASK	Resource 1	Resource 2	Resource 3	Resource 4	Resource 5
Task 1				R	
Task 2	R	A			I
Task 3		C		C	R
Task 4	I	R	I		
Task 5	A		R		
R=Responsible					
A=Accountable					
C=Consulted					
I=Informed					

Figure 56: Linear Responsibility Chart

Documenting best practices can lead to the decrease of time spent by staff members completing tasks because the most efficient method has been found and continually improved.

7.2.4 Standardize Data Entry Methods in ACEware Database

When interviewing the Administrative Assistant and the Event Coordinator at CLGT, it was discovered that the two staff members spent a considerable amount of time fixing ACEware data entry discrepancies. After the observation was discussed with the two staff members, it was concluded that most of the corrections being made to the data entries were related to the fact that people did not enter data consistently into the database. For example, if an input field asked for

the university name, people could enter it in a variety of ways, such as “Oklahoma State University,” “OSU,” or “Oklahoma State.”

The main complication resulting from inconsistent data entry is that it makes specific queries present misleading results. For instance, imagine that a query is executed to check how many transactions related to “Oklahoma State University” were made in the last month. When the results of the query are obtained, only the data entries that said exactly “Oklahoma State University” would be reported. Therefore, all of the non-matching data entries were ignored, even though there might have been a few intended to be “Oklahoma State University.” Referring to the university name example, if the misleading query is overlooked, a large amount of problems could arise, such as not taking all the transactions into account when billing or making deposits, accounting errors, poor decision making, etc.

In summary, standardization is the implementation of technical standards. Standardization is productive for increasing compatibility, interoperability, and repeatability while minimizing mistakes. In terms of database operations and information technology, there are innumerable amounts of protocols that can be used for data entry standardization. Going back to the university name example, a solution would be to provide a drop down menu including all of the possible university names under consideration, and having the user choose the desired option instead of typing it, eliminating data entry mistakes.

The main reason why standardization is important, is because it sets the framework of agreements to which all the stakeholders within an organization adhere to. This ensures that all the processes related to the performance of a service are performed within well established guidelines. The ultimate goal of standardizing processes is to consistently achieve a high level of quality by mistake proofing in order to reduce the overall time spent correcting typing errors and finding redundancies.

7.2.5 Delegate More Tasks to Student Workers

Another conclusion reached regarding the interviews with staff members was that even though the student workers were highly utilized, it appears that they could take on more responsibilities. In addition, every resource at CLGT agreed with the fact that the student workers were incredibly efficient and effective when performing their tasks. Therefore, if more tasks are delegated to the student workers, certain benefits to CLGT could be observed, such as:

- Relieving administrative workload from the front office staff by answering phone calls and emails regarding specific questions about programs, providing class registration/signup assistance, keeping track of classrooms' schedules, keeping staff calendars, placing maintenance orders, etc.
- Relieving ACEware database management workload by resolving data entry inconsistencies, providing assistance regarding ACEware database problems, reconciling classes' attendance with classes' registration, processing registrations, etc.
- Maximizing student workers' utilization by minimizing their forced idle time.
- Maximizing CLGT's overall efficiency without incurring extra costs.
- Employee cross-training.
- Employee empowerment.

It is important to mention that the benefits presented above will not be immediately observable because many of the tasks to be delegated to the student workers require a considerable amount of training, meaning it will take time for CLGT to see results. However, if this efficiency opportunity is addressed, it will allow CLGT to be more flexible and adaptable regarding employee turnover and programs' funding changes.

7.2.6 Standardize Travel Reimbursement Request Process

The process of completing a travel reimbursement form can be tedious and time consuming if not all of the necessary items are present. In order for the form to be complete, the Accounting Specialist must attach each receipt to the form or scan it into the online system. The process of retrieving a missing receipt from a staff member can result in delaying the reimbursement one day

to two weeks. Not only is the reimbursement delayed, but the time spent by the Accounting Specialist to track down receipts is time that could have been used on tasks that are more significant to the operation of CLGT.

A way to prevent this in the future is to standardize the manner in which a program submits travel reimbursement requests to the Accounting Specialist. By creating a simple form that programs use to record mileage travelled with related expenses, the process of recording mileage and expenses will remind programs of the different receipts needed for each expense. An example of a simple expense report that CLGT can use is in Appendix C: Travel Reimbursement Request Form Example.

APPENDIX A: PROJECT PROPOSAL

This is the project proposal signed by the Team and CLGT contact, Mr. Doug Wright. The proposal outlines the scope and expected outcomes of the project.

IEM 4913 Sr. Design Proposal

February 1, 2016

An Investigation of Shared Resources and Processes for the Center for Local Government Technology

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1.0 Background

The Center for Local Government Technology (CLGT) is a public service outreach program of the College of Engineering, Architecture, and Technology (CEAT) at Oklahoma State University. CLGT focuses its efforts on providing high-quality educational curriculums, training, technical assistance, and customized services to various customer groups dedicated to serving the public. The customer groups include: county officers and employees, tribal governments and agencies, municipal officers and employees, state agencies, as well as professional associations.

Currently, CLGT conducts its operations through six different programs grouped in two categories: Transportation Programs and Ad Valorem Programs. The Transportation programs provide training and technical assistance on transportation-related issues. The Ad Valorem programs provide training, accreditation, technical assistance, and hardware and IT support to the County Assessor and the County Treasurer offices in Oklahoma. The following are the six programs operated within CLGT:

- Transportation Programs:
 - Local Technical Assistance Program (LTAP)
 - Southern Plains Tribal Assistance Program (SPTTAP)
 - Transportation Intern Program (TIP)
 - Pilot/Escort Certification Program
- Ad Valorem Programs:
 - County Computer Assistance Program (CCAP)
 - Assessor Training and Accreditation Program (ATAP)

Each program is responsible for managing its own funding, budget, and set of resources, some of which are dedicated (meaning they only work for one program) and some of which are shared (meaning they work for more than one program). While sharing resources improves efficiencies and maximizes resource usage, in this particular scenario, it has proved to be somewhat challenging. The difficulty lies in estimating the resources' time spent on each program. Because CLGT offers many beneficial training courses, workshops, and accreditations for each program, the time spent by each of the support and administrative staff working on individual programs is not easily captured. Consequently, there are challenges in planning the programs' budgets and funding to ensure that charges and resource utilization are accurately matched.

An Investigation of Shared Resources and Processes for the Center for Local Government Technology

2.0 Problem Statement

The goal of this project is to quantify the time and effort spent by CLGT support and administrative staff and the amount of office supplies used on each program to better allocate costs. This quantification is expected to help assure that the charges and resource usage are properly aligned for the shared resources' operations. In addition, throughout the project, the team will seek out efficiency and effectiveness improvements to help stretch limited resources and increase the efficiency of CLGT shared service operations.

3.0 Anticipated Methodology/Tasks

Given to the nature of the project, the first task to be undertaken by the team will be to fully understand CLGT programs' current situation. The methods and techniques to be used for developing a quantitative understanding of CLGT operations include:

- Literature reviews of similar processes and organizations to identify potential actionable recommendations.
- Employee surveys to capture the tasks in order to account for variability that may occur throughout the year.
- Personnel interviews to determine tasks and possible inefficiencies to assure effective and efficient operations at CLGT.
- Time measurements to determine the time allocations for each program.
- Observing and recording CLGT processes in order to identify issues and determine process improvements.
- Obtaining records from management information systems in order to gather existing data to further understand and quantify the current processes.

Some of the methods to be employed by the team regarding data analytics include:

- Mathematical and statistical analysis to:
 - Accurately quantify the shared resources' time using descriptive statistics, which will enable analysis of each of the programs.
 - Assess the variance within and across CLGT programs.
 - Factor the variance into mathematical models to generate reliable time estimates within a given confidence level.
- Forecasting Techniques to:
 - Review the shared resources' demand by program and CLGT as a whole.
 - Determine any cyclical patterns in the shared resources' demands.
- Capacity Planning Techniques to:
 - Assess the ability of the shared resources' provided by CLGT to address normal activity levels and seasonal peaks.

As data are being collected, the team will carefully and extensively analyze it, using techniques described above, in order to understand the need for and availability of shared resources. After the team completes the data analysis, mathematical models will be developed to properly apportion the costs of the shared resources to the programs to ensure that charges and resource usage are aligned. The team will provide copies of the gathered data and the analysis of the current usage of shared resources to CLGT.

An Investigation of Shared Resources and Processes for the Center for Local Government Technology

Once all necessary information is gathered and analyzed, the team will identify, analyze, and provide actionable recommendations to better allocate charges for usage of shared resources and process improvements for the programs.

4.0 Anticipated Schedule

The team has created a schedule for use in tracking the project until completion. As seen in the schedule, the team will initiate the project by gaining an understanding of the current state of CLGT. Once the process is understood, the team will start gathering data to analyze and then use it to formulate recommendations for the allocation of cost to programs. Additionally, the team will also identify possible process improvement recommendations. These recommendations will then be provided to CLGT in the form of a project report and presentation. The plan is illustrated in Figure 1 below.

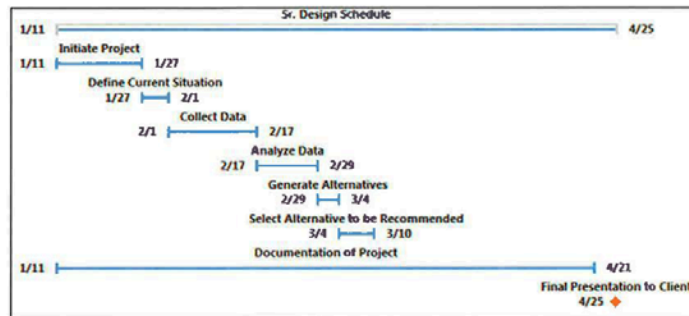


Figure 1 Anticipated Project Schedule

5.0 Anticipated Deliverables

The project deliverables that will be produced and presented to CLGT are:

- Copies of all data gathered.
- Analysis of the current usage of shared resources.
- Recommendations of an equitable allocation of program charges.
- All efficiency and effectiveness improvements identified during the course of study.
- Recommendation for improvements to be implemented.

A final report containing the deliverables listed above and presentation highlighting these deliverables, will be presented to CLGT on or before April 25, 2016.

6.0 Anticipated Benefits

The team expects to provide to CLGT with:

- An understanding of the current availability of, use of, and cost allocation for shared resources.
- A systematic analysis to better allot resource use charges.
- A reduction of costs associated with potential efficiency and effectiveness operational or procedural improvements.

An Investigation of Shared Resources and Processes for the Center for Local Government Technology

7.0 Risks and Risk Mitigation Strategy

The team has considered potential risks and planned mitigation strategies should they occur. The risks and associated mitigation strategies are briefly described below.

The primary risk is the availability of data. In the event that data is not readily available, the team will observe and record the shared resources activities during a fixed time period during the project to develop estimates for use in their analysis. Furthermore, the team will survey the shared resources to estimate and analyze their activities during parts of the year outside of the study period.

In addition, the team could encounter availability problems when trying to interview CLGT staff. In order to best accommodate CLGT staff, the team intends to keep flexible schedules and set up meetings at mutually acceptable times, in advance. The team will also provide the interviewees with meeting agendas, as well as any other information that will help the interview/meeting be as effective as possible, at least one day prior to the scheduled meeting time.

Another risk is the cooperation of CLGT staff. Should the team encounter any problems, they will notify Mr. Doug Wright, the Organization/Project Sponsor, as soon as possible.

An Investigation of Shared Resources and Processes for the Center for Local Government Technology

Endorsements – Endorsement below acknowledges receipt and acceptance of the proposal of a Senior Design Team from Oklahoma State University's School of Industrial Engineering and Management. Project will be executed on a 'best effort' basis and no warranty is stated or implied. All modifications to this proposal shall be provided, in writing, to all signatories for approval and acceptance.

On Behalf of The Center for Local Government Technology



Douglas Wright 1 FEB 16
Date

On Behalf of Senior Design Team



Lacy Greening



Alex Carstens Cattori



Nicole Claros

2/4/16
Date of Last Signature

APPENDIX B: DATA REQUEST FORM

Below is the Data Request Form. This document was used as an agreement between the team and CLGT on the collection and analysis of existing data.

IEM 4913 Sr. Design	February 15, 2015
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Data Request for the Center for Local Government Technology

Nicole Claros	Lacy Greening	Alex Carstens Cattori
nicole.claros@okstate.edu	lacy.greening@okstate.edu	acarste@okstate.edu
918-381-5598	214-404-1776	405-332-1428

Dear Mr. Wright,

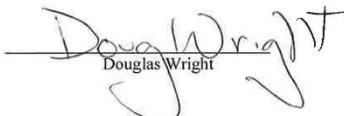
As previously discussed, our senior design team will conduct an investigation into the allocation of shared resources within your six programs. In order to provide the best possible solutions for our project, our team is requesting existing data such as: staff's time records, program schedules, current staff time allocations, etc. This data will help us determine the time an employee spends on each program.

Rest assured that all data gathered will be treated with confidentiality and for the sole purpose of this project.

We are looking forward for your response to our request.

Best Regards,
IEM Sr. Design Team


On Behalf of The Center for Local Government Technology




Douglas Wright

24 FEB 16
Date


On Behalf of Senior Design Team



Lacy Greening



Alex Carstens Cattori



Nicole Claros

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