EVALUATION OF DISTANCE LEARNING

by

Cheryl L. Poage

Research Project Presented in Partial Fulfillment
of the Requirements for the Degree
Master of Arts in Liberal Studies
Education

REGIS UNIVERSITY

December, 2001

EVALUATION OF DISTANCE LEARNING

by

Cheryl L. Poage

has been approved

December, 2001

APPROVED:

W.L. Avery, Ph.D. , MLS Faculty Advisor

W.L. Avery, Ph.D. , MLS Degree Chair

ABSTRACT

Evaluation of Distance Learning

The primary goal of the project was to evaluate the effectiveness of a high speed network that provided the capability to transfer bi-directional data and interactive video teleconferencing for the purposes of training emergency service responders and the provision of command leadership resources during activation of Emergency Operation Centers (EOC).

Another goal of the project was to evaluate the effectiveness of citizen access to public records and services provided by cooperating agencies via web site links hosted by the county library system community Internet kiosks. Evaluation of this goal will be conducted separately and will not be a part of this research project.

TABLE OF CONTENTS

Chapter 1

INTRODUCTION

The Parker Fire Protection District has been interested in remote learning systems for some time in an effort to reduce the number of times that emergency crews are required to leave their primary response areas for training purposes. In September 1997 the Parker Fire Protection District was awarded a grant from the National Telecommunications and Information Administration, United States Department of Commerce, Telecommunications and Information Infrastructure Assistance Program (TIIAP).

The project partners on this grant were the Parker Fire Protection District, the Town of Parker, Douglas County, South Metro Fire Rescue (formerly the Castlewood Fire Protection District), and the Douglas Public Library District. The Intranet network (SPECTRUM) for emergency service agencies involved Parker Fire Protection District, the Town of Parker, Douglas County, and South Metro Fire Rescue.

The community access via the Internet portion of the project involved all of the partners, with the Douglas Public Library District providing the primary information conduit for the general public.

Parker Fire Protection District is 105 square miles and covers a suburban and semi-rural area southeast of Denver. The area has a population of over 49,000 that is

widely dispersed in concentrated pockets separated by open areas or ranch land. This presents a deployment problem in that stations must be widely spaced in order to give relatively short response times to those areas of concentrated population. When a unit leaves its first due area (area of primary response) to train at the training center, that area is uncovered and has a long response time for the next closest engine. Training is a high priority and can result in extended response times several times per month.

If there were a way to instruct from a central location without removing units from their first due district, average response times can be reduced and still provide an effective learning experience. Several options were possible. The most obvious was to have instructors teach multiple sessions in each station, which were difficult to schedule and inefficient. Repetitive use of instructors leads to higher costs for overtime instructors or instructors from outside the department. Another option is to provide videotape instruction. While this method has been used, it was found that the lack of interaction causes unusual drowsiness and lack of concentration. The solution sought was one in which firefighters could interact with an instructor in a fairly normal way. Some agencies use a one way cable TV instruction with a conferenced audio. This was a better solution, but the instructor loses the sense of the remote audience. Facial expressions and body language are lost. Two-way video was the preferred solution for this situation.

Cost was a prohibiting factor, especially since the preferred system had not yet proven its value to the fire service. The Department of Commerce was offering grants to test out new information infrastructure to solve local problems.

Other fire agencies wanted to try the teletraining solution without committing at this time to placing interactive video in each station. South Metro Fire Rescue wanted to install video-training capability for two stations for testing/demonstration purposes.

It was also surmised that in a large disaster situation, decision-makers would be reluctant to leave their city and travel to the county seat to join their county colleagues in the county EOC (Emergency Operations Center). Under certain circumstances it may even be impossible to travel the distance at all. The development committee thought that this would be a good opportunity to use two way video to link the Town of Parker EOC to the Douglas County EOC. This way the decision-makers could share information and participate in solutions together, albeit remotely. Other ideas for teleconferencing included sheriff officer role-call briefings, county data sharing, and citizen access to meetings.

The Solution

Network

The project had a directive to provide interactive distance learning capability via a backbone of T-1 connections, including satellite reception equipment providing new access to training programs from national public safety institutions at ten sites. The Intranet system allowed for 384 Kbps transmissions of interactive video telecommunications through a First Virtual ATM network and a Multiconferencing Unit (MCU) bridge. The Asynchronous Transfer Mode (ATM) network capability provided

for dynamic allocation of bandwidth allowing point-to-point, multipoint, and ISDN broadcasts with simultaneous high speed data transmission.

The network concept initially proposed to the NTIA consisted of frame relay virtual circuits between the remote sites and hubs with full motion, 30 frames per second (FPS) video equipment. Frame relay was a suggested solution that one vendor proposed for cost savings. Unfortunately, it was found that frame technology was not a viable solution due to the inherent latency in frames arriving in delayed order causing jumping of the picture. The frame relay solution could not work over a public network. (New technology improvements may have eliminated this problem.) This meant that the network must be either T1 or DS1 (1.5Megabits per second) dedicated copper lines, fiber optics, or microwave. Fiber optic cable was unavailable in several areas and this made the cost of the fiber optics prohibitive. Microwave was also too costly to be an option. So the choice was made to use leased lines with T1 capability.

Bridging

Ability to see and hear multiple sites required either the purchase of a bridge (MCU or multi-conferencing unit) or a contract for this service through a bridging company. Based on the frequent need and emergency operation requirements, it was deemed to be more cost effective to purchase a MCU.

Network Protocol

By using compressed video transmission algorithm, full motion can be sent through a bandwidth of only 384 Kbps. Since the T1 bandwidth is 1.5 Mbps, the spare bandwidth can be used for multiple video sessions (conferences) or data transmission.

To effectively utilize the bandwidth, asynchronous transfer mode (ATM) protocol was selected to be used across the T1 line. This technology though more expensive initially, allowed for dynamic reallocation of the bandwidth for most effective Spectrum use and ATM was anticipated to be offered through public networks such as US West. Using the public network when available would reduce future expense for leased lines.

The dynamic reallocation of bandwidth afforded uninterrupted simultaneous data transmission and teleconference capability.

The Parker Fire Protection District Data Intranet was moved from a frame T-1 network to the new network in Spring of 1999.

Redundancy

The use of the network in a disaster situation may be impaired, thus destroying the primary connection between the Emergency Operation Centers (EOCs). Redundancy between Parker and Castle Rock, the county seat, was needed. Diverse routing of T1 lines, a three-hub system, ISDN (Integrated Services Digital Network), and a microwave link were possibilities. Due to cost, it was decided to use a single ISDN circuit until the system proved its worth and a better redundant link could be established.

System Specifications

The partners in the Douglas County Spectrum Project wanted the system to be able to migrate and expand as needs grew. Equipment was specified to meet standard protocols for interfacing with other manufacturers. Power Point presentation documents, objects, as well as video from tapes, live cameras, or transmissions received over a

satellite receiver needed to be sent over the network. The ultimate network design allowed for data sharing between agencies such as GIS maps and databases and to have public kiosks in the local libraries tied to the network for citizen access to government, even after hours. The goal was to have citizen access through the Internet.

Intranet

This Intranet system utilizes Parker Fire Station One (Administrative Office) as the primary hub location where the bridge has been physically located. The studio was located at the Joint Service Facility, which houses the Parker Fire Training Academy. Individual T-1 lines from Parker Town Hall, Parker Police Department, Parker Fire Stations 72, 73, 74, and eventually 75, and the Douglas County Justice Center (DCJC) provide a direct connection to the bridge.

The secondary hub has a single T-1 connection to the primary hub and also has a backup ISDN computer connection with one BRI (Basic Rate Interface-128KBs).

System Capabilities

These locations can conduct multiple site teletraining events. The DCJC acts as a secondary hub and has individual T1 lines from the Law Enforcement Academy and South Metro Fire Rescue Stations 33 and 39. Since the connection between the DCJC and the bridge was a single T1, only two sites from this hub can be in a multipoint conference simultaneously. Individual conferences between two sites can be accomplished without programming the Multiple Conference Unit (MCU). The

instructors can select the site they would like to view with the other participants, or allow the system to switch to whichever site has been speaking for a few seconds. This allows all participants to see other participants in the session when they are contributing. It also allows a blend of camera angles, documents or object camera, video or satellite feeds, or computer video output to be selected to facilitate the instructional environment.

Communication to or from locations outside of the Intranet can be reached through the ISDN gateway, which has been located at the Parker Hub. This feature allows a speaker, remote from the fire district, to give a lecture or participate in a discussion.

In addition, these sites allow for the sharing of emergency operation center (EOC) resources providing increased capability to manage large incidents throughout the county.

Internet

Another goal was to provide citizens with the capability to access specific non-secure government information via Internet access through linkages with the Douglas Public Library District. A 256 Kbps frame relay access was put in place to provide access to an Internet Service Provider (ISP) with system security for the connected agencies provided by a firewall, a system of IP addresses, and a router. There are some agencies that have chosen to utilize their existing ISP connections. This diverse access to the Internet provides all agencies the level of security that they deem necessary and cost effective.

Full Internet access was provided to staff at Parker Fire Protection District, with limited key individuals being given email accounts. An evaluation of any improvement in work productivity for the District has been included in this project.

The Douglas Public Library District has committed to host agency web sites if necessary but prefers to link to the web site addresses. The diverse access and web site maintenance issues as well as teleconferencing equipment service agreements have been the responsibility of each agency. Evaluation of this directive has been proposed as an independent study.

System Limitations

Due to the single T1 bandwidth between hubs, if two sites from the DCJC secondary hub are in the same Teletraining, only one site from the Parker Hub can be in the multipoint conference.

A feature that allows the instructor to view four locations at once (a quartered screen) was not installed due to cost considerations, but would be a great help in instructing.

Incoming ISDN calls and outgoing calls into the Denver metro area do not increase the monthly phone bill as these six lines (386 Kbps) are on a flat rate account. Outgoing calls on the ISDN lines to long distance areas are very expensive as the long distance fees occur for each of the six ISDN lines.

Chapter 2

REVIEW OF LITERATURE

Evaluation Goals

The primary evaluation areas for this project; involve the effectiveness of video teleconferencing using an internal network on ATM over T-1 lines (Intranet). The reduction in the cost of training emergency service on-duty staff through virtual classrooms provided through multipoint interactive video training, the determination of the effectiveness of learning in this environment, and the effectiveness of the virtual Emergency Operation Center (EOC) operations were the primary study questions.

Previous Evaluation

A Boolean R Logic search was conducted on several online indices: Education, Education + Evaluation, Education + Evaluation + Distance Learning; Adult + Education, Adult + Education + Evaluation, and Adult + Education + Distance Learning.

Several literature sources provided insight into the distance learning evaluation categories; yet few programs have been rigorously evaluated. Private industry and community colleges are the primary educational systems that have employed interactive video-based distance learning. The majority of these programs have not been evaluated for cost or learning effectiveness. The evaluation that has been done primarily centers around individual student performance.

The high cost of implementing and maintaining an effective interactive teleconferencing system has deterred its broad-base use. There are a few publicly accessible documents that discuss instructional techniques and evaluation with this medium; however, as most documents are proprietary, even those prepared by community colleges.

Computer Based Training (CBT) primarily involves the Internet and has undergone the most extensive study with regard to teaching and learning concepts and has rapidly become an accepted norm for the industry. The cost has been far less per student and has effectively increased the geographic range of students and teachers. An extensive review of this material provided insight into the revisions needed to positively impact learning; again, there has been limited overall evaluation.

Cyrs: Theory-Based Research vs. Evaluation

Cyrs (1997) discussed strategies for evaluation of distance education and stated that, "It is important to differentiate between theory-based research and evaluation." He defined program evaluation as the "systematic investigation of worth" of any ongoing distance education activity. This evaluation process historically would have involved quantitative analysis where samples, controls, and variables are collected for later evaluation.

Cyrs (1997) noted a counter movement to this method that has recently emerged at the Open University (House, 1986, as cited in Cyrs, p. 88) which incorporates more qualitative data through the use of focus groups, interviews, and journals.

Woodley & Kirkwood: Quantitative and Qualitative Measures

Woodley and Kirkwood (1986), as cited in Cyrs (1997, p. 89), presented six categories of information that can be collected about distance education activities. The first were the quantitative measures of activity which were counts of events, people, and objects. The second was the quantitative measure of efficiency, which included records such as: number of students completing the course, average student workload, course cost, and tuition generated. The third measure looked at outcomes, which involved qualitative surveys of students to find student perceptions. The fourth category measured program aims in terms of what type of teaching was intended and whether the goal was achieved. This was done through student surveys. The fifth category involved the measurement of policy through surveys of students and employers to determine costs, impediments, and problems that can be used in making policy decisions. The sixth category measured organizations in terms of internal organizational impact through the use of on-site visits and interviews.

AEIOU: Evaluation Components

The AEIOU evaluation approach (Fortune and Keith, 1992; Sweeney, 1995; and Sorenson, 1996; all cited in Cyrs, 1997, p. 90, 91) provided a framework for identifying key evaluation questions and offered five components for evaluation: accountability, effectiveness, impact, organizational context, and unanticipated consequences.

Accountability evaluates whether the project's objectives and activities were completed through asking questions such as: were the appropriated number of sessions held? how many of students enrolled? and what was the quantity of program materials produced and distributed?

Evaluating effectiveness attempts to place value on the project's activities and can be assessed through questions such as: were the students satisfied with the program? did the students learn what they were supposed to learn? and did the teachers feel adequately prepared to teach distance learners?

Impact evaluates whether the project made a difference and the collection of longitudinal data is a key element of this measure. Questions such as increased use over time and changes in policy and procedures are typical impact measures.

Organizational context looks at what structures, policies, or events within an organization helped or hindered the project's ability to reach its goals. The authors recommend that the evaluator be intimately involved with the project to evaluate any barriers to successful implementation. Organizational context can be evaluated by addressing questions such as: what factors created implementation difficulties? what contributed most to the success or failure of the project? and what different strategies should be recommended for replication?

Unanticipated consequences provide important information for implementation of new programs and examine any changes in relationships between the collaborators that were not expected or unanticipated uses on the distance learning system.

The suggested data collection process for these components was very similar to those suggested by Woodley and Kirkwood (1986), utilizing quantitative data where possible and qualitative data acquired through surveys, focus groups, and interviews of key personnel.

Mantyla & Gividen: Evaluation Questions

Mantyla and Gividen (1997) concurred with the key content areas that should be included for evaluation and suggested that whatever evaluation method is chosen, the following questions need to be satisfied:

- What is the purpose of the evaluation for our organization?
- Which aspects of distance learning are important to evaluate?
- How will we define and measure success?
- How will we analyze the evaluation results?
- How will we use the results?

Mantyla and Gividen provided the Unisys evaluation model for desktop evaluation and the United States Air Force student critique for video teletraining evaluation. Both instruments utilized extensive Likert survey formats to analyze the variables. Macklin and Hoffman (1996), as cited in Mantyla and Gividen (1997), conducted a survey for the Department of Energy in which the following findings helped to form a foundation for evaluation in other studies:

1) Traditional classroom evaluation methods can be successfully adapted for use at a distance, particularity for instructional television courses.
2) Site facilitators can serve effectively as the eyes, ears, and hands of evaluators as well as instructors at a distance.
5) Multiple evaluation methods can be used and validated for each other.
6) Collection techniques can include approaches that accommodate several communication styles: verbal, written and behavioral.

These findings have indicated that common types of questions can effectively measure system adequacy.

McCleary & Egan: Variables Impacting Performance

McCleary and Egan (1989) developed an evaluation of interactive televison instruction in which a three-course sequence was taught to groups of off-campus students and to groups of on-campus students by the same instructor. The variables impacting learner performance, retention, instructor effectiveness, learner receptivity, and course design features were the primary concerns of the study. Data generated from the surveys was analyzed using a series of two tailed t-tests.

The most revealing findings were obtained from the student ratings comparing the three courses. The decrease in variance between the off-campus and on-campus courses was attributed to experience of the instructor and students, but more importantly to design changes that were implemented.

The largest number of improvements in off-campus effectiveness were achieved through the use of visual materials when used to illustrate specific concepts or techniques and through course organization changes which resulted from student feedback. Arranging for a course manual to be delivered to students prior to the class provided for the most improvement in effectiveness for distance learning.

Student feedback was facilitated by training the on-site facilitator to assist students with content as well as technological issues. The other variable that impacted effectiveness was student feedback within three days regarding papers and quizzes whereas, instructor site visits were found not to have an impact. The critical variable was course design which provided for student feedback and course organization.

Fuchs: Performance Assessment

Fuchs (1995) addressed methods of linking assessment to instruction, which provide clear descriptions of student performance that can be linked to the instructional actions.

Behavioral assessment relies on direct observation of targeted behaviors in an environmental setting where the targeted behavior would normally be expected to occur.

Mastery learning involves evaluating a set of subskills which are the instructional objectives of a targeted curriculum. The performance criterion which indicates mastery of the subskill is specified and the instructor pretests, teaches the objective, and post-tests on the material.

Curriculum-based measurement (CBM) is a long-term assessment measure which establishes a broad outcome and involves regular assessment over a period of time. Each assessment is of equal difficulty and incorporates prior curriculum knowledge. Performance analysis on the separate skills imbedded in the assessment incorporates standardized measurement techniques and this provides reliability and validity.

Fuchs purported that performance assessment has three key features:

1) students construct versus select their responses;
2) assessment format allows teachers to observe student behavior on tasks; and
3) scoring shows patterns in students' learning and thinking.

These assessments should meet seven criteria:

Measure important learning outcomes.
Address all three purposes of assessment.
Provide clear descriptions of student performance that can be linked to instructional actions.
Be compatible with a variety of instructional models.
Be easily administered, scored, and interpreted by teachers.
Communicate the goals of learning to teachers and students.
Generate accurate, meaningful information (i.e., be reliable and valid).

Community Evaluation

Review of the literature did not reveal other community Internet programs that have undergone evaluation. The evaluation parameters discussed in the literature for distance learning, can provide a reasonable model for evaluation of this segment of the project.

Review of the Department of Defense's Florida Military Teletraining Project

The Department of Defense's Florida Military Teletraining Project was an evaluation study conducted from 1991-1993. The project involved the University of Central Florida, and three Florida community colleges. The purposes were to determine if compressed two-way interactive video could be used to deliver in-depth training; evaluate the feasibility of utilizing civilian institutions to develop and deliver training; and to evaluate feasibility of future distance learning usage, (Bramble, 1995).

The evaluation of this project was undertaken to compare the similarity of the fire service training proposed in the Parker Fire pilot project, evaluate "lessons learned" to enhance the instructional design of planned learning activities for fire service personnel, and investigate the evaluation criteria of the Florida project.

Bramble and Martin (1995) reviewed the Department of Defense Military Teletraining Project in a general overview format, focusing on the "distributed training strategy" goals, which were to improve instructional quality, increase standardization, and reduce time away from units. The primary reason for military reliance on this training strategy was the increase in numbers of reservists and decreasing resources.

Barry and Runyan (1995) reviewed the Department of Defense project in greater depth than Bramble and also provided a historic overview of distant learning techniques

tested by the military since 1954. The two-way compressed video provided the greatest level of interactivity between distance learners and instructors. Barry also addressed the cost savings realized from distance learning environments.

Military distance programs were initiated with the delivery of print-based correspondence courses in the 1940's. In the 1950's, television was used as a learning medium. Limited interactivity was incorporated in 1973 when the Air Force introduced "Teleteach" which utilized dial-up telephones. In 1990, the Army operated Asynchronous Computer Conferencing (ACC) and the Navy tested two-way video teletraining (Barry and Runyan, 1995).

Their study found no significant difference in student performance in remote learning settings and referenced a comparison study conducted by Christopher (1982) of test scores and concluded that there was no difference in learning between distant students and face to face students.

While other studies showed similar student performance levels, varying issues were reported ranging from increased teaching time required for distant courses to student preference for classroom-based training if interactivity was limited. The Department of Defense Teletraining Project, which utilized audio and video two-way interactive, did effectively deliver occupational training (Bramble and Martin, 1995).

Martin and Bramble (1996) presented a detailed description of the Department of Defense project and related evaluation results of the five courses studied. While the study evaluated student and instructor satisfaction, student achievement, and other course characteristics; the primary lesson learned was,

> . . . that instructors cannot simply decide to change from a standard mode of instruction to a video-teletraining mode and expect similar success.

Cost Effectiveness

Bramble and Martin (1995) concluded that the costs and benefits of course delivery utilizing interactive video were dependent upon a number of factors including the amount of reconfiguration effort required, the technology used and its cost, the support personnel required, the number of students, and the length of the training.

A retrospective review of military distance training efforts found that two-way full-motion video with two-way audio provided the maximum capability for interaction. Military studies further indicated that no significant difference in achievement was found between distance and resident learners. Navy cost studies reported savings of $11.6 million in four years and the Air Force reported savings of $5.0 million and 30 man-years in a two-year period. "The military virtual classroom in here . . . and here to stay " (Barry and Runyan, 1995).

Overview of the Department of Defense Military Teletraining Project

The project involved five courses; three of which ranged from sixty-six to ninety-six hours over a two-week duration and two courses were one-day workshops. Course reconfiguration utilized a common methodology in the use of word pictures where full text versions were shown on video, but key words were omitted in the printed student guides.

Each student guide was organized by lesson with each lesson comprising:

Objectives for the lesson.
Text of the lesson displayed by frames
Interactive strategies and media (graphics, video, and hard copy)
Practical exercises and tests
Images of screen and print graphics, including word pictures
List of equipment and materials needed to support objectives
Estimated time to complete lesson, (Bramble and Martin, 1995)

Bramble and Martin reported that the system reliability was 99.6% over the 422.5 hours of course transmission and the student ratings of the courses were consistently above 4 on a 5 point Likert scale, while proficiency tests showed improved unit performance tests for all courses (Bramble and Martin, 1995).

Instructional Model

Martin and Bramble (1996) evaluated the instructional methodology utilized in the Department of Defense project and concluded that distance instructors must,

> . . . . understand the basic principles of learning and Instructional Systems Design (ISD); organize and manage the learning environment and materials; have knowledge of and the ability to use the delivery technology; and effective presentation skills including questioning strategies, use of student involvement activities, appropriate pacing of the lesson, providing appropriate feedback, and motivating students (Batey & Cowell, 1986; Bradshaw, 1989; Chute, Bathazar, & Poston, 1988; Cyrs & Smith, 1990; OTA, 1989; Shale, 1988; all cited in Martin and Bramble, 1996).

Concepts to be Evaluated for the Parker Fire Project

The Department of Defense Teletraining Project delivered and evaluated five courses over the U.S. Army Teletraining Network (TNET) which provided two-way audio, video, and graphics with a digital transmission rate of 256 kilobits per second (Kbps) which was documented by Martin and Bramble (1996). This frame transmission rate generally produced pictures that present with jerky motion (ghosting); however, the image with limited motion is quite viewable.

The 30 frames per second rate utilizing a 384Kbps transmission in the Parker project provided for a significant improvement in view ability and, with the correct lighting, is an acceptable substitute for full-motion television broadcast bandwidths.

In addition to the two-way communication, Ku-band data satellite transmissions supplemented the Department of Defense project's program delivery. The Parker project has similar capability utilizing an analog/digital Cu/Ku band satellite receiver. This signal can be distributed to remote classrooms via the RCA ports for VCR access to the codec.

Comparison of the delivery technology between the Department of Defense project and the Parker project indicates that the level of audio and video transmission is significantly higher in the Parker project. This improvement should allow for improved satisfaction levels by the remote student if the instructional design criteria established in the Department of Defense project are met.

The overall scope and size of the Parker project are much smaller than the Department of Defense project; however, the instructional issues, paramilitary organizational structure, and the resource issues are quite similar. The challenge Parker faces centers around the resources available to implement the necessary curriculum revisions, site facilitation, and instructor training.

Chapter 3

METHOD

The project evaluation has been segregated into two independent study areas. The first is the evaluation of the effectiveness a high speed network (Spectrum) that provided the capability to transfer bi-directional data, interactive teleconferencing, and Internet access.

The second area of evaluation centered on the effectiveness of interactive video teleconferencing for the purposes of training emergency service responders utilizing "virtual classrooms." A portion of this study encompassed the evaluation of providing command leadership resources via video teleconferencing during activation of Emergency Operation Centers (EOC). Interactive video telecommunication allowed for the creation of virtual EOCs where command staff are able to participate in an EOC activation while remaining in their respective jurisdiction's geographical boundaries.

Spectrum

This research project involved a formative (ongoing) evaluation of the Spectrum project utilizing a descriptive design involving quantitative and qualitative methods to evaluate cost effectiveness, student learning, system satisfaction, and disclosure of unanticipated outcomes. The quantitative data was collected with class documentation records and qualitative data was collected through surveys and interviews of key staff.

A summative evaluation process involved an evaluation of the program outcomes. This evaluation utilized the quantitative and qualitative data collected for the formative evaluation.

Hypotheses

Hypothesis I: Utilization of teleconferencing for training purposes will reduce the cost of delivering training to emergency services personnel.

Hypothesis II: The quality of teleconferencing delivered at a minimum of 30 frames per second will not reduce the quality of classroom-based lecture or briefing presentations.

Hypothesis III: Public safety agencies will reduce the response time to emergency incidents with an ability to train emergency service responders without having them leave their primary response areas.

Hypothesis IV: The development of a high speed Intranet network for the bi-directional transfer of data and Internet access will improve access to information for emergency service personnel.

Hypothesis V: Interactive audio/visual signals can improve the ability of decision makers and key command officers in designated EOC's to provide oversight of mitigation efforts during major emergency incidents.

Delimitations

The Spectrum Intranet project involved four governmental agencies: Douglas County Sheriffs Office, South Metro Fire Rescue District, Town of Parker, and Parker Fire Protection District. The target population for the evaluation of cost effectiveness was selected from the Parker Fire District. The EOC operation involved other users of the system from the Spectrum partners.

The sample population for the evaluation of distance learning via interactive video teleconferencing and reduction of response times was a subgroup limited to the Parker Fire Protection District users. This subgroup was used in this portion of the study primarily because the control of extraneous factors can be more easily managed. In addition, the collection of data was more reliable as this entity had the primary responsibility for the overall grant implementation and reporting. It must also be noted that this subgroup had demonstrated the most commitment to implementing distance learning on a full-time basis.

A further stratification of this subgroup populated the sample for the assessment of performance for a non-random selection of curricula. Curricula targeted to undergo performance assessment was selected at the discretion of the training officer; with the selection based on which curricula best support environmental field testing of skills.

It was anticipated that the sample populations introduced selection bias as there was not an independent control group that had been identified nor was random selection implemented. Historical data was collected to populate a control group to provide the comparison on-site curricula instruction versus instruction via the virtual classroom.

There was further potential for bias as the Parker Fire Protection District was establishing a training protocol for its distance learning instructors in an effort to increase learning effectiveness and reduce negative influences prior to implementation of distance learning via the interactive video teleconferencing system. See Appendix A.

The design of the Spectrum system technology was established to reduce the potential for a negative outcome due to technological barriers. As other systems were not evaluated, further potential for bias exists.

Statistical Analysis

Representative reliability was determined through the analysis of the sub-population data; however, population of the groups contained bias. A historical-comparative method utilized a control group which was populated with quantitative and qualitative historical data.

Measurement validity was attempted through evaluating content validity. Content validity was sought to confirm that all measures were representative.

Concurrent validity was achieved through the use of records from the participating agencies to ascertain whether an indicator is valid.

The training reports provided the base for evaluating criterion validity to determine if the selected indicators actually captured the meaning of the construct. Since the measures may have multiple indicators, construct validity with multiple measures was achieved.

A trial evaluation of the measures was utilized to ascertain the effectiveness of the measures.

Statistical validity was established at a minimum through determining the measures of central tendency, the average deviation, the standard deviation, and the variance. The use of the Chi-square test was also evaluated to assist in the comparison of the observed data and any theoretical distribution.

Quantitative Measures

Quantitative measures of activity and efficiency were collected through the use of individual surveys (see Appendix A).

1. The type of class conducted.
2. The number of instructor hours required per class category.
3. The number of historical instructor hours per class category.
4. The per hour cost of the class conducted.
5. The per hour historical cost per class conducted.
6. The number of historical travel miles for training.
7. The historical out of district training time.
8. The number of man-hours spent in teleconference meetings.
9. The number of historical man-hours saved via teleconference meetings.

Qualitative Measures

A Likert Scale survey with closed ended questions was utilized in an evaluation questionnaire targeting instructor and learner perceptions of distance learning. The surveys were intended to provide an ordinal-level of measurement with a purposeful sample.

Post implementation of oral interviews were conducted to assess the changes in the satisfaction level of data transmission, virtual classroom training, and shift meetings. These interviews were conducted with all battalion chiefs and stratified samples of remote site personnel.

Virtual EOC operations were assessed using a historical-comparative method with participant interviews.

Chapter 4

RESULTS

Hypothesis I: Utilization of teleconferencing for training purposes will reduce the cost of delivering training to emergency services personnel.

Hypothesis III: Public safety agencies will reduce the response time to emergency incidents with an ability to train emergency service responders without having them leave their primary response areas.

There are five fire stations and three shifts that provide emergency service coverage for the District. Lecture based training or briefings to emergency service personnel at Parker Fire Protection District may be delivered by any of four methods.

Method I. One method requires that the instructor travel to each of the five stations on three separate days in order to present the material to all members. This represents fifteen different presentations.

Method II. A second method brings the crews from two stations together at one site, leaving one neighborhood at risk with prolonged response times. The third station provides coverage for the neighborhood that is furthest away. This method requires nine different presentations.

Method III. A third method utilizes a cover engine that rotates to outlying areas while that crew travels to another site. This method increases operating costs, but reduces the potential for prolonged response times for two of the response areas. An instructor would need to provide six presentations.

Method IV. The fourth method utilizes the teleconferencing system for lectures and briefings. This method does not have travel costs and does not create any prolonged out-of-area response times. A presenter would need to present three presentations.

A cover engine currently costs $75 per hour to operate. Costs to operate and maintain the engine were not calculated for the purposes of this study and would be in addition to the reported costs here.

Instructors and/or presenters are most frequently in-house staff. Outside lecturers are provided occasionally but these costs occur on a random and individual basis; therefore non-staff lecturers were not included in this study.

The average staff costs are:

Job Title	Average Wage
Firefighter Overtime	$21.81
Paramedic Overtime	$24.86
Battalion Chief	$25.22
Division Chief	$38.27
Chief	$44.49

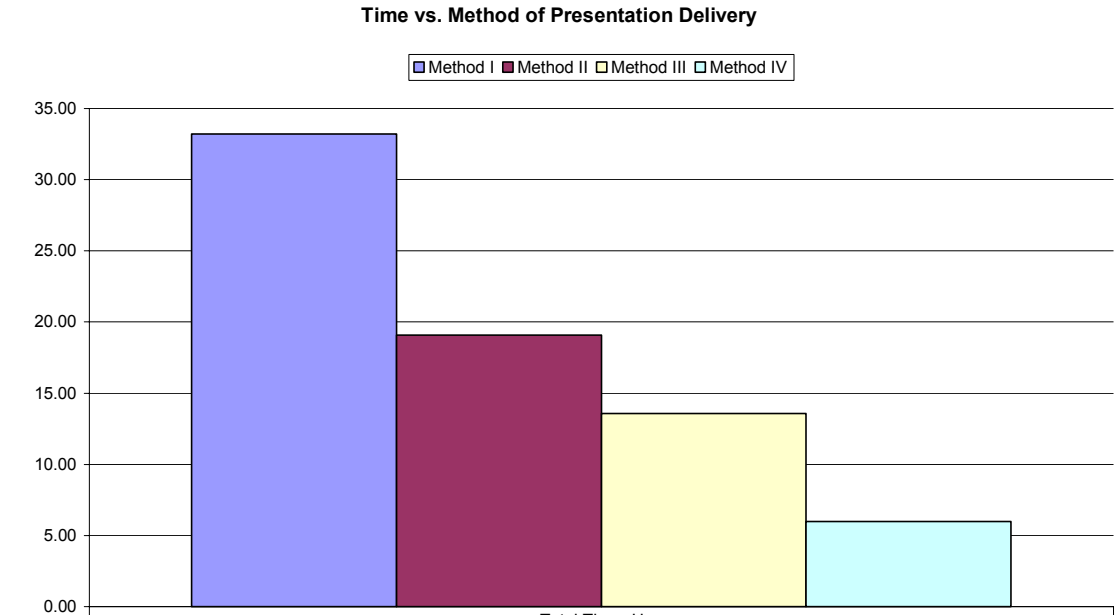
When the engine companies travel to the training center (JSF), the potential for an emergency call when the unit is out of position is increasing. This risk increases as the population increases and the resulting demand for emergent services also increases.

The distances and average emergent travel times from the JSF to the prospective stations were developed as indicated in the following table. The JSF is in the Fire Station 71 response area, thus no value for mileage and time was used.

Fire Station	Miles from JSF	Emergent Travel Time In Minutes
Station 71	0	0
Station 72	5.1	7.02
Station 73	7.2	15.62
Station 74	5.2	7.04
Station 75	3.1	4.52

The District's service goal is to maintain an average emergent response time of five minutes. The goal can rarely be obtained when units are out of their primary response area to attend the frequent training sessions, briefings, and meetings that are scheduled for the crews.

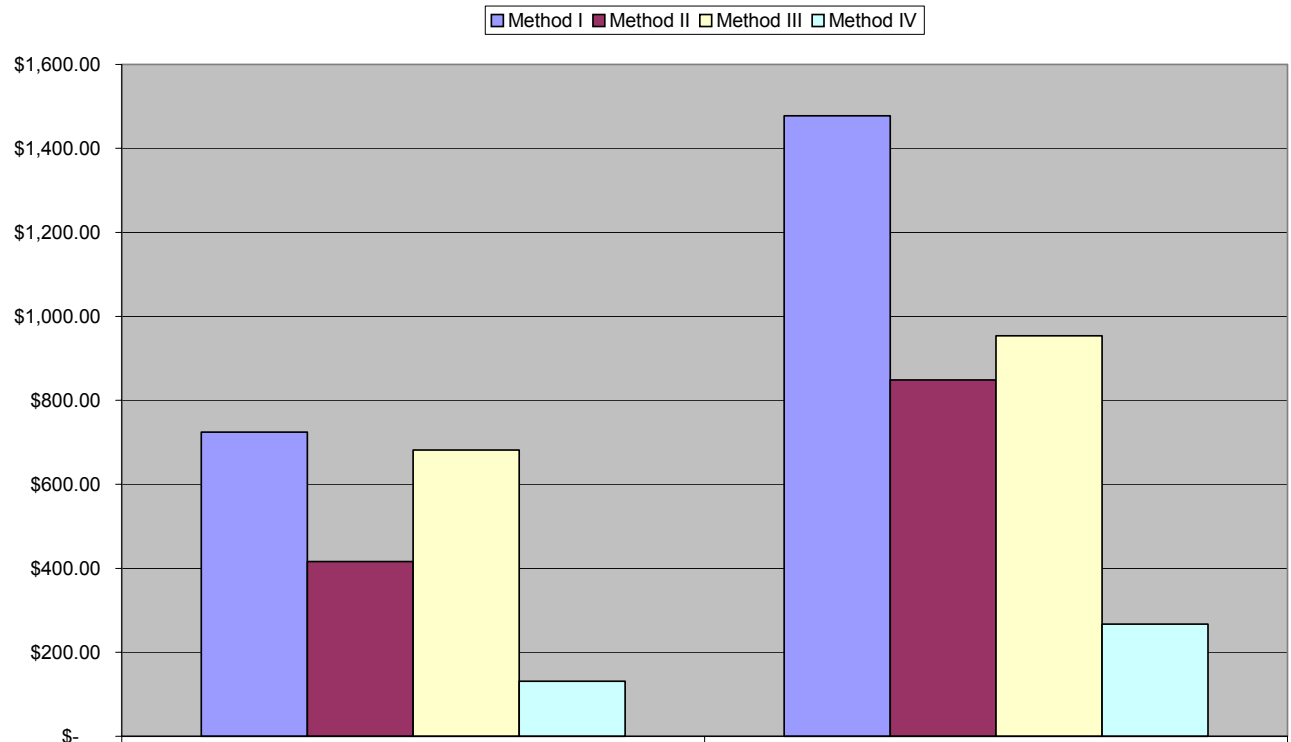
The cost factors are based on a two-hour session with appropriate travel times dependent on station location and method of presentation delivery.



	Total Time- Hrs.
Method I	33.22
Method II	19.07
Method III	13.57
Method IV	6

Method I: Instructor Travels
Method II: Crew Travels
Method III: Cover Engine For Two Stations
Method IV: Teleconferencing

Cost of Presentation (Salary Range: Firefighter OT-Chief) and Cover Engine For Method III for a Two Hr. Presentation



	Salary-FF Presenter & Cover Eng.	Salary-Chief Presenter & Cover Eng.
Method I	$724.53	$1,477.96
Method II	$415.99	$848.57
Method III	$681.72	$953.88
Method IV	$130.86	$266.94

Method I. (Roving Instructor) and Method IV. (Teleconferencing) are the only two delivery methods in use that do not impact normal emergent response times. Whereas, Method II. (Traveling Crews) and Method III. (Cover Engine) impact response times.

Teleconferencing provides a 5.5 fold reduction in instructor/presenter time over the Roving Instructor method and the same reduction in the cost of instructor/presenter salaries.

The maintenance contracts for the teleconferencing equipment have a total average annual cost of $14,000 for all fire stations, studio, and the hub. These costs were not included in this study. Similarly, operation and maintenance of a cover engine, as well as other training expenses were not included.

Despite the time and salary cost savings that teleconferencing provides, skill based portions of required certification training cannot utilize Methods I or Methods IV.

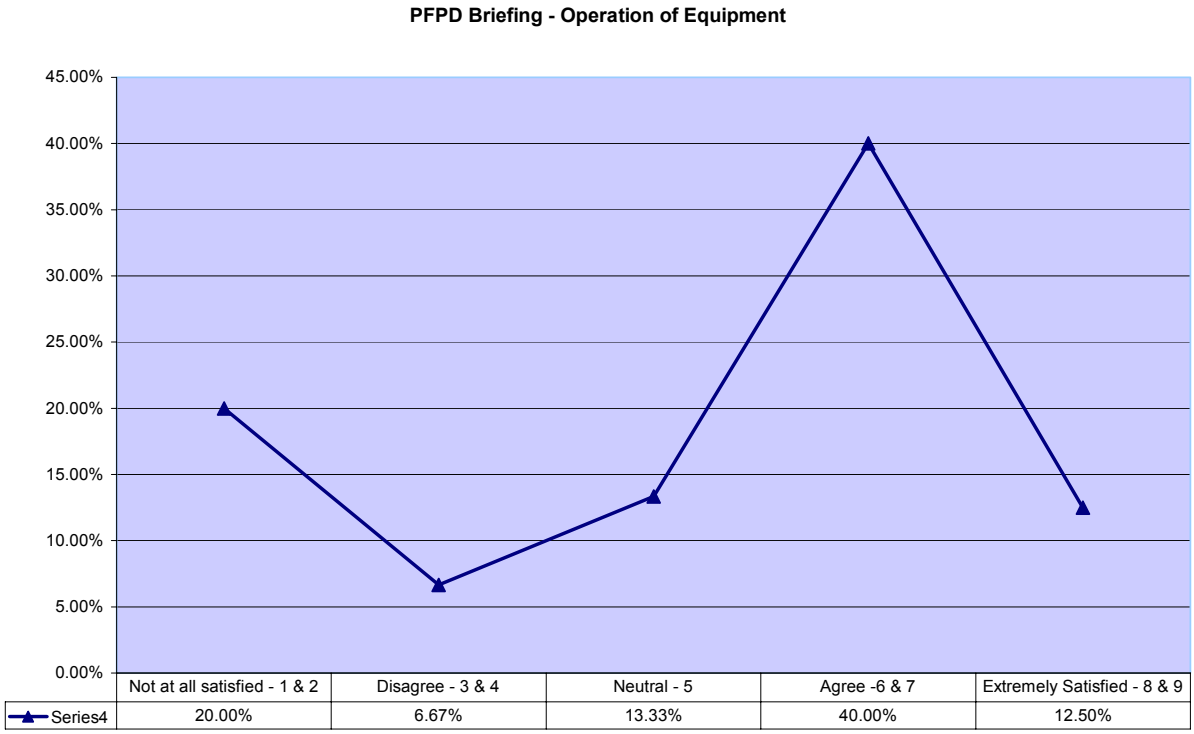
There has been significant reluctance to use teleconferencing for a number of reasons. The initial reason was system failure. There will continue to be some equipment failures, but regular testing provides the only preventative measure. The primary reason for failure has been human error. Most of the human errors are related to lack of familiarity with the equipment. With increased use of the system, a reduction in human error can be expected. Repetition of skill is the basis of training in the fire service and this principal must also be applied to the teleconferencing equipment.

To achieve wider acceptance by firefighters/paramedics, attempts to incorporate teleconferencing into skill based training has ceased. The offering of supplemental training and briefings will increase in an effort to improve communication and to provide additional instructional information, which otherwise occurs less frequently than desired.

Hypothesis II: The quality of teleconferencing delivered at a minimum of 30 frames per second will not reduce the quality of classroom-based lecture or briefing presentations.

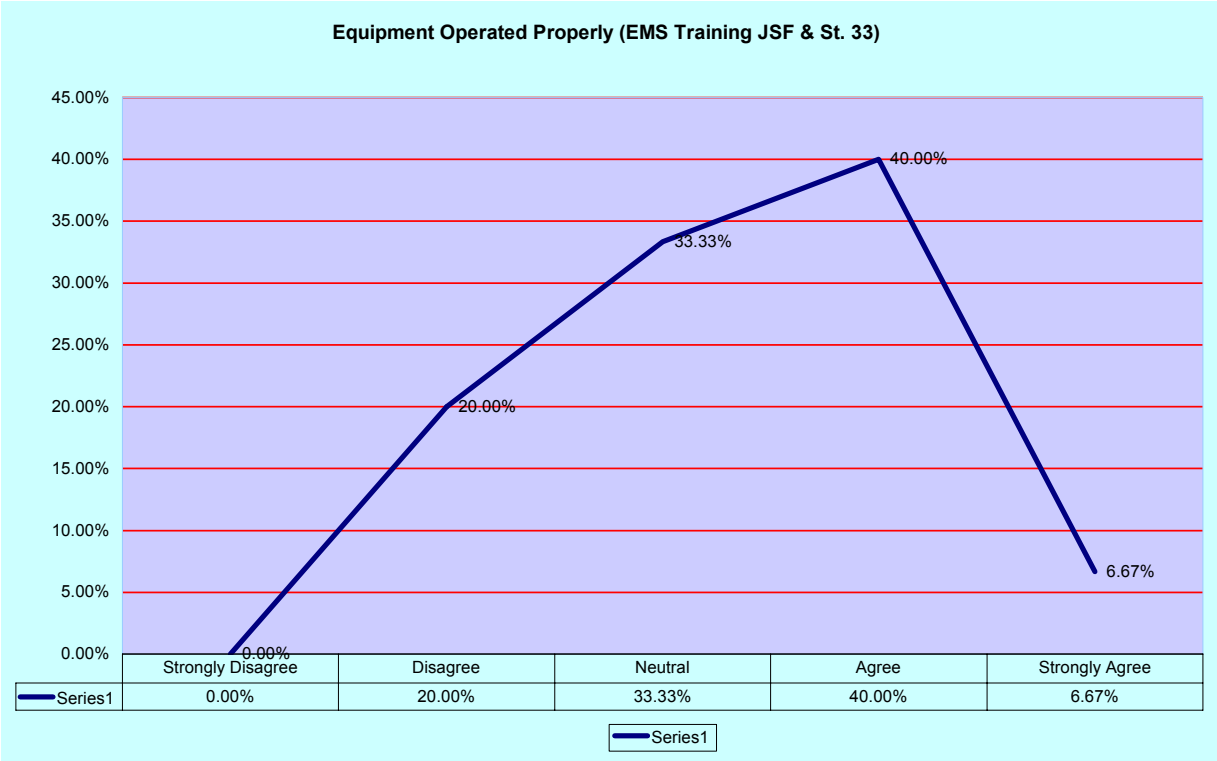
In evaluating the operation of the telecommunication system, a detailed analysis of the perceived operation of the system by listeners was conducted through a Likert scaled survey. Detailed evaluation occurred for question 1a. (How satisfied were you with the operation of the equipment.) The rating scale ranged from Not At All Satisfied (1) to Extremely Satisfied (10).

Fifteen respondents provided input to the question regarding equipment operation. Over 52% of the viewers indicated that the equipment operated satisfactorily and 13.33% were



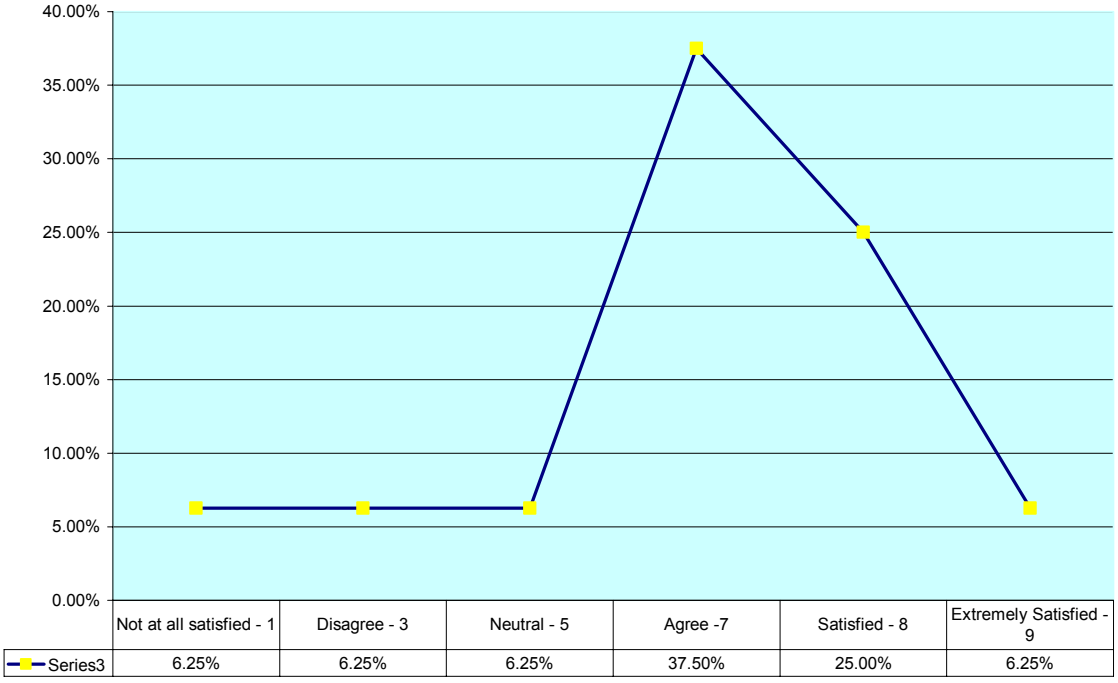
neutral on the question.

In an Emergency Medical training conducted by Swedish Hospital which included South Metro Fire Station 33, 46.67% felt that the equipment operation was satisfactory and 33.33% were neutral on the question. The Likert Scale in this survey ranged from Strongly Disagree (1) to Strongly Agree (5).



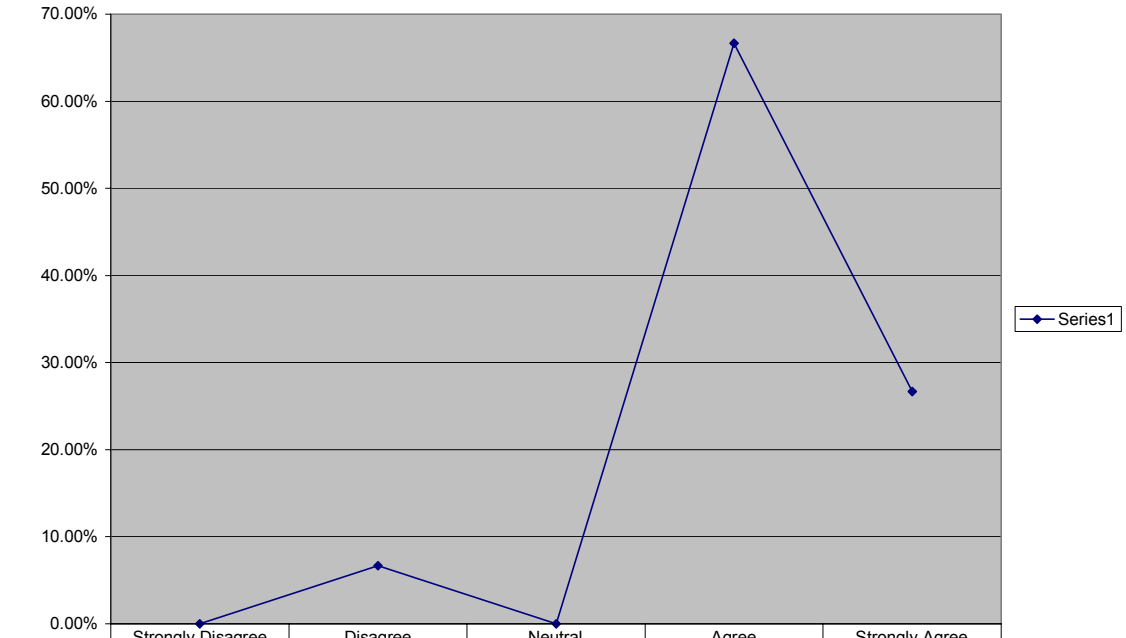
In the two previously mentioned test cases, respondents were asked to rate the effectiveness of the teleconferencing format for the briefing and the training lecture. The respondents in the Parker Fire test briefing had a 75% approval rating for this format; while in the Swedish test, 93.34% of the respondents indicated that teleconferencing was an effective format for that type of lecture presentation.

PFPD Briefing-Teletraining Format Was Effective



	Not at all satisfied - 1	Disagree - 3	Neutral - 5	Agree -7	Satisfied - 8	Extremely Satisfied - 9
Series3	6.25%	6.25%	6.25%	37.50%	25.00%	6.25%

EMS-Teletraining Format Was Appropriate For This Topic

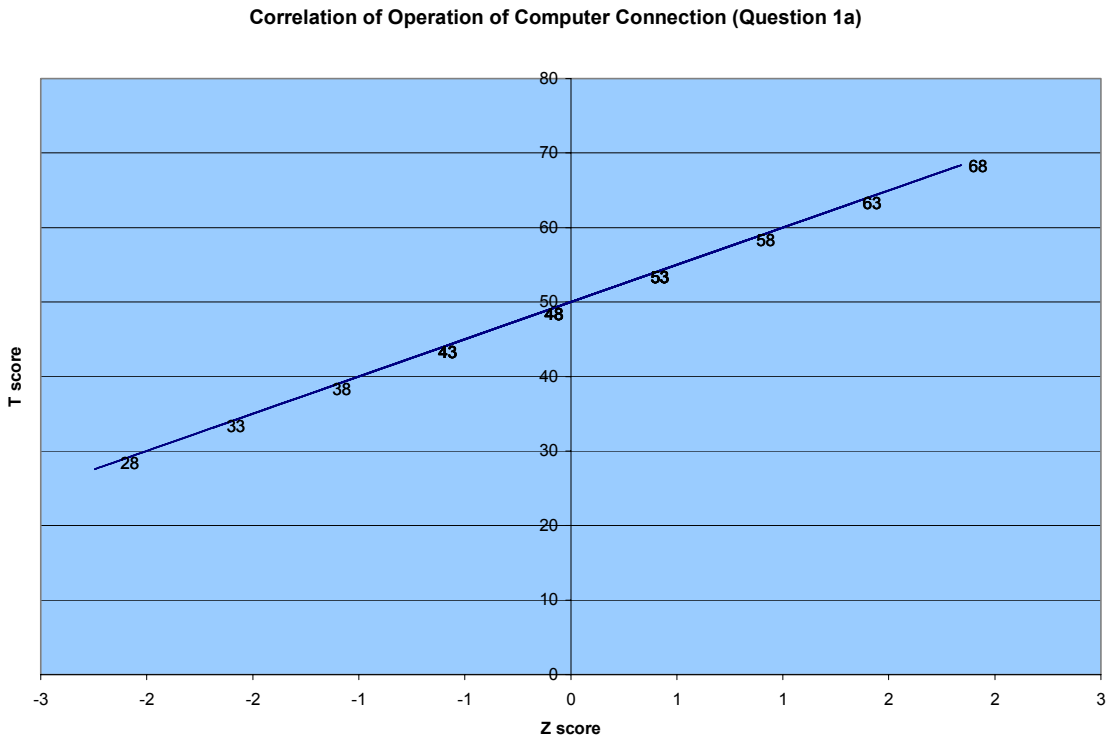


	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Series1	0.00%	6.67%	0.00%	66.67%	26.67%

Hypothesis IV: The development of a high speed Intranet network for the bi-directional transfer of data and Internet access will improve access to information for emergency service personnel.

A Likert Scale survey was conducted to evaluate the impact of the high-speed access to information by different classifications of personnel within emergency services. The total number of respondents was 47 with some variation on individual questions.

The relationship between Z scores and T scores indicated that they were perfectly correlated for question 1 a. (How satisfied are you with the changes in the computer network from a remote site with regard to the operation of the computer connection. The range was from 1 (Not At All Satisfied) to 9 (Extremely Satisfied).



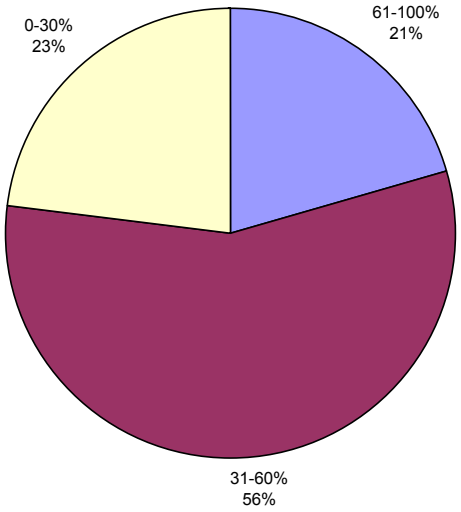
Question	1 a.	1 g.	1 h.
Mean	5	51	66
Median	5	50	70
Max	9	10	10
Min	1	20	20
S.D.	2	304	18
N	40	39	39

A two-tailed t-test for nonindependent (matched) samples was conducted for question 1 g. (Rate your productivity on your job tasks on the computer network before the new system became operational) and 1 h. (Rate your productivity on your job tasks on the computer network since the new system became operational.) The scale was 0%, which represented no productivity, 50% which represented average increase in productivity, to 100%, which represented the highest rate of productivity.

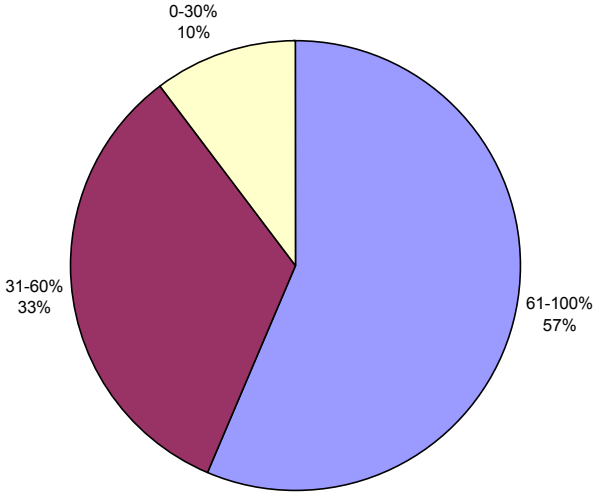
Before the high-speed connections were in place, 20.51% of the respondents reported that their rate of productivity on job tasks on the computer network was in the 61-100% range. After the new system became operational, 56.41% of the respondents reported that their rate of productivity on the computer was in the 61-100% range. This represented a 35.9% increase in productivity for all employee classifications.

The value for the observed value of t (T_{obt}) was 3.85. The critical value of t (T_{crit}) where df=38 was 2.010. Since T_{obt} was greater than T_{crit}, there was a positive result supporting the hypothesis that the development of a high speed Intranet network for the bi-directional transfer of data and Internet access will improve access to information for emergency service personnel.

Rate Your Productivity On Your Job Tasks On The Computer Network Before The New System Became Operational - All Job Classifications.



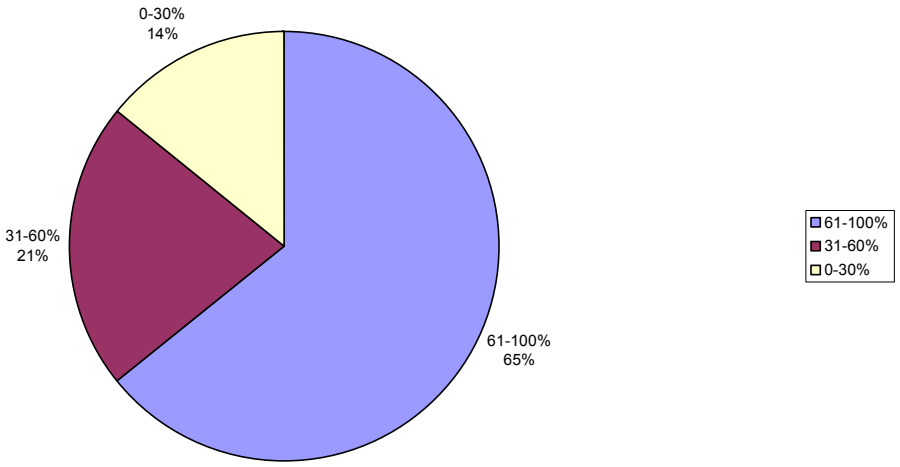
Rate Your Productivity On Your Job Tasks On The Computer Network Since The New System Became Operational - All Job Classifications.



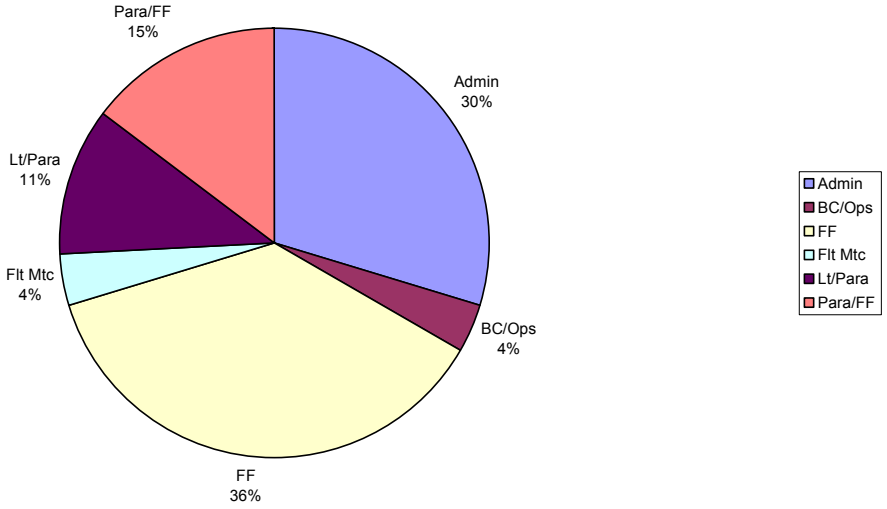
The impact of providing access to the Internet was also evaluated using the same scale of 0-100% in question 3a. A Chi Square analysis was done to evaluate the results reported by different job classifications. Sixty-five per cent of the surveyed employees felt that they had a 61-100% increase in their productivity with the provision of Internet access.

	Admin fo/fe	**BC/Ops**	**FF**	**FM**	**Lt**	**Par**	**Totals**
61-100%	8	1	10	1	3	4	27
31-60%	1	1	4	0	2	1	9
0-30%	0	1	1	1	3	0	6
TOTALS	9	3	15	2	8	5	42
f_e	**f_e**	**F_e**	**f_e**	**f_e**	**f_e**	**f_e**	
61-100%	5.785714	1.92857	9.642857	1.285714	5.142857	3.214286	
31-60%	1.928571	0.64286	3.214286	0.428571	1.714286	1.071429	
0-30%	1.285714	0.42857	2.142857	0.285714	1.142857	0.714286	
TOTALS							
	$X^2=(f_o-f_e)^2/f_e$						
61-100%	0.847443	0.44709	0.013228	0.063492	0.892857	0.192063	
31-60%	0.44709	0.19841	0.192063	0.428571	0.047619	0.004762	
0-30%	1.285714	0.7619	0.609524	1.785714	3.017857	0.714286	
TOTALS	2.580247	1.40741	0.814815	2.277778	3.958333	0.911111	11.94969
	Observed Value of X^2=11.94969						
	df=(r-1)(c-1)		df=(3-1)(6-1)		Df=10		
		Critical Value of Chi Square with df = 10 is 18.31 at .05.					
		Critical Value of Chi Square with df = 10 is 23.21 at .01.					
		Observed value of Chi Square is less than the critical values of Chi Square, therefore there is a significant difference by occupation for impact of Internet access on job related productivity.					

Employee Increase In Productivity Rating After Internet Access Was Provided At Work



A 61-100% Increase In Work Productivity After Internet Provision As Reported By Occupation



Hypothesis V: Interactive audio/visual signals can improve the ability of decision makers and key command officers in designated EOC's to provide oversight of mitigation efforts during major emergency incidents.

Evaluation of the Emergency Operation Center (EOC) use of teleconferencing was accomplished through direct observation and key staff interviews. There were two tests of the system in this format. The first was a chemical agent mass casualty exercise involving two EOC locations, one public information site and direct visual feed from the incident location through the effort of the ARIS ham radio operators.

The second test involved two EOC sites with full 384 Kbps transmission and a backup single BRI ISDN desktop computer connection. The event was the actual emergency operation for Y2K.

In both tests, the key command officers were successful in maintaining communication over the teleconferencing systems and were able to effectively operate from diverse command locations. Since the interagency routine testing of equipment operation is not in place, significant setup time is needed for each use.

Chapter 5

CONCLUSION

In conclusion, all hypotheses have been proven true. The cost effectiveness, timesavings and work productivity provided through the implementation of a high-speed network have been proven. While the capital costs are high and the future upgrade costs and maintenance costs will be comparatively high; the net result in reported increases in work productivity, communication and training opportunities, and the increased ability to stay in primary emergency response districts warrant serious consideration.

REFERENCES

Cyrs, T. E. (1997). Teaching and learning at a distance: What it takes to effectively design, deliver, and evaluate programs. San Francisco: Jossey-Bass.

Mantyla, K., & Gividen, J. R. (1997). Distance learning: A step-by-step guide for trainers. Alexandria, VA: American Society for Training and Development.

McCleary, I. D., & Egan, M. W. (1989). Program design and evaluation: Two-way interactive television. American Journal of Distance Education, 3(1), 50-60.

Fuchs, L. (1995). Connecting performance assessment to instruction: A comparison of behavioral assessment, mastery learning, curriculum-based measurement, and performance assessment. Online. ERIC Digest ED 381984. Available:WWW:http://www.ed.gov/databases/ERIC_Digests. [1999, January 30].

Barry, M. & Runyan, G.B. (1995). A review of distance-learning studies in the U.S. military. The American Journal of Distance Education, 9(3), 38-45.

Bramble, W.J. & Martin, B.L. (1995). The Florida teletraining project: military training via two-way compressed video. The American Journal of Distance Education, 9(1), 2-16.

Martin, B.L. & Bramble, W.J. (1996). Designing Effective Video Teletraining Instruction: The Florida Teletraining Project. Education Technology Research and Development. 44(1), 87-98.

APPENDIX A

Evaluation Documentation Forms

Briefing-Presenter Survey Form
Please Return This Form To Training

Date: _____ Subject/Class_____ Presenter: _____

Start Time: _____ End Time: _____ Total Time: _____

Please Check Type of Connection:

Satellite ___ Multipoint ___ Point to Point ___ ISDN Incoming ___ ISDN Outgoing ____

Please Check Your Location:

Station 71		Station 74	
Station 72		Station 75	
Station 73		Joint Service Fac.	
		Swedish	

How satisfied are you with the telebriefing?	**Not at all Satisfied**							**Extremely Satisfied**		**Not Apply**
1. Environment										
a. Operation of the equipment	1	2	3	4	5	6	7	8	9	0
b. Quality of the audio reception	1	2	3	4	5	6	7	8	9	0
c. Quality of the video reception	1	2	3	4	5	6	7	8	9	0
d. Size of the monitor	1	2	3	4	5	6	7	8	9	0
e. Overall atmosphere	1	2	3	4	5	6	7	8	9	0
2. Media										
a. Presentation materials received at site	1	2	3	4	5	6	7	8	9	0
b. Relevance of visuals to briefing	1	2	3	4	5	6	7	8	9	0
c. Clearness and appearance of visuals	1	2	3	4	5	6	7	8	9	0
3. Content										
a. Communication of briefing objectives	1	2	3	4	5	6	7	8	9	0
b. Ease of using your existing material	1	2	3	4	5	6	7	8	9	0
c. Presenter and listener interaction	1	2	3	4	5	6	7	8	9	0
4. Listener										
a. Interaction with listeners	1	2	3	4	5	6	7	8	9	0
b. Ability to keep interest of the listener	1	2	3	4	5	6	7	8	9	0
c. Ability to resolve audio/video problems	1	2	3	4	5	6	7	8	9	0
d. Television appearance of other listeners	1	2	3	4	5	6	7	8	9	0
e. Gestures, mannerisms, and eye contact	1	2	3	4	5	6	7	8	9	0
f. Comfort with telecommunications equipment	1	2	3	4	5	6	7	8	9	0
5. Overall										
a. The telebriefing format was effective for this briefing	1	2	3	4	5	6	7	8	9	0
The telebriefing format met my individual needs for this briefing	1	2	3	4	5	6	7	8	9	0
b. At this time I feel that telecommunication is: (please complete)										

Briefing-Listener Survey Form
Please Return This Form To Training

Date: _____ Subject/Class_____ Presenter: _____

Start Time: _____ End Time: _____ Total Time: _____

Please Check Type of Connection:

Satellite ___ Multipoint ___ Point to Point ___ ISDN Incoming ___ ISDN Outgoing ____

Please Check Your Location:

Station 71		Station 74	
Station 72		Station 75	
Station 73		Joint Service Fac.	
		Swedish	

How satisfied are you with the telebriefing?	**Not at all satisfied**							**Extremely satisfied**		**Not Apply**
1. Environment										
a. Operation of the equipment	1	2	3	4	5	6	7	8	9	0
b. Quality of the audio reception	1	2	3	4	5	6	7	8	9	0
c. Quality of the video reception	1	2	3	4	5	6	7	8	9	0
d. Size of the monitor	1	2	3	4	5	6	7	8	9	0
e. Overall learning atmosphere	1	2	3	4	5	6	7	8	9	0
2. Media										
a. Materials received at site	1	2	3	4	5	6	7	8	9	0
b. Relevance of visuals to instruction	1	2	3	4	5	6	7	8	9	0
c. Clearness and appearance of visuals	1	2	3	4	5	6	7	8	9	0
3. Briefing Content										
a. Communication of briefing objectives	1	2	3	4	5	6	7	8	9	0
b. Listener and presenter interaction	1	2	3	4	5	6	7	8	9	0
4. Presenter										
a. Knowledge of material	1	2	3	4	5	6	7	8	9	0
b. Interaction with listener	1	2	3	4	5	6	7	8	9	0
c. Ability to keep interest of listeners	1	2	3	4	5	6	7	8	9	0
d. Television appearance	1	2	3	4	5	6	7	8	9	0
e. Gestures, mannerisms, and eye contact	1	2	3	4	5	6	7	8	9	0
f. Comfort with telecommunications equipment	1	2	3	4	5	6	7	8	9	0
g. Ability to resolve audio/video problems	1	2	3	4	5	6	7	8	9	0
5. Overall										
c. The teletraining format was effective for this Briefing.	1	2	3	4	5	6	7	8	9	0
d. The information I received met my Individual needs for the briefing.	1	2	3	4	5	6	7	8	9	0
e. At this time I feel that telecommunication is: (please complete)										

Comments _____

Computer Network Survey Form - Please return form by Oct. 10

Please check your job function(s): ( ) Lt. ( ) Paramedic ( ) Engineer ( ) BC ( ) Firefighter ( ) Training ( ) Fleet Maintenance ( ) Administrative

Date of hire with Parker Fire: _____

Please Check Remote Locations Where You Have Used Computers.

Station 71	Station 73	Joint Service Fac.
Station 72	Station 74	Station 75

How satisfied are you with the changes in the computer network from a remote site?	**Not at all satisfied**							**Extremely satisfied**		**Not Apply**
1. Computer Network Environment										
a. Operation of the computer connection	1	2	3	4	5	6	7	8	9	0
b. Speed of software (Sunpro, etc.) connection	1	2	3	4	5	6	7	8	9	0
c. Speed of the file access time	1	2	3	4	5	6	7	8	9	0
d. Speed of accessing mail messages	1	2	3	4	5	6	7	8	9	0

What percent of your total working time is spent on the computer network? (circle one)

0 10 20 30 40 50 60 70 80 90 100

How much of an improvement have you experienced with sending and receiving files from the main server from remote sites since installation of the new connections (April-July, 1999). (circle one - 100 percent represents highest improvement; 50 percent represents average improvement; and 0 represents no improvement.)

0 10 20 30 40 50 60 70 80 90 100

Rate your productivity on your job tasks on the computer network before the new system became operational. (circle one - 100 percent represents highest rate of productivity; 50 percent represents average rate of productivity; and 0 represents no productivity)

0 1 0 20 30 40 50 60 70 80 90 100

Rate your productivity on your job tasks on the computer network since the new system became operational. (circle one - 100 percent represents highest rate of productivity; 50 percent represents average rate of productivity; and 0 represents no productivity)

0 1 0 20 30 40 50 60 70 80 90 100

2. Internet Email Access	**Not at all Satisfied**							**Extremely satisfied**		**Not Apply**
If you have a Parker Fire Internet email address please rate your satisfaction with this service.	1	2	3	4	5	6	7	8	9	0

Rate your productivity on your job tasks since you have been provided with Internet email access. (circle one - 100 percent represents highest increase in productivity; 50 percent represents average increase in productivity; and 0 represents no increase in productivity)

0 1 0 20 30 40 50 60 70 80 90 100

3. Internet Access	**Not at all Satisfied**							**Extremely satisfied**		**Not Apply**
Please rate your satisfaction with the Internet access at work.	1	2	3	4	5	6	7	8	9	0

Rate your productivity on your job tasks since you have been provided with Internet access. (circle one - 100 percent represents highest increase in productivity; 50 percent represents average increase in productivity; and 0 represents no increase in productivity)

0 1 0 20 30 40 50 60 70 80 90 100

3. Overall	**Not at all satisfied**							**Extremely satisfied**		**Not Apply**
Your level of satisfaction with the changes in the oCmputer network.	1	2	3	4	5	6	7	8	9	0

Comments_____

HealthONE Emergency Medical Services
TELETRAINING PROGRAM EVALUATION

Program_____ Date(s) of Program_____

Program Instructor_____ Location_____

Directions:

- Use #2 pencil only
- Darken appropriate box on right; erase completely to change answer
- Example: Correct mark: ▬ Incorrect marks: X ✓

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
PRESENTATION					
1. The presentation(s) was well organized.	☐	☐	☐	☐	☐
2. There was adequate opportunity for interaction with the presentor during the program.	☐	☐	☐	☐	☐
3. There was adequate time for questions to be answered during the program.	☐	☐	☐	☐	☐
ENVIRONMENT	☐	☐	☐	☐	☐
4. The equipment operated properly.	☐	☐	☐	☐	☐
5. The quality of the audioreception was acceptable.	☐	☐	☐	☐	☐
6. The quality of the video reception was acceptable.	☐	☐	☐	☐	☐
7. The size of the monitor was acceptable.	☐	☐	☐	☐	☐
MEDIA	☐	☐	☐	☐	☐
8. The visual aids projected clearly.	☐	☐	☐	☐	☐
9. The visual aids were relevant to the presentation.	☐	☐	☐	☐	☐
10. Handouts/materials for the presentation were received at the site.	☐	☐	☐	☐	☐
11. A post test for the presentation was available.	☐	☐	☐	☐	☐
EQUIPMENT USE	☐	☐	☐	☐	☐
12. I was comfortable with the telecommunications equipment.	☐	☐	☐	☐	☐
13. We were able to resolve audio/video problems.	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
GENERAL	☐	☐	☐	☐	☐
14. The TeleTraining format was appropriate for this topic.	☐	☐	☐	☐	☐
15. The level of material presented was appropriate to my level of care.	☐	☐	☐	☐	☐
16. The program met my educational needs.	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐

17. Make any applicable comments to the following aspect of the class:

Presentors:

18. The most beneficial aspect of the program was:

19. List any recommendations that would make this program more applicable to your needs.

20. List any other topics you feel would be appropriate for future teleconferencing.

Thank you for your time in completing this evaluation!

Vm\p&p-qa\evals\teleconferencing program evaluation
9/8/00

APPENDIX B

Statistical Analysis Work Pages

Question No. Responses																		
1b.	**1c.**	**1d.**	**1e.**	**2a.**	**2b.**	**2c.**	**3a.**	**3b.**	**4a.**	**4b.**	**4c.**	**4d.**	**4e.**	**4f.**	**4g.**	**5a.**	**5b.**	**5c. Comment**
1	6	7	2	7	7	8	5	2	8	5	5	8	8	8	8	5	5	Loousy Audio Interation, not interactive, hard to maintain interest
1	2	4	1	7	9	7	2	1	9	9	6	9		9	2	1	1	
1	7	7	1	3	5	5		3	9	9	9	9	9	8	3	3	6	hard to hear, system should be scrubbed
2	8	8	7	4	8	4	7	7	8	7	7	8	9	6	3	7	7	OK-don't like lack of interaction
5	6	7	3	4	8	2	8	5	8	6	8	8	8	7	7	7	7	works OK for some areas of training but is imited.
6	7	9	8	0	8	4	9	8	9	9	9	9	9	9	0	8	8	
6	8	9	8	0	6		7	7	8	8	8	8	8	8	8	8	8	
2	4	6	8	6	8	8	8	8	8	8	8	8	8	0	7	6	7	In need of improvement.
7		6	7	7	8	6	9	8	8	9	9	9	8	8	0	7	8	
9	9	9	9	5	5	9	9	9	9	9	9	9	9	9	9	9	9	Good Job, far better than Monday.
5	4	8	6	3	7	4	7	7	7	7	6	7	7	7	0	8	8	requires extensive preparation, difficult to present interactive classes.
3	5	6	4	6	8	6	8	3	7	8	7	6	8	7	8	7	7	Adequate for short presentations. Anything longer or requiring more interaction would not be very effective. It is very annoying when one person is hard to hear and another is so loud you have to turn the volume down.
5	3	6	4	7	8	2	8	7	9	7	9	8	8		0	6	7	OK for briefing. I don't like the format for classes, lectures, inteactive education.
4	4	7	6	8	8	8	7	5	8	8	7	7	8	8	8	7	7	Still in need of some refinement.
5	5	5	6	6	7	5	8	7	9	8	9	9	8	8	8	7	7	Good for short meetings and briefings. Long classes or meetings need to held on site.
4	7	7	7	7	7	5	7	8	8	8	8	7	8	7	6	8	8	Good Instrument for this type of presentation, voiced varied when he turned his head, overheads at timers were hard to see (small type & graphs, st 72 mic was open.
4.1	5.7	6.9	5.4	5.7	7.3	5.5	7.3	5.9	8.3	7.8	7.8	8.1	8.2	7.8	6.4	6.5	6.9	
4	6	7	6	5.5	8	5.5	8	7	8	8	8	8	8	8	7.5	7	7	
16	15	16	16	14	16	15	15	16	16	16	16	16	15	14	12	16	16	
1	2	4	1	3	5	2	2	1	7	5	5	6	7	6	2	1	1	
9	9	9	9	8	9	9	9	9	9	9	9	9	9	9	9	9	9	

EMS 9-11

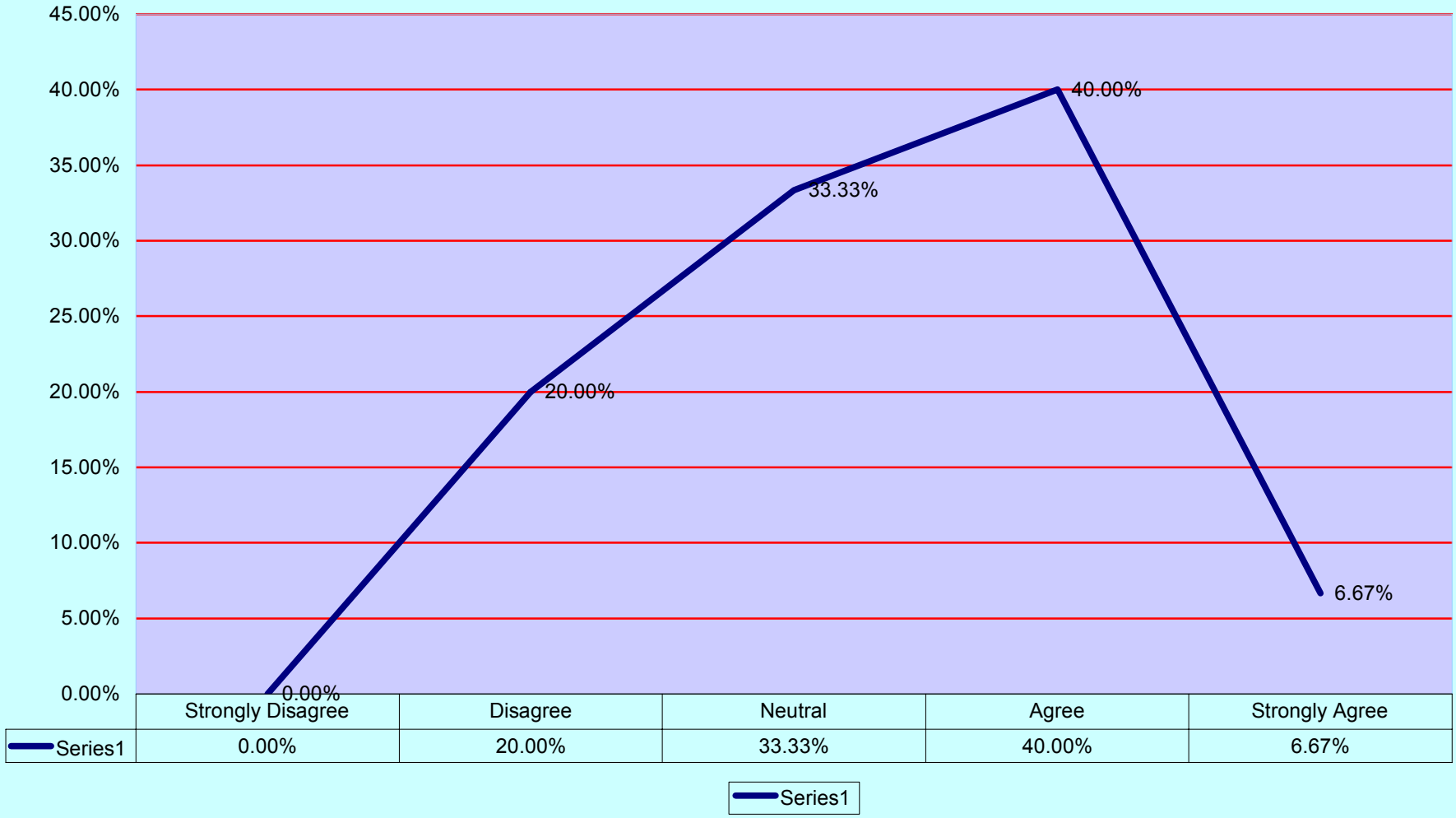
Relate to TIIAP Form				3b		1a	1b	1c	1d	2c	2b	2a		4f	4g	5a		5b				
Question	**AutoNo.**	**Location**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Scale	1	33	4	3	3	2	2	4	4	4	3	5	5	3	2	4	4	4				
Strongly Disagree=1	2	33	4	4	4	5	4	4	3	3	4	5	3	4	3	4	5	5				
Disagree=2	3	33	4	4	4	4	4	4	4	4	4	4	4	4	2	5	4	4				
Neither Agree or Disagree=3	4	33	3	4	4	4	3	4	4	3	4	4	4	4	3	4	4	4				
Agree=4	5	33	4	2	4	2	2	2	2	2	4	4	4	4	1	4	4	4				
Strongly Agree=5	6	33	5	5	5	3	3	4	4	4	4	2	4	1	1	5	5	5				
	7	JSF	5	5	5	4	4	4	4	4	4	4	4	4	4	5	5	5				
	8	JSF	4	4	4	4	4	4	4	5	5	5	5	4	4	4	4	4				
	9	JSF	5	4	4	3	3	3	3	4	4	3	4	4	3	4	4	4				
	10	JSF	1	1	1	3	2	2	3	3	2	2	1	3	1	2	1	1				
	11	JSF	4	3	4	3	3	3	2	4	4	3	4	2	2	4	4	4	3			
	12	JSF	5	4	4	4	4	4	4	5	4	4	5	4	4	4	4	4		5	4	4
	13	JSF	5	5		3	2	5	5			5	5	3	1	5	3	3				
	14	JSF	5	5	5	4	4	4	4	4	4	4	4	1	4	4	4	4				
	15	JSF	4	3	4	2	1	4	4	4	4	2	4	3	1	4	5	4				
				4		3	3	4	4	4	4	4		3	2	4		4				
Mean = Sum of n/n																						
Median																						
n				15		15	15	15	15	14	14	15		15	15	15		15				
range low																						
range high																						

EMS 9-11 (2)

Relate to TIIAP Form

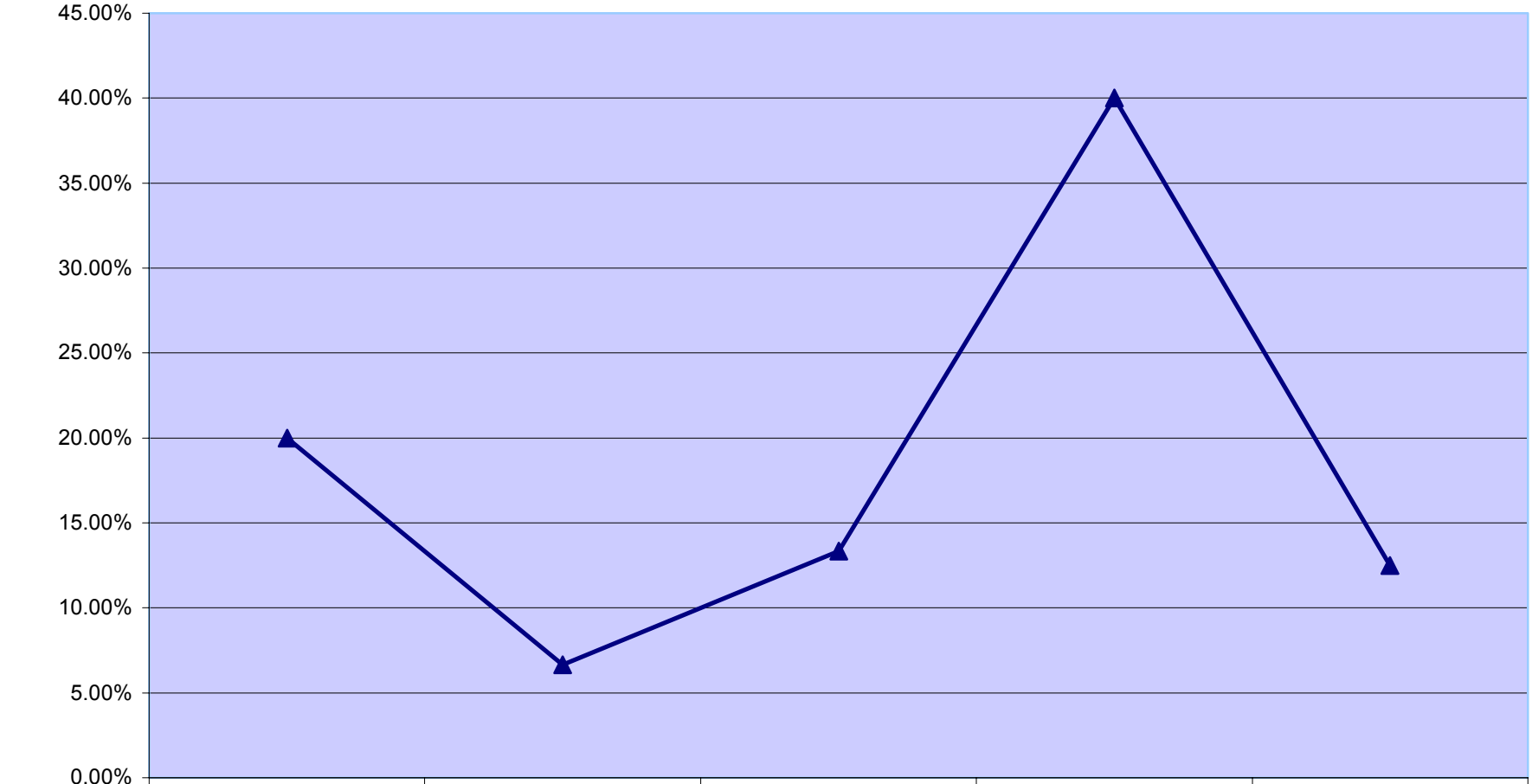
Question	AutoNo.	Location	1	3b 2	3	1a	1b	1c	1d	2c	2b	2a	11	4f	4g	5a	15	5b 16	17	18	19	20
Scale	10	JSF	1	1	1	3	2	2	3	3	2	2	1	3	1	2	1	1				
Strongly Disagree=1	13	JSF	5	5		3	2	5	5			5	5	3	1	5	3	3				
Disagree=2	5	33	4	2	4	2	2	2	2	2	4	4	4	4	1	4	4	4				
Neither Agree or Disagree=3	11	JSF	4	3	4	3	3	3	2	4	4	3	4	2	2	4	4	4	3			
Agree=4	1	33	4	3	3	2	2	4	4	4	3	5	5	3	2	4	4	4				
Strongly Agree=5	9	JSF	5	4	4	3	3	3	3	4	4	3	4	4	3	4	4	4				
	4	33	3	4	4	4	3	4	4	3	4	4	4	4	3	4	4	4				
	14	JSF	5	5	5	4	4	4	4	4	4	4	4	1	4	4	4	4				
	12	JSF	5	4	4	4	4	4	4	5	4	4	5	4	4	4	4	4		5	4	4
	8	JSF	4	4	4	4	4	4	4	5	5	5	5	4	4	4	4	4				
	15	JSF	4	3	4	2	1	4	4	4	4	2	4	3	1	4	5	4				
	3	33	4	4	4	4	4	4	4	4	4	4	4	4	2	5	4	4				
	2	33	4	4	4	5	4	4	3	3	4	5	3	4	3	4	5	5				
	6	33	5	5	5	3	3	4	4	4	4	2	4	1	1	5	5	5				
	7	JSF	5	5	5	4	4	4	4	4	4	4	4	4	4	5	5	5				
Mean = Sum of n/n				4		3	3	4	4	4	4	4		3	2	4		4				
Median				4		3	3	3	4	4	4	4		4	2	4		4				
n				15		15	15	15	15	14	14	15		15	15	15		15				
range low				1		2	1	2	2	2	2	2		1	1	2		1				
range high				5		5	4	5	5	5	5	5		4	4	5		1				
range				4		3	3	3	3	3	3	3		3	3	3		0				

Equipment Operated Properly (EMS Training JSF & St. 33)



	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Series1	0.00%	20.00%	33.33%	40.00%	6.67%

PFPD Briefing - Operation of Equipment



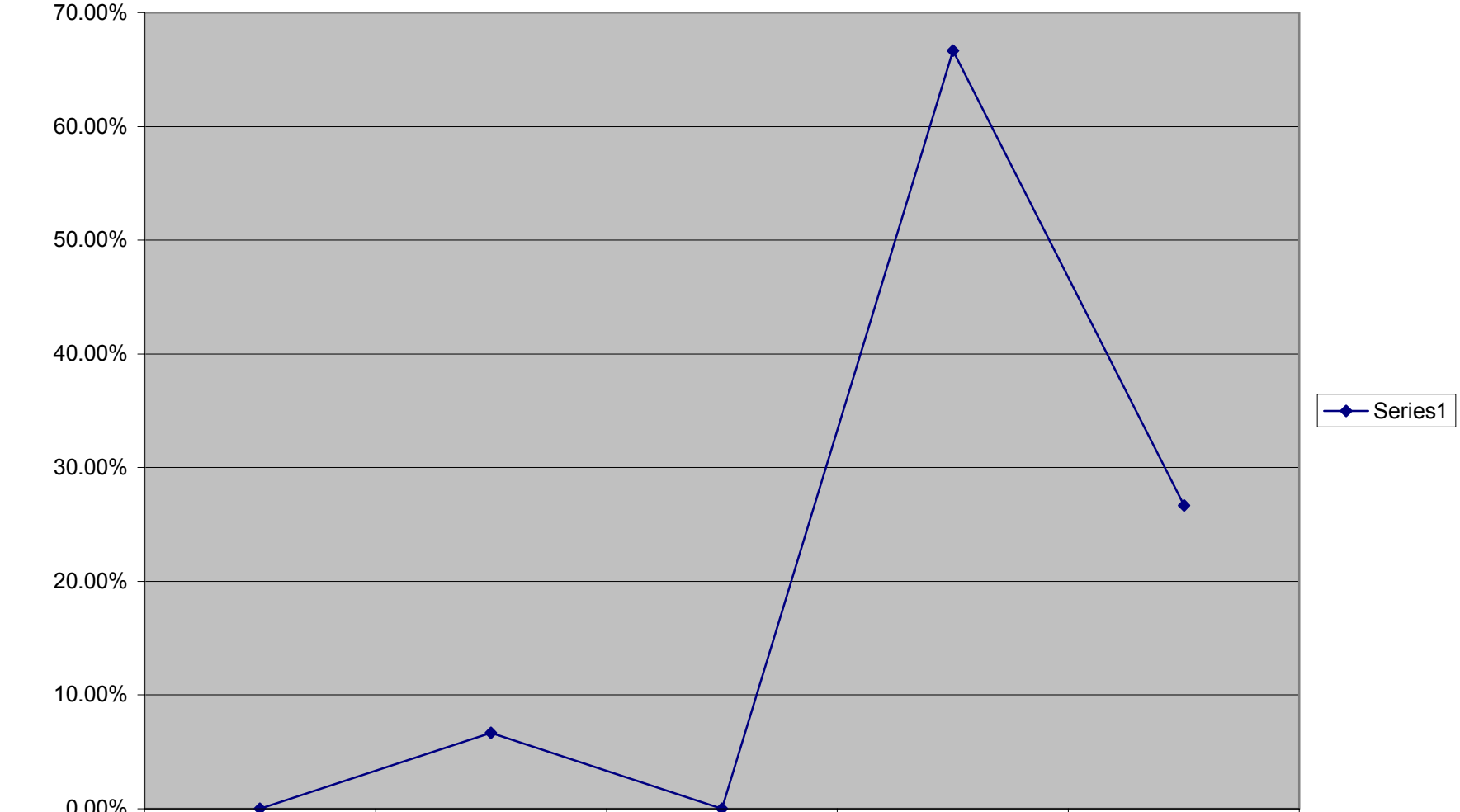
	Not at all satisfied - 1 & 2	Disagree - 3 & 4	Neutral - 5	Agree -6 & 7	Extremely Satisfied - 8 & 9
Series4	20.00%	6.67%	13.33%	40.00%	12.50%

EMS 9-11 (3)

Relate to TIIAP Form

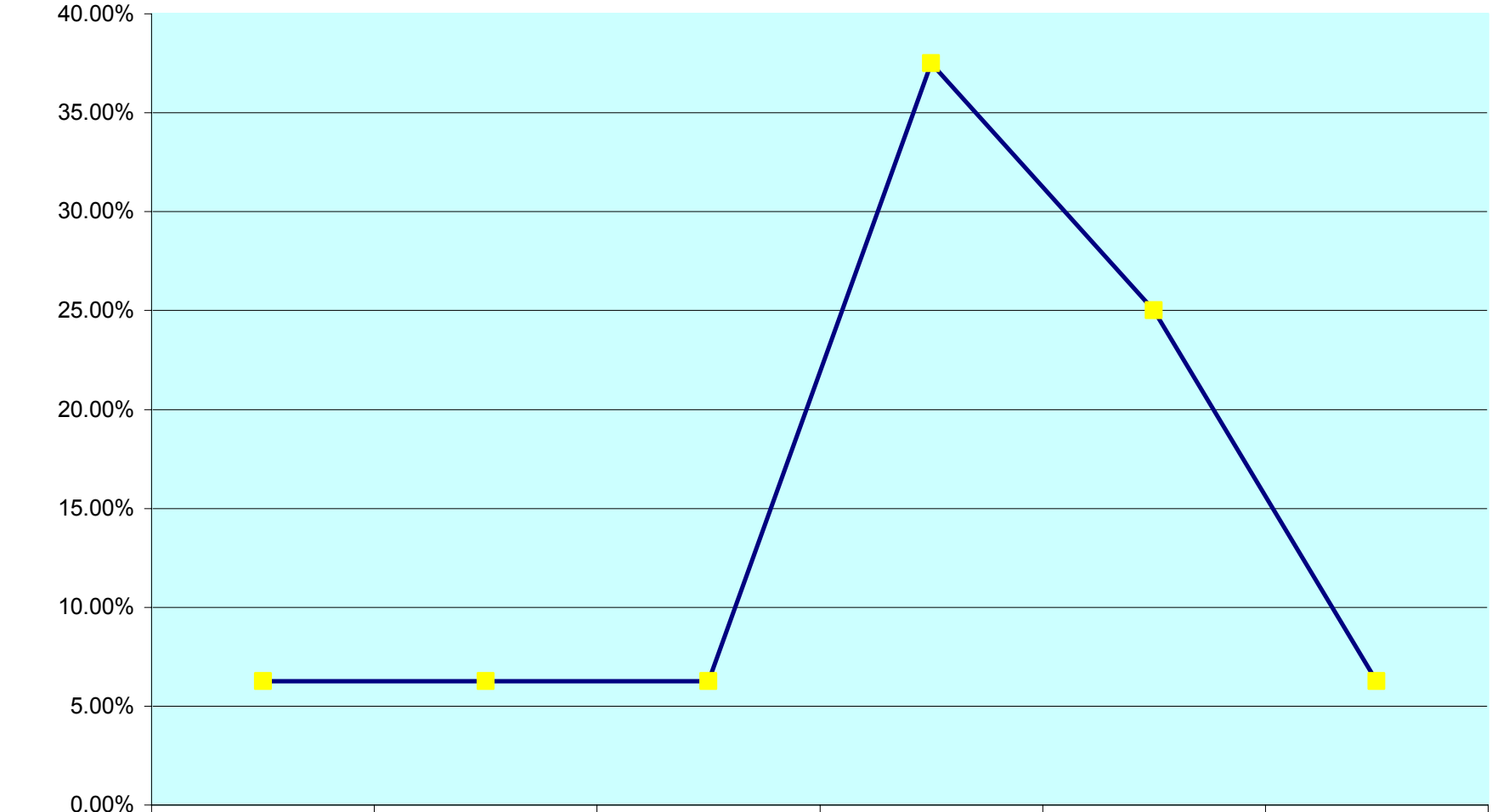
Question	AutoNo.	Location		3b		1a	1b	1c	1d	2c	2b	2a		4f	4g	5a		5b				
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Scale	10	JSF	1	1	1	3	2	2	3	3	2	2	1	3	1	2	1	1				
Strongly Disagree=1	13	JSF	5	5		3	2	5	5			5	5	3	1	5	3	3				
Disagree=2	5	33	4	2	4	2	2	2	2	2	4	4	4	4	1	4	4	4				
Neither Agree or Disagree=3	11	JSF	4	3	4	3	3	3	2	4	4	3	4	2	2	4	4	4	3			
Agree=4	1	33	4	3	3	2	2	4	4	4	3	5	5	3	2	4	4	4				
Strongly Agree=5	9	JSF	5	4	4	3	3	3	3	4	4	3	4	4	3	4	4	4				
	4	33	3	4	4	4	3	4	4	3	4	4	4	4	3	4	4	4				
	14	JSF	5	5	5	4	4	4	4	4	4	4	4	1	4	4	4	4				
	12	JSF	5	4	4	4	4	4	4	5	4	4	5	4	4	4	4	4		5	4	4
	8	JSF	4	4	4	4	4	4	4	5	5	5	5	4	4	4	4	4				
	15	JSF	4	3	4	2	1	4	4	4	4	2	4	3	1	4	5	4				
	3	33	4	4	4	4	4	4	4	4	4	4	4	4	2	5	4	4				
	2	33	4	4	4	5	4	4	3	3	4	5	3	4	3	4	5	5				
	6	33	5	5	5	3	3	4	4	4	4	2	4	1	1	5	5	5				
	7	JSF	5	5	5	4	4	4	4	4	4	4	4	4	4	5	5	5				
Mean = Sum of n/n				4		3	3	4	4	4	4	4		3	2	4		4				
Median				4		3	3	3	4	4	4	4		4	2	4		4				
n				15		15	15	15	15	14	14	15		15	15	15		15				
range low				1		2	1	2	2	2	2	2		1	1	2		1				
range high				5		5	4	5	5	5	5	5		4	4	5		1				
range				4		3	3	3	3	3	3	3		3	3	3		0				

EMS-Teletraining Format Was Appropriate For This Topic



	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Series1	0.00%	6.67%	0.00%	66.67%	26.67%

PFPD Briefing-Teletraining Format Was Effective



	Not at all satisfied - 1	Disagree - 3	Neutral - 5	Agree -7	Satisfied - 8	Extremely Satisfied - 9
Series3	6.25%	6.25%	6.25%	37.50%	25.00%	6.25%

Question 14 & 15a

Relate to TIIAP Form

Question	AutoNo.	Location	14
Scale	13	JSF	5
Strongly Disagree=1	3	33	5
Disagree=2	6	33	5
Neither Agree or Disagree=3	7	JSF	5
Agree=4	5	33	4
Strongly Agree=5	11	JSF	4
	1	33	4
	9	JSF	4
	4	33	4
	14	JSF	4
	12	JSF	4
	8	JSF	4
	15	JSF	4
	2	33	4
	10	JSF	2
Sum			62
Mean = Sum of n/n			4
Median			4
n			15
range low			2
range high			5
range			3

Sum of Squares(S-M)

Sum of Squares(S-M)/n= Variance

Question NO.	Auto No.	Date	Location	5a.
	10	10/3	74	9
	6	10/3	73	8
	7	10/3	73	8
	11	10/3	74	8
	16	10/2	74	8
	4	10/2	75	7
	5	10/3	73	7
	9	10/3	74	7
	12	10/3	75	7
	14	10/3	75	7
	15	10/3	75	7
	8	10/3	74	6
	13	10/4	75	6
	1	10/2	75	5
	3	10/2	75	3
	2	10/2	75	1
Mean = Sum of n/n				6.5
Median				7
n				16
range low				1
range high				9

S.D.= sq. root of variance

EMS Training-The Teletraining Format Was Appropriate For This Topic	
Strongly Disagree	0.00%
Disagree	6.67%
Neutral	0.00%
Agree	66.67%
Strongly Agree	26.67%

Teletraining Format Was Effective For This Briefing	
Not at all satisfied - 1	6.25%
Disagree - 3	6.25%
Neutral - 5	6.25%
Agree -7	37.50%
Satisfied - 8	25.00%
Extremely Satisfied - 9	6.25%

Computer Use Data

AutoNO	DIVISION	DOHire	USE Location	1a	1b	1c	1d	1e	1f	1g	1h	2	2a	3	3a	3b	Comments
1	fm		jsf	5	5	5	6	10	40	70	70	8	70	8	70	6	Sometimes real slow & informix login not there
2	admin	7/0/99	71	na	na	na	na	60	55	60	60	8	80	8	90	8	
3	admin		71	na	na	na	na	80	60	50	70	7	80	7	80	7	
4	admin	8/0/84	71	na	na	na	na	50	0	0	0	9	80	9	80	7	
5	admin	3/0/98	71	na	na	na	na	50	50	50	50	8	80	8	90	8	
6	OPS	0/0/83	jsf-75	8	6	8	8	70	80	40	90	8	90	8	60	7	Internet down frequently, when up- great
7	bc	0/0/84	all	4	4	4	4	50	60	60	60	na	0	3	0	5	setup variation between sites, ability to add screen savers, programs by site
8	admin	8/0/83	71-home-ootown	8	8	8	8	40	50	50	50	9	90	9	70	9	
9	bc	6/0/84	71,73,74,jsf,75	9	9	9	9	60	10 0	60	10 0	9	80	9	80	8	great improvement since Rob's hire
10	lt		71,73,75	6	5	5	9	70	70	40	80	0	0	6	10	8	Nice Work
11	par	6/0/93	71,72,73,74,75	7	7	6	7	50	70	40	60	0	0	8	na	7	72 and 75 locking up old equipment
12	ff	1/1/1999	na	6	2	2	6	20	50	70	70	5	70	8	50	6	
13	ff	3/1/1999	71,72,73,74,75	6	6	6	6	10	60	70	70	7	70	7	70	7	
14	admin	0/0/81	all	8	8	8	8	90	80	20	80	9	60	9	40	9	
15	admin	na	71,jsf,75	6	6	6	6	30	80	60	80	7	60	7	80	7	
16	ff	na	all	6	6	6	6	20	70	50	70	8	70	8	70	7	Much improved see details
17	ff	8/10/1998	71,72,73,74,75	5	5	5	5	10	na	50	50	6	60	7	0	6	
18	par	0/0/95	71,72,73,74,75	4	4	4	5	20	50	50	50	4	70	6	70	6	equip. issues, see details
19	ff	8/0/98	all	9	9	9	9	na	na	na	na	na	na	9	70	9	applications quite working frequently
20	lt	7/0/94	all	5	5	5	5	20	10	30	60	8	90	8	80	5	T-1 great for data, training on teleconferencing is a waste
21	eng		na	5	5	5	5	10	na	na	na	na	na	na	na	5	
22	admin	4/1/1994	71	na	na	na	na	40	na	90	90	8	50	9	90	8	
23	eng	7/5/1994	72,73	3	3	3	3	10	70	30	50	na	na	4	50	5	
24	ltpar	6/0/89	71,74,75,jsf	6	3	5	8	30	50	60	80	8	80	8	10 0	6	
25	na	3/0/97	71,72,73,74,75	5	4	4	4	10	50	50	70	na	na	6	60	6	
26	ff	8/10/1998	na	6	6	7	6	10	50	50	50	na	na	7	50	5	not reliable

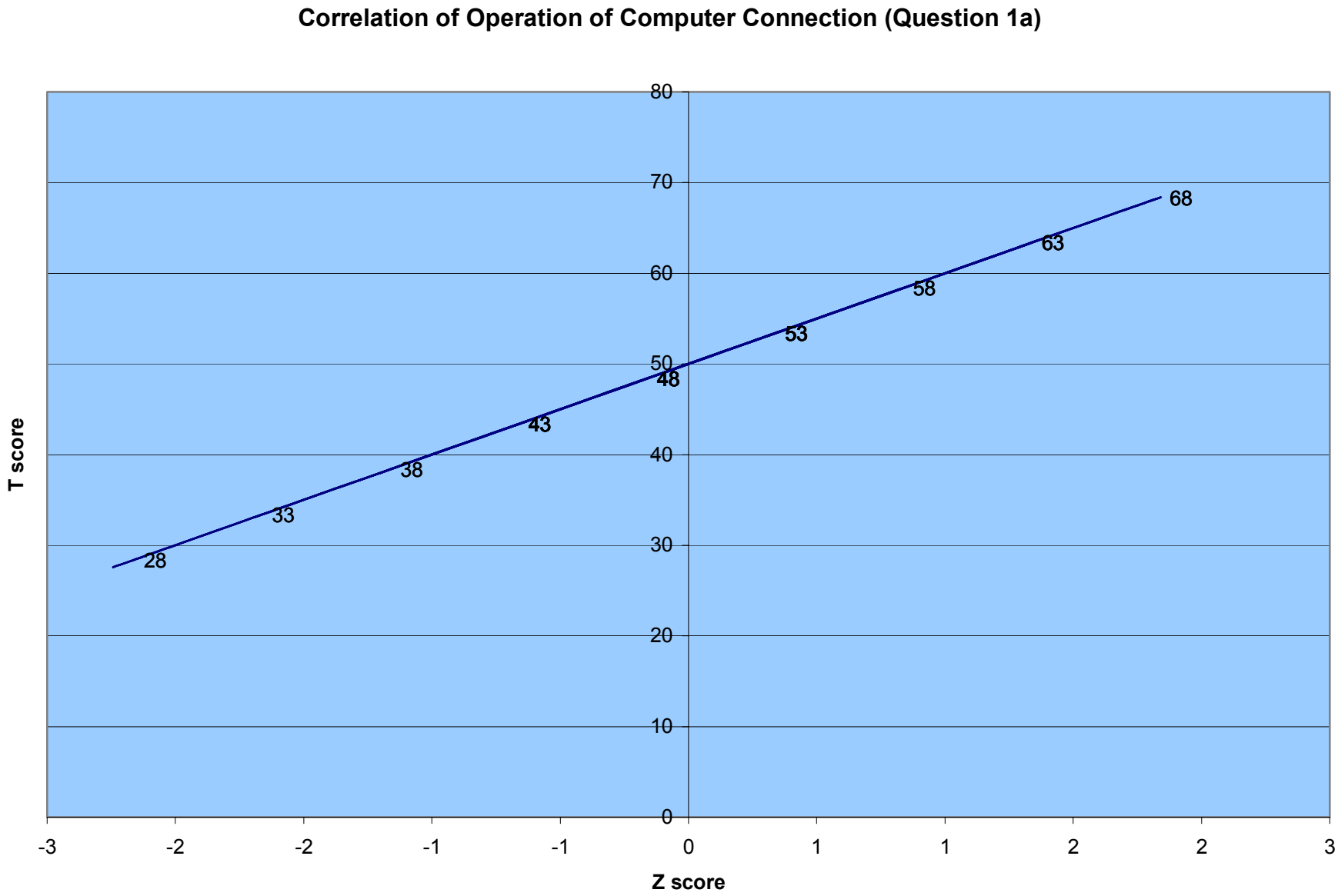
27	par	1/28/2000	75	3	2	2	3	20	10	na	20	na	na	6	50	5	faster cpus and bigger monitors
28	lt	2/0/95	71,72,73,74,75	4	2	3	3	20	50	30	50	na	50	7	60	5	system is faster, sunpro needs improvement, new equipment needed at stations.
29	ff	1/1/1999	75	5	7	2	6	10	80	70	80	na	na	7	70	7	faster cpus and bigger monitors
30	eng	2/13/1995	71,72,73,74,75	4	4	4	4	10	50	30	60	na	na	9	50	5	
31	ltpartng	7/13/1987	all	7	7	7	8	30	90	30	80	na	na	8	90	8	most problems occur with station computers
32	parfftngadmin	6/0/89	75	7	7	7	7	60	50	20	50	6	60	7	80	na	performance inconsistant between sites
33	par	8/10/1998	73,74,75	2	2	2	2	30	50	50	70	7	80	8	80	5	needs to be faster and more reliable at stations
34	ff	8/6/1999	75	5	5	2	6	10	80	80	70	na	na	4	70	7	faster cpus and bigger monitors
35	ff	8/0/98	75	1	6	2	1	10	50	30	30	9	100	9	90	5	home network access is a great option
36	eng	na	75	2	1	2	2	30	30	40	30	8	100	8	80	6	
37	par	3/1/1999	71,72,73,74,75	4	4	5	6	20	na	na	na	na	na	9	100	na	
38	eng	8/0/96	71,72,73,74	6	7	7	7	10	70	40	70	na	na	8	80	8	
39	lt	6/0/84	all	5	6	6	6	30	50	50	70	na	na	6	0	6	
40	fm	5/0/88	jsf	8	8	8	8	50	90	50	90	9	90	9	10	8	Abra and great plains are great.
41	fm	7/1/1999	jsf	1	na	na	na	na	na	na	na	na	na	1	na	1	no experience-too hard to use
42	admin	0/0/83		na	na	na	na	45	na	100	100	9	90	9	100	9	no problems
43	ltparadmin	11/0/85	71,73,jsf	4	5	5	5	50	na	na	na	5	10	5	10	5	
44	ltpar	6/16/1989	all	4	3	4	6	40	70	70	na	6	70	6	60	6	keep up the good work, work to increase reliability
45	ff	3/0/00	71,72,73,74,75	6	6	6	7	10	60	60	70	na	70	7	70	7	
46	eng	6/0/89	71,73,74,75	9	na	9	9	30	100	20	90	9	70	9	80	9	speed great, hardware crashes.
47	admin	6/0/95	71	na	na	na	na	na	na	na	na	9	na	9	na	9	admin improvement is noticeable
48																	
49			Mean	5	5	5	6	33	60	49	65	7	66	7	64	7	
50			Median	5	5	5	6	30	58	50	70	8	70	8	70	7	

							10	10	10		10		10		
51	Max	9	9	9	9	90	0	0	0	9	0	9	0	9	
52	Min	1	1	2	1	10	0	0	0	0	0	1	0	1	
53	Stan. Deviation	2													

Standard Deviation

Auto NO	DIVISION	DOHire	USE Location	1a	N-M	(n-m) (n-m)	1b	1c	1d	1e	1f	1g	1h	2	2a	3	3a	3b	Comments
1	fm		jsf	5	0	0	5	5	6	10	40	70	70	8	70	8	70	6	Sometimes real slow & informix login not there
2	admin	7/0/99	71	na			na	na	na	60	55	60	60	8	80	8	90	8	
3	admin		71	na			na	na	na	80	60	50	70	7	80	7	80	7	
4	admin	8/0/84	71	na			na	na	na	50	0	0	0	9	80	9	80	7	
5	admin	3/0/98	71	na			na	na	na	50	50	50	50	8	80	8	90	8	
6	OPS	0/0/83	jsf-75	8	3	7	6	8	8	70	80	40	90	8	90	8	60	7	Internet down frequently, when up-great
7	bc	0/0/84	all	4	-1	2	4	4	4	50	60	60	60	na	0	3	0	5	setup variation between sites, ability to add screen savers, programs by site
8	admin	8/0/83	71-home-ootown	8	3	7	8	8	8	40	50	50	50	9	90	9	70	9	
9	bc	6/0/84	71,73,74,jsf,75	9	4	13	9	9	9	60	100	60	100	9	80	9	80	8	great improvement since Rob's hire
10	lt		71,73,75	6	1	0	5	5	9	70	70	40	80	0	0	6	10	8	Nice Work
11	par	6/0/93	71,72,73,74,75	7	2	3	7	6	7	50	70	40	60	0	0	8	na	7	72 and 75 locking up old equipment
12	ff	1/1/1999	na	6	1	0	2	2	6	20	50	70	70	5	70	8	50	6	
13	ff	3/1/1999	71,72,73,74,75	6	1	0	6	6	6	10	60	70	70	7	70	7	70	7	
14	admin	0/0/81	all	8	3	7	8	8	8	90	80	20	80	9	60	9	40	9	
15	admin	na	71,jsf,75	6	1	0	6	6	6	30	80	60	80	7	60	7	80	7	
16	ff	na	all	6	1	0	6	6	6	20	70	50	70	8	70	8	70	7	Much improved see details
17	ff	8/10/1998	71,72,73,74,75	5	0	0	5	5	5	10	na	50	50	6	60	7	0	6	
18	par	0/0/95	71,72,73,74,75	4	-1	2	4	4	5	20	50	50	50	4	70	6	70	6	equip. issues, see details
19	ff	8/0/98	all	9	4	13	9	9	9	na	na	na	na	na	na	9	70	9	applications quite working frequently
20	lt	7/0/94	all	5	0	0	5	5	5	20	10	30	60	8	90	8	80	5	T-1 great for data, training on teleconferencing is a waste
21	eng	12/31/1996	na	5	0	0	5	5	5	10	na	na	na	na	na	na	na	5	
22	admin	4/1/1994	71	na			na	na	na	40	na	90	90	8	50	9	90	8	
23	eng	7/5/1994	72,73	3	-2	6	3	3	3	10	70	30	50	na	na	4	50	5	
24	ltpar	6/0/89	71,74,75,jsf	6	1	0	3	5	8	30	50	60	80	8	80	8	100	6	
25	na	3/0/97	71,72,73,74,75	5	0	0	4	4	4	10	50	50	70	na	na	6	60	6	
26	ff	8/10/1998	na	6	1	0	6	7	6	10	50	50	50	na	na	7	50	5	not reliable
27	par	1/28/2000	75	3	-2	6	2	2	3	20	10	na	20	na	na	6	50	5	faster cpus and bigger monitors

28	lt	2/0/95	71,72,73,74,75	4	-1	2	2	3	3	20	50	30	50	na	50	7	60	5	system is faster, sunpro needs improvement, new equipment needed at stations.
29	ff	1/1/1999	75	5	0	0	7	2	6	10	80	70	80	na	na	7	70	7	faster cpus and bigger monitors
30	eng	2/13/1995	71,72,73,74,75	4	-1	2	4	4	4	10	50	30	60	na	na	9	50	5	
31	ltpartng	7/13/1987	all	7	2	3	7	7	8	30	90	30	80	na	na	8	90	8	most problems occur with station computers
32	parfftngadmin	6/0/89	75	7	2	3	7	7	7	60	50	20	50	6	60	7	80	na	performance inconsistant between sites
33	par	8/10/1998	73,74,75	2	-3	11	2	2	2	30	50	50	70	7	80	8	80	5	needs to be faster and more reliable at stations
34	ff	8/6/1999	75	5	0	0	5	2	6	10	80	80	70	na	na	4	70	7	faster cpus and bigger monitors
35	ff	8/0/98	75	1	-4	19	6	2	1	10	50	30	30	9	100	9	90	5	home network access is a great option
36	eng	na	75	2	-3	11	1	2	2	30	30	40	30	8	100	8	80	6	
37	par	3/1/1999	71,72,73,74,75	4	-1	2	4	5	6	20	na	na	na	na	na	9	100	na	
38	eng	8/0/96	71,72,73,74	6	1	0	7	7	7	10	70	40	70	na	na	8	80	8	
39	lt	6/0/84	all	5	0	0	6	6	6	30	50	50	70	na	na	6	0	6	
40	fm	5/0/88	jsf	8	3	7	8	8	8	50	90	50	90	9	90	9	10	8	Abra and great plains are great.
41	fm	7/1/1999	jsf	1	-4	19	na	na	na	na	na	na	na	na	na	1	na	1	no experience-too hard to use
42	admin	0/0/83		na			na	na	na	45	na	100	100	9	90	9	100	9	no problems
43	ltparadmin	11/0/85	71,73,jsf	4	-1	2	5	5	5	50	na	na	na	5	10	5	10	5	
44	ltpar	6/16/1989	all	4	-1	2	3	4	6	40	70	70	na	6	70	6	60	6	keep up the good work, work to increase reliability
45	ff	3/0/00	71,72,73,74,75	6	1	0	6	6	7	10	60	60	70	na	70	7	70	7	
46	eng	6/0/89	71,73,74,75	9	4	13	na	9	9	30	100	20	90	9	70	9	80	9	speed great, hardware crashes.
47	admin	6/0/95	71	na			na	na	na	na	na	na	na	9	na	9	na	9	admin improvement is noticeable
48			Sum		0	165													
49			Mean	5			5	5	6	33	60	49	65	7	66	7	64	7	
50			Median	5			5	5	6	30	58	50	70	8	70	8	70	7	
51			Max	9			9	9	9	90	100	100	100	9	100	9	100	9	
52			Min	1			1	2	1	10	0	0	0	0	0	1	0	1	
53			S.D.	2			2	2	2	22	23	20	21	2	28	2	28	2	
54																			
55			S.D g49/N			4													
56			S.D.=Sq.Rt D56			2													

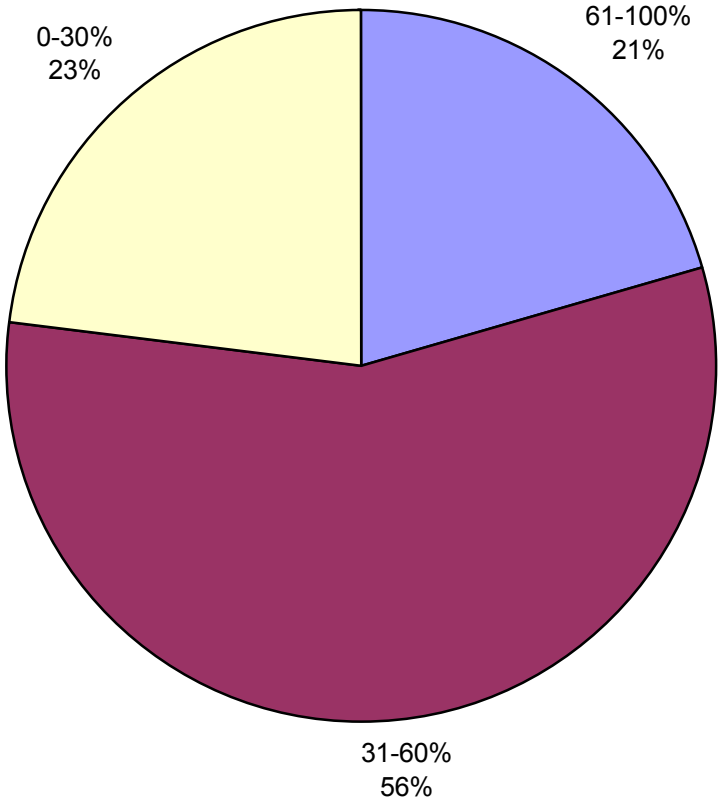

Correlation of Operation of Computer Connection (Question 1a)
T score
Z score
80
70
60
50
40
30
20
10
0
-3
-2
-2
-1
-1
0
1
1
2
2
3
28
33
38
43
48
53
58
63
68

Z-Score

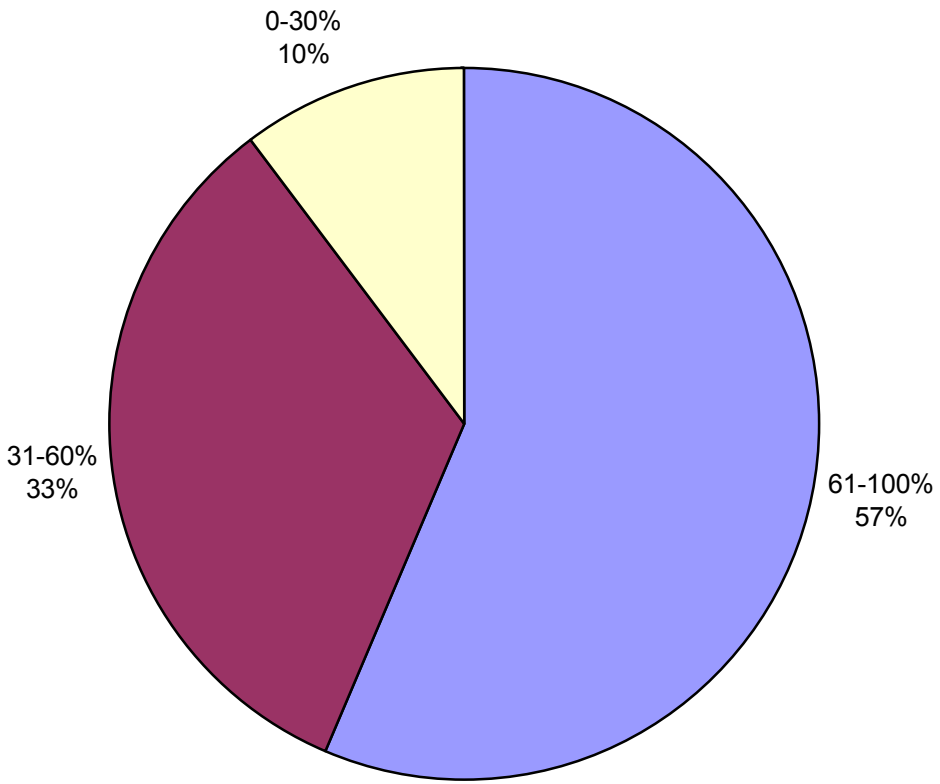
AutoNO	DIVISION	DOHire	USE Location	1a	N-M	(n-m)(n-m)	z=N-mean/S.D.	T=10(z)+50	1b	1c	1d	1e	1f	1g	1h	2	2a	3	3a	3b	Comments
1	fm		jsf	5	0	0	0	48	5	5	6	10	40	70	70	8	70	8	70	6	Sometimes real slow & inforr not there
2	admin	7/0/99	71	na					na	na	na	60	55	60	60	8	80	8	90	8	
3	admin		71	na					na	na	na	80	60	50	70	7	80	7	80	7	
4	admin	8/0/84	71	na					na	na	na	50	0	0	0	9	80	9	80	7	
5	admin	3/0/98	71	na					na	na	na	50	50	50	50	8	80	8	90	8	
6	OPS	0/0/83	jsf-75	8	3	7	1	63	6	8	8	70	80	40	90	8	90	8	60	7	Internet down frequently, whe great
7	bc	0/0/84	all	4	-1	2	-1	43	4	4	4	50	60	60	60	na	0	3	0	5	setup variation between sites to add screen savers, progra site
8	admin	8/0/83	71-home-ootown	8	3	7	1	63	8	8	8	40	50	50	50	9	90	9	70	9	
9	bc	6/0/84	71,73,74,jsf,75	9	4	13	2	68	9	9	9	60	100	60	100	9	80	9	80	8	great improvement since Rob
10	lt		71,73,75	6	1	0	0	53	5	5	9	70	70	40	80	0	0	6	10	8	Nice Work
11	par	6/0/93	71,72,73,74,75	7	2	3	1	58	7	6	7	50	70	40	60	0	0	8	na	7	72 and 75 locking up old equ
12	ff	1/1/1999	na	6	1	0	0	53	2	2	6	20	50	70	70	5	70	8	50	6	
13	ff	3/1/1999	71,72,73,74,75	6	1	0	0	53	6	6	6	10	60	70	70	7	70	7	70	7	
14	admin	0/0/81	all	8	3	7	1	63	8	8	8	90	80	20	80	9	60	9	40	9	
15	admin	na	71,jsf,75	6	1	0	0	53	6	6	6	30	80	60	80	7	60	7	80	7	
16	ff	na	all	6	1	0	0	53	6	6	6	20	70	50	70	8	70	8	70	7	Much improved see details
17	ff	8/10/1998	71,72,73,74,75	5	0	0	0	48	5	5	5	10	na	50	50	6	60	7	0	6	
18	par	0/0/95	71,72,73,74,75	4	-1	2	-1	43	4	4	5	20	50	50	50	4	70	6	70	6	equip. issues, see details
19	ff	8/0/98	all	9	4	13	2	68	9	9	9	na	na	na	na	na	na	9	70	9	applications quite working fre
20	lt	7/0/94	all	5	0	0	0	48	5	5	5	20	10	30	60	8	90	8	80	5	T-1 great for data, training or teleconferencing is a waste
21	eng	########	na	5	0	0	0	48	5	5	5	10	na	na	na	na	na	na	na	5	
22	admin	4/1/1994	71	na					na	na	na	40	na	90	90	8	50	9	90	8	
23	eng	7/5/1994	72,73	3	-2	6	-1	38	3	3	3	10	70	30	50	na	na	4	50	5	
24	ltpar	6/0/89	71,74,75,jsf	6	1	0	0	53	3	5	8	30	50	60	80	8	80	8	100	6	
25	na	3/0/97	71,72,73,74,75	5	0	0	0	48	4	4	4	10	50	50	70	na	na	6	60	6	
26	ff	8/10/1998	na	6	1	0	0	53	6	7	6	10	50	50	50	na	na	7	50	5	not reliable
27	par	1/28/2000	75	3	-2	6	-1	38	2	2	3	20	10	na	20	na	na	6	50	5	faster cpus and bigger monit
28	lt	2/0/95	71,72,73,74,75	4	-1	2	-1	43	2	3	3	20	50	30	50	na	50	7	60	5	system is faster, sunpro need improvement, new equipmen at stations.
29	ff	1/1/1999	75	5	0	0	0	48	7	2	6	10	80	70	80	na	na	7	70	7	faster cpus and bigger monit

30	eng	2/13/1995	71,72,73,74,75	4	-1	2	-1	43	4	4	4	10	50	30	60	na	na	9	50	5	
31	ltpartng	7/13/1987	all	7	2	3	1	58	7	7	8	30	90	30	80	na	na	8	90	8	most problems occur with sta computers
32	parfftngadmin	6/0/89	75	7	2	3	1	58	7	7	7	60	50	20	50	6	60	7	80	na	performance inconsistant bet sites
33	par	8/10/1998	73,74,75	2	-3	11	-2	33	2	2	2	30	50	50	70	7	80	8	80	5	needs to be faster and more at stations
34	ff	8/6/1999	75	5	0	0	0	48	5	2	6	10	80	80	70	na	na	4	70	7	faster cpus and bigger monit
35	ff	8/0/98	75	1	-4	19	-2	28	6	2	1	10	50	30	30	9	100	9	90	5	home network access is a gr option
36	eng	na	75	2	-3	11	-2	33	1	2	2	30	30	40	30	8	100	8	80	6	
37	par	3/1/1999	71,72,73,74,75	4	-1	2	-1	43	4	5	6	20	na	na	na	na	na	9	100	na	
38	eng	8/0/96	71,72,73,74	6	1	0	0	53	7	7	7	10	70	40	70	na	na	8	80	8	
39	lt	6/0/84	all	5	0	0	0	48	6	6	6	30	50	50	70	na	na	6	0	6	
40	fm	5/0/88	jsf	8	3	7	1	63	8	8	8	50	90	50	90	9	90	9	10	8	Abra and great plains are gre
41	fm	7/1/1999	jsf	1	-4	19	-2	28	na	na	na	na	na	na	na	na	na	1	na	1	no experience-too hard to us
42	admin	0/0/83		na					na	na	na	45	na	100	100	9	90	9	100	9	no problems
43	ltparadmin	11/0/85	71,73,jsf	4	-1	2	-1	43	5	5	5	50	na	na	na	5	10	5	10	5	
44	ltpar	6/16/1989	all	4	-1	2	-1	43	3	4	6	40	70	70	na	6	70	6	60	6	keep up the good work, work increase reliability
45	ff	3/0/00	71,72,73,74,75	6	1	0	0	53	6	6	7	10	60	60	70	na	70	7	70	7	
46	eng	6/0/89	71,73,74,75	9	4	13	2	68	na	9	9	30	100	20	90	9	70	9	80	9	speed great, hardware crash
47	admin	6/0/95	71	na					na	na	na	na	na	na	na	9	na	9	na	9	admin improvement is notice
48			Sum		0	165															
49			Mean	5					5	5	6	33	60	49	65	7	66	7	64	7	
50			Median	5					5	5	6	30	58	50	70	8	70	8	70	7	
51			Max	9					9	9	9	90	100	100	100	9	100	9	100	9	
52			Min	1					1	2	1	10	0	0	0	0	0	1	0	1	
53			S.D.	2					2	2	2	22	23	20	21	2	28	2	28	2	
54																					
55			S.D g49/N			4															
56			S.D.=Sq.Rt D56			2															
57																					

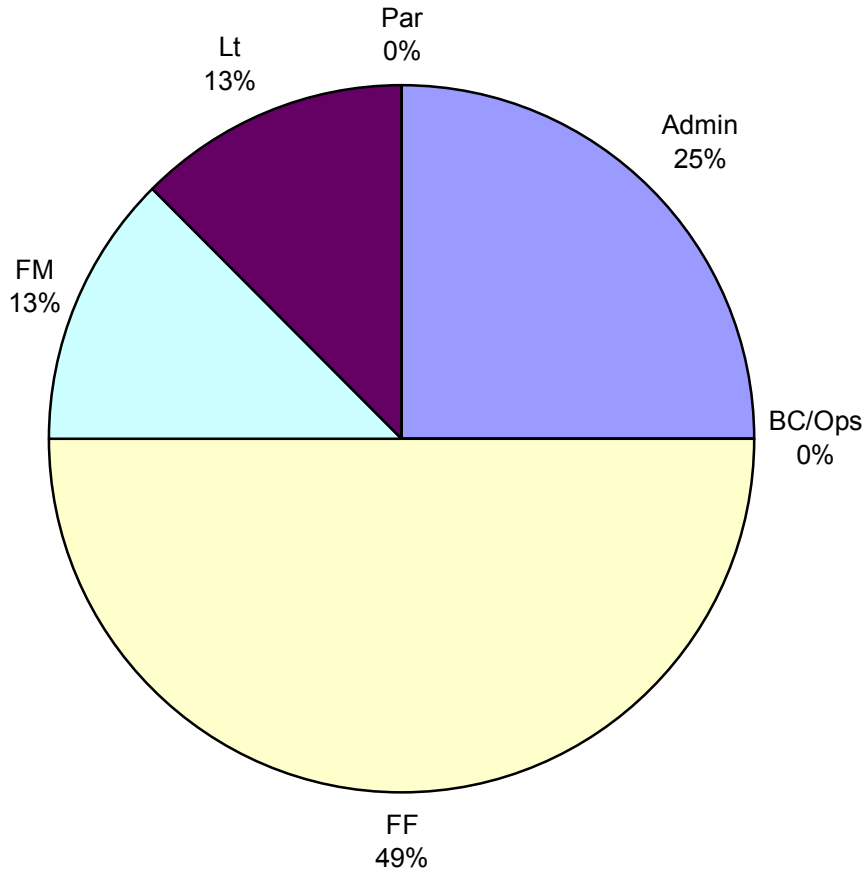
Rate Your Productivity On Your Job Tasks On The Computer Network Before The New System Became Operational - All Job Classifications.



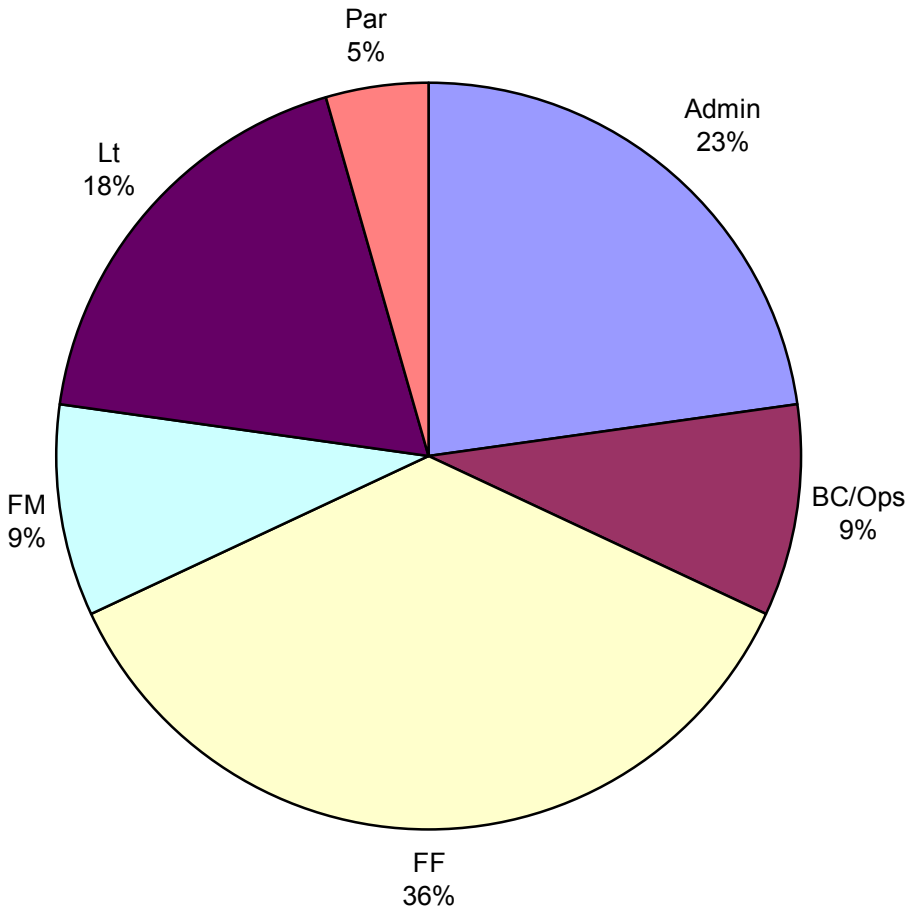
Rate Your Productivity On Your Job Tasks On The Computer Network Since The New System Became Operational - All Job Classifications.



61-100% Rating Of Computer Work Productivity Before The New System By Job Classification



61-100% Rating Of Computer Work Productivity Since The New System By Job Classification



Questions 1g and 1h%

AutoNO	DIVISION	DOHire	USE Location	1g	1h
32	parfftngadmin	6/0/89	75	20	50
37	par	3/1/1999	71,72,73,74,75	na	na
33	par	8/10/1998	73,74,75	50	70
11	par	6/0/93	71,72,73,74,75	40	60
18	par	0/0/95	71,72,73,74,75	50	50
27	par	1/28/2000	75	na	20
6	OPS	0/0/83	jsf-75	40	90
25	na	3/0/97	71,72,73,74,75	na	na
31	ltpartng	7/13/1987	all	30	80
43	ltparadmin	11/0/85	71,73,jsf	na	na
44	ltpar	6/16/1989	all	na	na
24	ltpar	6/0/89	71,74,75,jsf	60	80
10	lt		71,73,75	40	80
39	lt	6/0/84	all	50	70
20	lt	7/0/94	all	30	60
28	lt	2/0/95	71,72,73,74,75	30	50
41	fm	7/1/1999	jsf	na	na
40	fm	5/0/88	jsf	50	90
1	fm		jsf	70	70
21	ff/eng	12/31/1996	na	na	na
46	ff/eng	6/0/89	71,73,74,75	20	90
38	ff/eng	8/0/96	71,72,73,74	40	70
30	ff/eng	2/13/1995	71,72,73,74,75	30	60
23	ff/eng	7/5/1994	72,73	30	50
36	ff/eng	na	75	40	30
19	ff	8/0/98	all	na	na
29	ff	1/1/1999	75	70	80
34	ff	8/6/1999	75	80	70
12	ff	1/1/1999	na	70	70
13	ff	3/1/1999	71,72,73,74,75	70	70
45	ff	3/0/00	71,72,73,74,75	60	70
16	ff	na	all	50	70

1g	Admin	BC/Ops	FF	FM	Lt	Par	Totals
61-100%	5.13%	0.00%	10.26%	2.56%	2.56%	0.00%	0.205128
31-60%	5	3	6	1	3	3	21
0-30%	2	0	4	0	3	1	10
TOTALS	7.051282	3	10.10256	1.02564103	6.025641	4	31.20513

1h	Admin	BC/Ops	FF	FM	Lt	Par	Totals
61-100%	12.82%	5.13%	20.51%	5.13%	10.26%	2.56%	0.564103
31-60%	3	1	4	0	2	3	13
0-30%	1	0	2	0	0	1	4
TOTALS	4.128205	1.051282	6.205128	0.05128205	2.102564	4.025641	17.5641

1g	N	%
61-100%	8	20.51%
31-60%	22	56.41%
0-30%	9	23.08%
TOTALS	39	100.00%

Improvement after the changes in the 61-100% category

35.90%

1h	N	
61-100%	22	56.41%
31-60%	13	33.33%
0-30%	4	10.26%
TOTALS	39	100.00%

17	ff	8/10/1998	71,72,73,74,75	50	50
26	ff	8/10/1998	na	50	50
35	ff	8/0/98	75	30	30
9	bc	6/0/84	71,73,74,jsf,75	60	100
7	bc	0/0/84	all	60	60
47	admin	6/0/95	71	na	na
42	admin	0/0/83		100	100
22	admin	4/1/1994	71	90	90
15	admin	na	71,jsf,75	60	80
14	admin	0/0/81	all	20	80
3	admin		71	50	70
2	admin	7/0/99	71	60	60
5	admin	3/0/98	71	50	50
8	admin	8/0/83	71-home-ootown	50	50
4	admin	8/0/84	71	0	0
48					
49			Mean	46	63
50			Median	50	70
51			Max	100	100
52			Min	0	0
53			N	39	39

Questions 1g and H T-Test

AutoNO	DIVISION	DOHire	USE Location	1a	N-M	(n-m)(n-m)	z=N-mean/S.D.	T=10(z)+50	1g	Score - Mean	1gx1g	1h	1hx1h
1	fm		jsf	5	0	0	0	48	70	19	4900	70	4900
2	admin	7/0/99	71	na					60	9	3600	60	3600
3	admin		71	na					50	-1	2500	70	4900
4	admin	8/0/84	71	na									
5	admin	3/0/98	71	na					50	-1	2500	50	2500
6	OPS	0/0/83	jsf-75	8	3	7	1	63	40	-11	1600	90	8100
7	bc	0/0/84	all	4	-1	2	-1	43	60	9	3600	60	3600
8	admin	8/0/83	71-home-ootown	8	3	7	1	63	50	-1	2500	50	2500
9	bc	6/0/84	71,73,74,jsf,75	9	4	13	2	68	60	9	3600	100	10000
10	lt		71,73,75	6	1	0	0	53	40	-11	1600	80	6400
11	par	6/0/93	71,72,73,74,75	7	2	3	1	58	40	-11	1600	60	3600
12	ff	1/1/1999	na	6	1	0	0	53	70	19	4900	70	4900
13	ff	3/1/1999	71,72,73,74,75	6	1	0	0	53	70	19	4900	70	4900
14	admin	0/0/81	all	8	3	7	1	63	20	-31	400	80	6400
15	admin	na	71,jsf,75	6	1	0	0	53	60	9	3600	80	6400
16	ff	na	all	6	1	0	0	53	50	-1	2500	70	4900
17	ff	8/10/1998	71,72,73,74,75	5	0	0	0	48	50	-1	2500	50	2500
18	par	0/0/95	71,72,73,74,75	4	-1	2	-1	43	50	-1	2500	50	2500
19	ff	8/0/98	all	9	4	13	2	68					
20	lt	7/0/94	all	5	0	0	0	48	30	-21	900	60	3600
21	eng	12/31/1996	na	5	0	0	0	48					
22	admin	4/1/1994	71	na					90		8100	90	8100
23	eng	7/5/1994	72,73	3	-2	6	-1	38	30	-21	900	50	2500
24	ltpar	6/0/89	71,74,75,jsf	6	1	0	0	53	60	9	3600	80	6400
25	na	3/0/97	71,72,73,74,75	5	0	0	0	48	50	-1	2500	70	4900

26	ff	8/10/1998	na	6	1	0	0	53	50	-1	2500	50	2500
27	par	1/28/2000	75	3	-2	6	-1	38				20	400
28	lt	2/0/95	71,72,73,74,75	4	-1	2	-1	43	30	-21	900	50	2500
29	ff	1/1/1999	75	5	0	0	0	48	70	19	4900	80	6400
30	eng	2/13/1995	71,72,73,74,75	4	-1	2	-1	43	30	-21	900	60	3600
31	ltpartng	7/13/1987	all	7	2	3	1	58	30	-21	900	80	6400
32	parfftngadmin	6/0/89	75	7	2	3	1	58	20	-31	400	50	2500
33	par	8/10/1998	73,74,75	2	-3	11	-2	33	50	-1	2500	70	4900
34	ff	8/6/1999	75	5	0	0	0	48	80	29	6400	70	4900
35	ff	8/0/98	75	1	-4	19	-2	28	30	-21	900	30	900
36	eng	na	75	2	-3	11	-2	33	40	-11	1600	30	900
37	par	3/1/1999	71,72,73,74,75	4	-1	2	-1	43			0		
38	eng	8/0/96	71,72,73,74	6	1	0	0	53	40	-11	1600	70	4900
39	lt	6/0/84	all	5	0	0	0	48	50	-1	2500	70	4900
40	fm	5/0/88	jsf	8	3	7	1	63	50	-1	2500	90	8100
41	fm	7/1/1999	jsf	1	-4	19	-2	28					
42	admin	0/0/83		na					100	49	10000	100	10000
43	ltparadmin	11/0/85	71,73,jsf	4	-1	2	-1	43					
44	ltpar	6/16/1989	all	4	-1	2	-1	43	70	19	4900		
45	ff	3/0/00	71,72,73,74,75	6	1	0	0	53	60	9	3600	70	4900
46	eng	6/0/89	71,73,74,75	9	4	13	2	68	20	-31	400	90	8100
47	admin	6/0/95	71	na									
48			Sum		0	165			1970	-58	112700	2590	184900
49			Mean	5					51			66	
50			Median	5					50			70	
51			Max	9					100			100	

52	Min	1				20			20	
53	S.D.	2				304			18	
		4								
54	N	0				39			39	
55	S.D g49/N		4							
56	S.D.=Sq.Rt D56		2							
57				S.D. squared=(n1-1)Ssquared+(n2-1)S2 squared/n1-n2-2						
58				**$S=sum(score-mean)^2/N$**		67				
59										
60				**$S^2=N*sumX^2-(sumX)^2/N^2$**	**1g**	**59280 0**		**1h**	**50300 0**	
61										
62				**$S^2_p=[(n_1-1)S^2_1+(n_2-1)S^2_{2]}/n_1+n_2-2$**			**56270 8**			
				S_{x1-x2}		SRof	28857		170	
				$t_{obt}=(meanx1-meanx2)/S_{x1-x2}$			- 0.088			

Two-Tailed Test for Non-Independent Matched Sample T_{obt}

AutoNO	DIVISION	DOHire	USE Location	1a	N-M	(n-m) (n-m)	z=N-mean /S.D.	T=10(z)+50	1g	1h	1h-1g=D	D^2
1	fm		jsf	5	0	0	0	48	70	70	0	0
2	admin	7/0/99	71	na					60	60	0	0
3	admin		71	na					50	70	20	400
4	admin	8/0/84	71	na								
5	admin	3/0/98	71	na					50	50	0	0
6	OPS	0/0/83	jsf-75	8	3	7	1	63	40	90	50	2500
7	bc	0/0/84	all	4	-1	2	-1	43	60	60	0	0
8	admin	8/0/83	71-home-ootown	8	3	7	1	63	50	50	0	0
9	bc	6/0/84	71,73,74,jsf,75	9	4	13	2	68	60	100	40	1600
10	lt		71,73,75	6	1	0	0	53	40	80	40	1600
11	par	6/0/93	71,72,73,74,75	7	2	3	1	58	40	60	20	400
12	ff	1/1/1999	na	6	1	0	0	53	70	70	0	0
13	ff	3/1/1999	71,72,73,74,75	6	1	0	0	53	70	70	0	0
14	admin	0/0/81	all	8	3	7	1	63	20	80	60	3600
15	admin	na	71,jsf,75	6	1	0	0	53	60	80	20	400
16	ff	na	all	6	1	0	0	53	50	70	20	400
17	ff	8/10/1998	71,72,73,74,75	5	0	0	0	48	50	50	0	0
18	par	0/0/95	71,72,73,74,75	4	-1	2	-1	43	50	50	0	0
19	ff	8/0/98	all	9	4	13	2	68				
20	lt	7/0/94	all	5	0	0	0	48	30	60	30	900
21	eng	12/31/1996	na	5	0	0	0	48			0	
22	admin	4/1/1994	71	na					90	90	0	0
23	eng	7/5/1994	72,73	3	-2	6	-1	38	30	50	20	400
24	ltpar	6/0/89	71,74,75,jsf	6	1	0	0	53	60	80	20	400
25	na	3/0/97	71,72,73,74,75	5	0	0	0	48	50	70	20	400
26	ff	8/10/1998	na	6	1	0	0	53	50	50	0	0
27	par	1/28/2000	75	3	-2	6	-1	38				
28	lt	2/0/95	71,72,73,74,75	4	-1	2	-1	43	30	50	20	400
29	ff	1/1/1999	75	5	0	0	0	48	70	80	10	100
30	eng	2/13/1995	71,72,73,74,75	4	-1	2	-1	43	30	60	30	900
31	ltpartng	7/13/1987	all	7	2	3	1	58	30	80	50	2500
32	parfftngadmin	6/0/89	75	7	2	3	1	58	20	50	30	900
33	par	8/10/1998	73,74,75	2	-3	11	-2	33	50	70	20	400
34	ff	8/6/1999	75	5	0	0	0	48	80	70	-10	100

35	ff	8/0/98	75	1	-4	19	-2	28	30	30	0	0
36	eng	na	75	2	-3	11	-2	33	40	30	-10	100
37	par	3/1/1999	71,72,73,74,75	4	-1	2	-1	43				
38	eng	8/0/96	71,72,73,74	6	1	0	0	53	40	70	30	900
39	lt	6/0/84	all	5	0	0	0	48	50	70	20	400
40	fm	5/0/88	jsf	8	3	7	1	63	50	90	40	1600
41	fm	7/1/1999	jsf	1	-4	19	-2	28				
42	admin	0/0/83		na					100	100	0	0
43	ltparadmin	11/0/85	71,73,jsf	4	-1	2	-1	43			0	
44	ltpar	6/16/1989	all	4	-1	2	-1	43	70		-70	4900
45	ff	3/0/00	71,72,73,74,75	6	1	0	0	53	60	70	10	100
46	eng	6/0/89	71,73,74,75	9	4	13	2	68	20	90	70	4900
47	admin	6/0/95	71	na								
48			Sum		0	165			1970	2570	600	31200
49			Mean	5					51	66	15.38	
50			Median	5					50	70		
51			Max	9					1970	100		
52			Min	1					20	30		
53			S.D.	2					304	17		
54			N						39	39		
55			S.D g49/N			4						
56			S.D.=Sq.Rt D56			2						
57								S.D. squared=(n1-1)Ssquared+(n2-1)S2 squared/n1-n2-2				
58												
59												856800.00
60												57798.00
61												14.82
62												3.85

Two tailed Non-Independant Match Sample T_{obt}		**3.85**
T_{obt}=Mean D/Sq. Root of N(sumD^2-(SumD)^2/N^2(N-1)	**T_{crit}** **df=38 where df=N-1**	**2.010**
	$T_{obt} > T_{crit}$ positive result	

Chi Square Questions 3a and 3b

AutoNO	DIVISION	DOHire	USE Location	3a	3b	Comments
2	admin	7/0/99	71	90	8	
3	admin		71	80	7	
4	admin	8/0/84	71	80	7	
5	admin	3/0/98	71	90	8	
8	admin	8/0/83	71-home-ootown	70	9	
14	admin	0/0/81	all	40	9	
15	admin	na	71,jsf,75	80	7	
22	admin	4/1/1994	71	90	8	
				10		no problems
42	admin	0/0/83		0	9	
47	admin	6/0/95	71	na	9	admin improvement is noticeable
7	bc	0/0/84	all	0	5	setup variation between sites, ability to add screen savers, programs by site
9	bc	6/0/84	71,73,74,jsf,75	80	8	great improvement since Rob's hire
21	eng	12/31/1996	na	na	5	
23	eng	7/5/1994	72,73	50	5	
30	eng	2/13/1995	71,72,73,74,75	50	5	
36	eng	na	75	80	6	
38	eng	8/0/96	71,72,73,74	80	8	
46	eng	6/0/89	71,73,74,75	80	9	speed great, hardware crashes.
12	ff	1/1/1999	na	50	6	
13	ff	3/1/1999	71,72,73,74,75	70	7	
16	ff	na	all	70	7	Much improved see details
17	ff	8/10/1998	71,72,73,74,75	0	6	
19	ff	8/0/98	all	70	9	applications quite working frequently
26	ff	8/10/1998	na	50	5	not reliable
29	ff	1/1/1999	75	70	7	faster cpus and bigger monitors
34	ff	8/6/1999	75	70	7	faster cpus and bigger monitors
35	ff	8/0/98	75	90	5	home network access is a great option
45	ff	3/0/00	71,72,73,74,75	70	7	
1	fm		jsf	70	6	Sometimes real slow & informix login not there
40	fm	5/0/88	jsf	10	8	Abra and great plains are great.

41	fm	7/1/1999	jsf	na	1	no experience-too hard to use
10	lt		71,73,75	10	8	Nice Work
20	lt	7/0/94	all	80	5	T-1 great for data, training on teleconferencing is a waste
28	lt	2/0/95	71,72,73,74,75	60	5	system is faster, sunpro needs improvement, new equipment needed at stations.
39	lt	6/0/84	all	0	6	
24	ltpar	6/0/89	71,74,75,jsf	10 0	6	
44	ltpar	6/16/1989	all	60	6	keep up the good work, work to increase reliability
43	ltparadmin	11/0/85	71,73,jsf	10	5	
31	ltpartng	7/13/1987	all	90	8	most problems occur with station computers
25	na	3/0/97	71,72,73,74,75	60	6	
6	OPS	0/0/83	jsf-75	60	7	Internet down frequently, when up-great
11	par	6/0/93	71,72,73,74,75	na	7	72 and 75 locking up old equipment
18	par	0/0/95	71,72,73,74,75	70	6	equip. issues, see details
27	par	1/28/2000	75	50	5	faster cpus and bigger monitors
33	par	8/10/1998	73,74,75	80	5	needs to be faster and more reliable at stations
37	par	3/1/1999	71,72,73,74,75	10 0	a	
32	parfftngadmin	6/0/89	75	80	na	performance inconsistant between sites

Chi-Square Question 3a

AutoNO	DIVISION	DOHire	USE Location	3a	Comments
2	admin	6/0/95	71	na	admin improvement is noticeable
				10	no problems
3	admin	0/0/83		0	
4	admin	7/0/99	71	90	
5	admin	3/0/98	71	90	
8	admin	4/1/1994	71	90	
14	admin		71	80	
15	admin	8/0/84	71	80	
22	admin	na	71,jsf,75	80	
42	admin	8/0/83	71-home-town	70	
47	admin	0/0/81	all	40	
7	bc/ops	6/0/84	71,73,74,jsf,75	80	great improvement since Rob's hire
9	bc/ops	0/0/83	jsf-75	60	Internet down frequently, when up-great setup variation between sites, ability to add screen savers, programs by site
6	bc/ops	0/0/84	all	0	
21	ff/eng	12/31/1996	na	na	

0 to 30, 31 to 60, 61 to 100

	Admin f_o/f_e	BC/Ops	FF	FM	Lt	Par	Totals
61-100%	8	1	10	1	3	4	27
31-60%	1	1	4	0	2	1	9
0-30%	0	1	1	1	3	0	6
TOTALS	9	3	15	2	8	5	42

	Admin fo/fe	BC/Ops	FF	FM	Lt	Par	Totals
61-100%	8	1	10	1	3	4	27
31-60%	1	1	4	0	2	1	9
0-30%	0	1	1	1	3	0	6
TOTALS	9	3	15	2	8	5	42

	f_e	f_e	f_e	f_e	f_e	f_e	f_e
61-100%	5.785714	1.928571	9.642857	1.285714	5.142857	3.2143	
31-60%	1.928571	0.642857	3.214286	0.428571	1.714286	1.0714	
0-30%	1.285714	0.428571	2.142857	0.285714	1.142857	0.7143	
TOTALS							

$X^2=(f_o-f_e)^2/f_e$

23	ff	8/0/98	75	90	home network access is a great option
30	ff/eng	na	75	80	
36	ff/eng	8/0/96	71,72,73,74	80	
38	ff/eng	6/0/89	71,73,74,75	80	speed great, hardware crashes.
46	ff	3/1/1999	71,72,73,74,75	70	
12	ff	na	all	70	Much improved see details
13	ff	8/0/98	all	70	applications quite working frequently
16	ff	1/1/1999	75	70	faster cpus and bigger monitors
17	ff	8/6/1999	75	70	faster cpus and bigger monitors
19	ff	3/0/00	71,72,73,74,75	70	
26	ff	1/1/1999	na	50	
29	ff	8/10/1998	na	50	not reliable
34	ff/eng	7/5/1994	72,73	50	
35	ff/eng	2/13/1995	71,72,73,74,75	50	
45	ff	8/10/1998	71,72,73,74,75	0	
1	fm		jsf	70	Sometimes real slow & informix login not there Abra and great plains are great.
40	fm	5/0/88	jsf	10	
41	fm	7/1/1999	jsf	na	no experience-too hard to use
10	ltpar	6/0/89	71,74,75,jsf	100	
20	ltpartng	7/13/1987	all	90	most problems occur with station

61-100%	0.847443	0.44709	0.01322	0.06349	0.89285	0.1921	
31-60%	0.44709	0.19841	0.19206	0.42857	0.04761	0.0048	
0-30%	1.285714	0.7619	0.60952	1.78571	3.01785	0.7143	
TOTALS	2.580247	1.40741	0.81481	2.27777	3.95833	0.9111	11.94969

Observed Value of X^2=11.94969

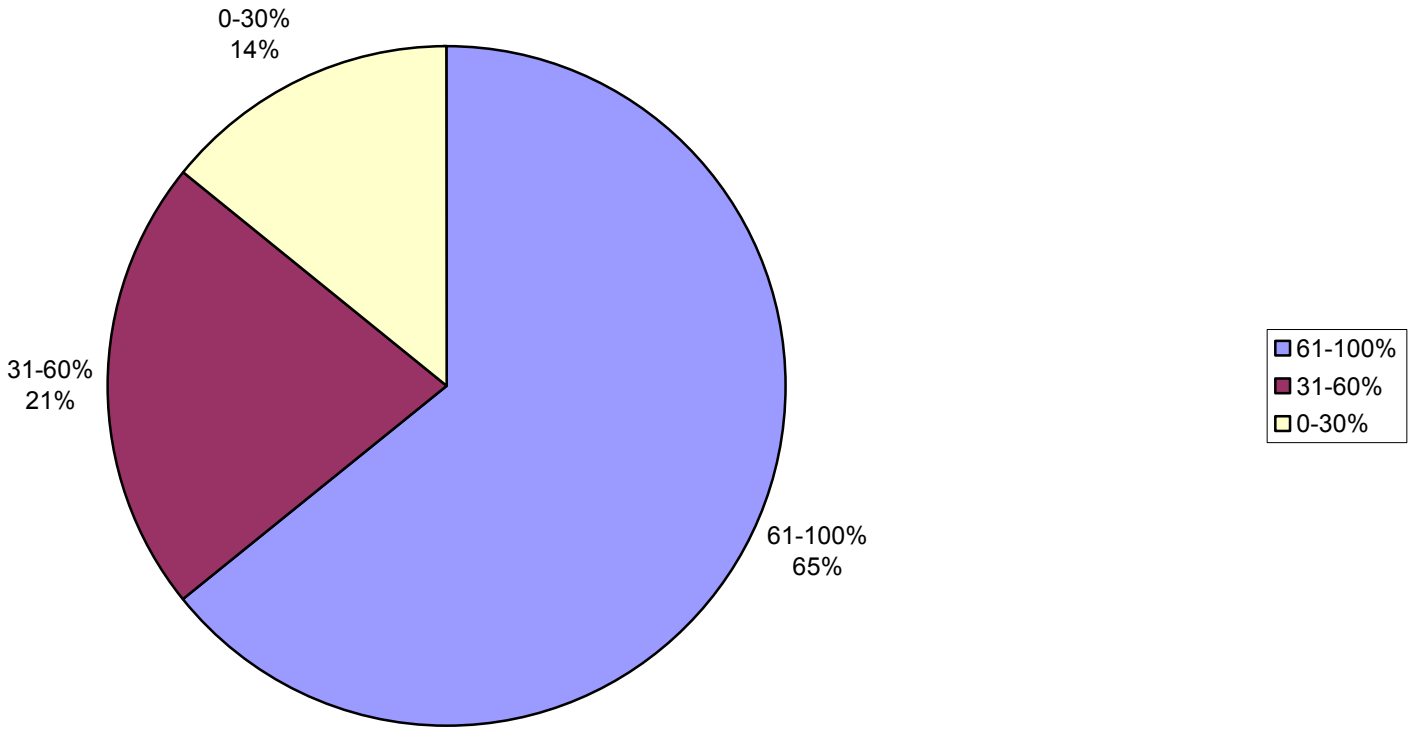
df=(r-1)(c-1) df=(3-1)(6-1) df=10

Critical Value of Chi Square with df = 10 is 18.31 at .05.

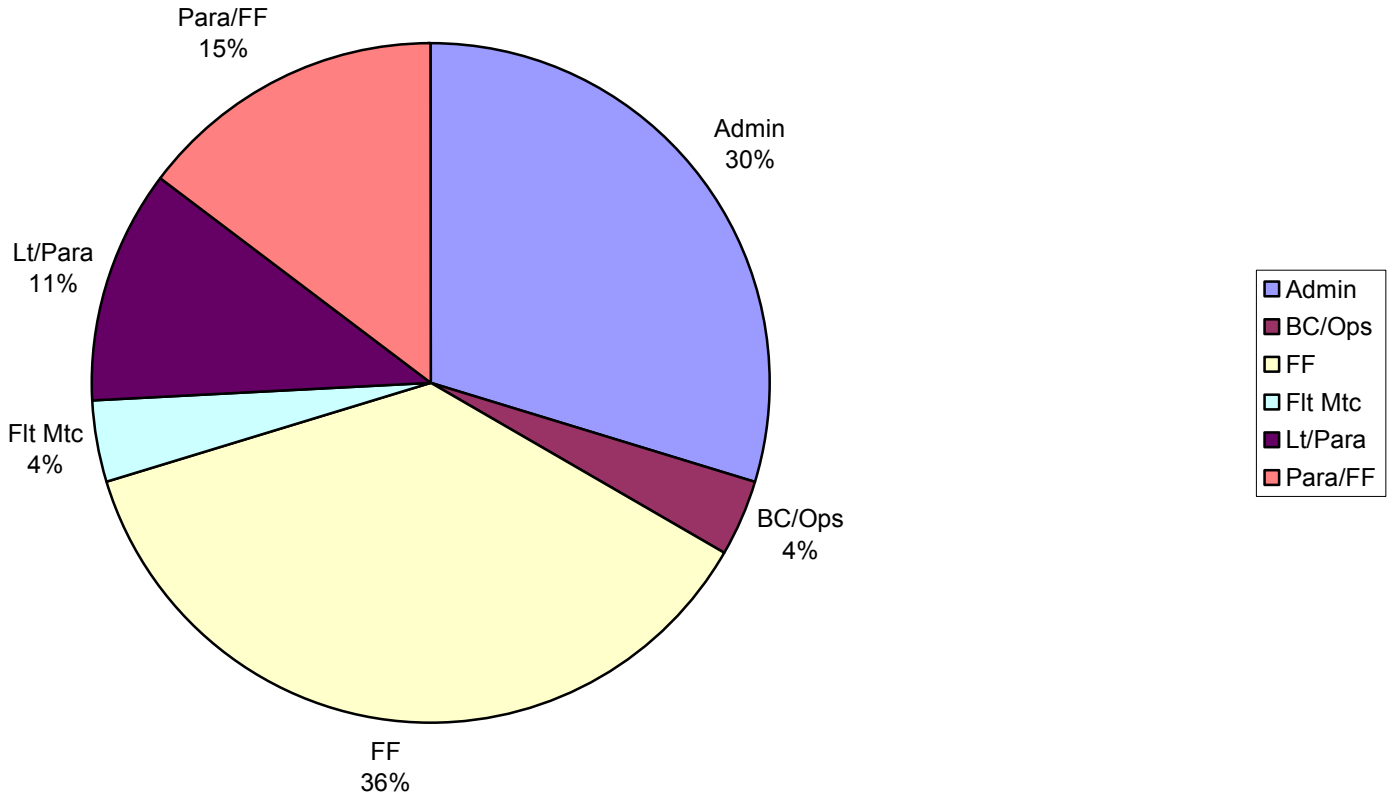
Critical Value of Chi Square with df = 10 is 23.21 at .01. Observed value of Chi Square is less than the critical values of Chi Square, therefore there is a significant difference by occupation for impact of Internet access on job related productivity.

					computers
28	lt	7/0/94	all	80	T-1 great for data, training on teleconferencing is a waste
39	lt	2/0/95	71,72,73,74,75	60	system is faster, sunpro needs improvement, new equipment needed at stations.
24	ltpar	6/16/1989	all	60	keep up the good work, work to increase reliability
44	lt		71,73,75	10	Nice Work
43	ltparadmin	11/0/85	71,73,jsf	10	
31	lt	6/0/84	all	0	
25	na	3/0/97	71,72,73,74,75	60	
11	par	6/0/93	71,72,73,74,75	na	72 and 75 locking up old equipment
18	par	3/1/1999	71,72,73,74,75	10 0	
27	par	8/10/1998	73,74,75	80	needs to be faster and more reliable at stations
33	parfftngadmin	6/0/89	75	80	performance inconsistant between sites
37	par	0/0/95	71,72,73,74,75	70	equip. issues, see details
32	par	1/28/2000	75	50	faster cpus and bigger monitors

Employee Increase In Productivity Rating After Internet Access Was Provided At Work



A 61-100% Increase In Work Productivity After Internet Provision As Reported By Occupation



Question 3a Observed Value of X^2

0 to 30, 31 to 60, 61 to 100

	Admin f_o/f_e	BC/Ops	FF	FM	Lt	Par	Totals
61-100%	8	1	10	1	3	4	27
31-60%	1	1	4	0	2	1	9
0-30%	0	1	1	1	3	0	6
TOTALS	9	3	15	2	8	5	42

	Admin	BC/Ops	FF	Flt Mtc	Lt/Para	Para/FF	Totals
61-100%	19%	2%	24%	2%	7%	10%	64%
31-60%	2%	2%	10%	0%	5%	2%	21%
0-30%	0%	2%	2%	2%	7%	0%	14%
TOTALS							100%

***Observed Value of X^2*=11.94969**

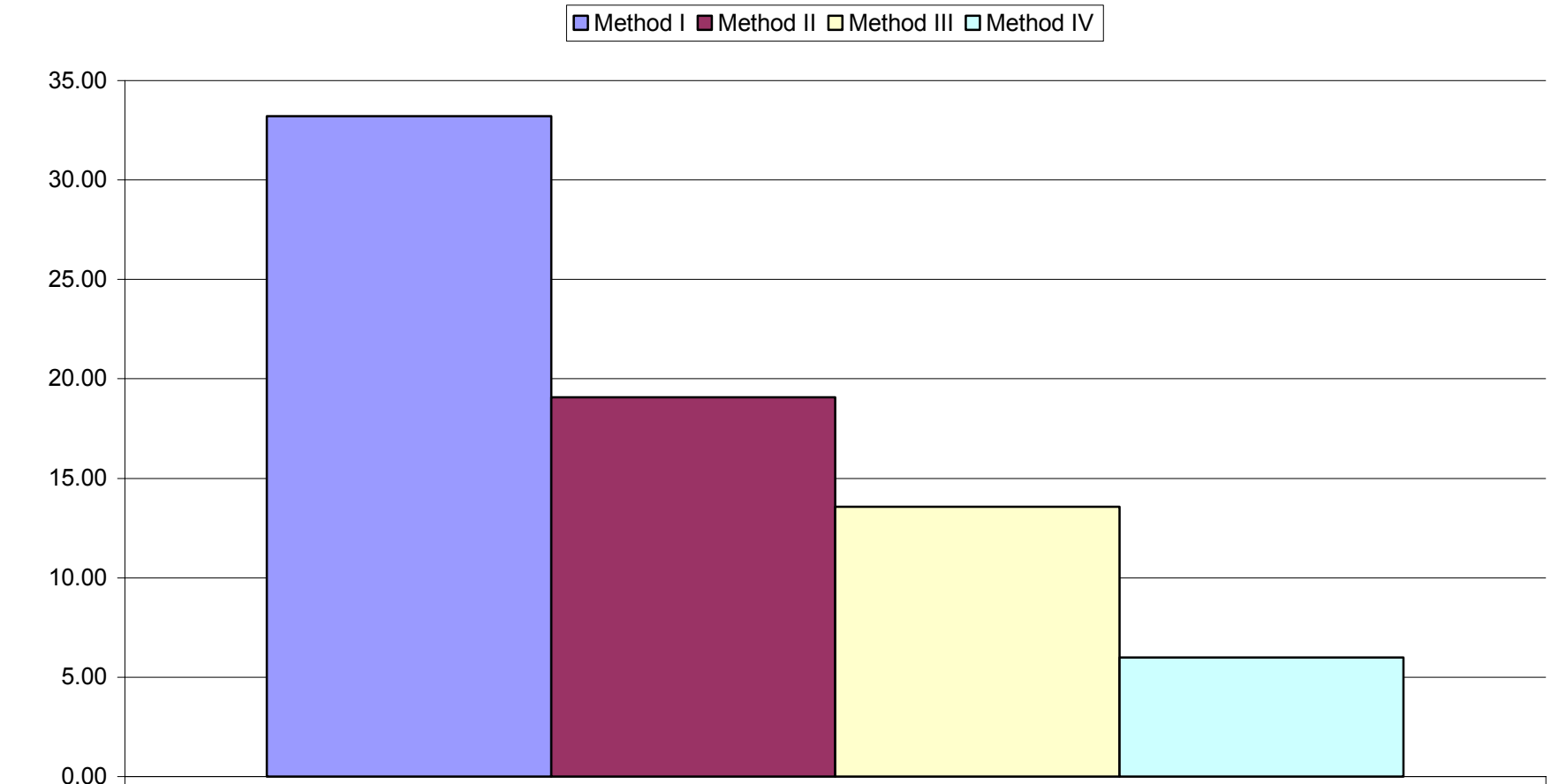
df=(r-1)(c-1) df=(3-1)(6-1) df=10

Critical Value of Chi Square with df = 10 is 18.31 at .05.

Critical Value of Chi Square with df = 10 is 23.21 at .01.

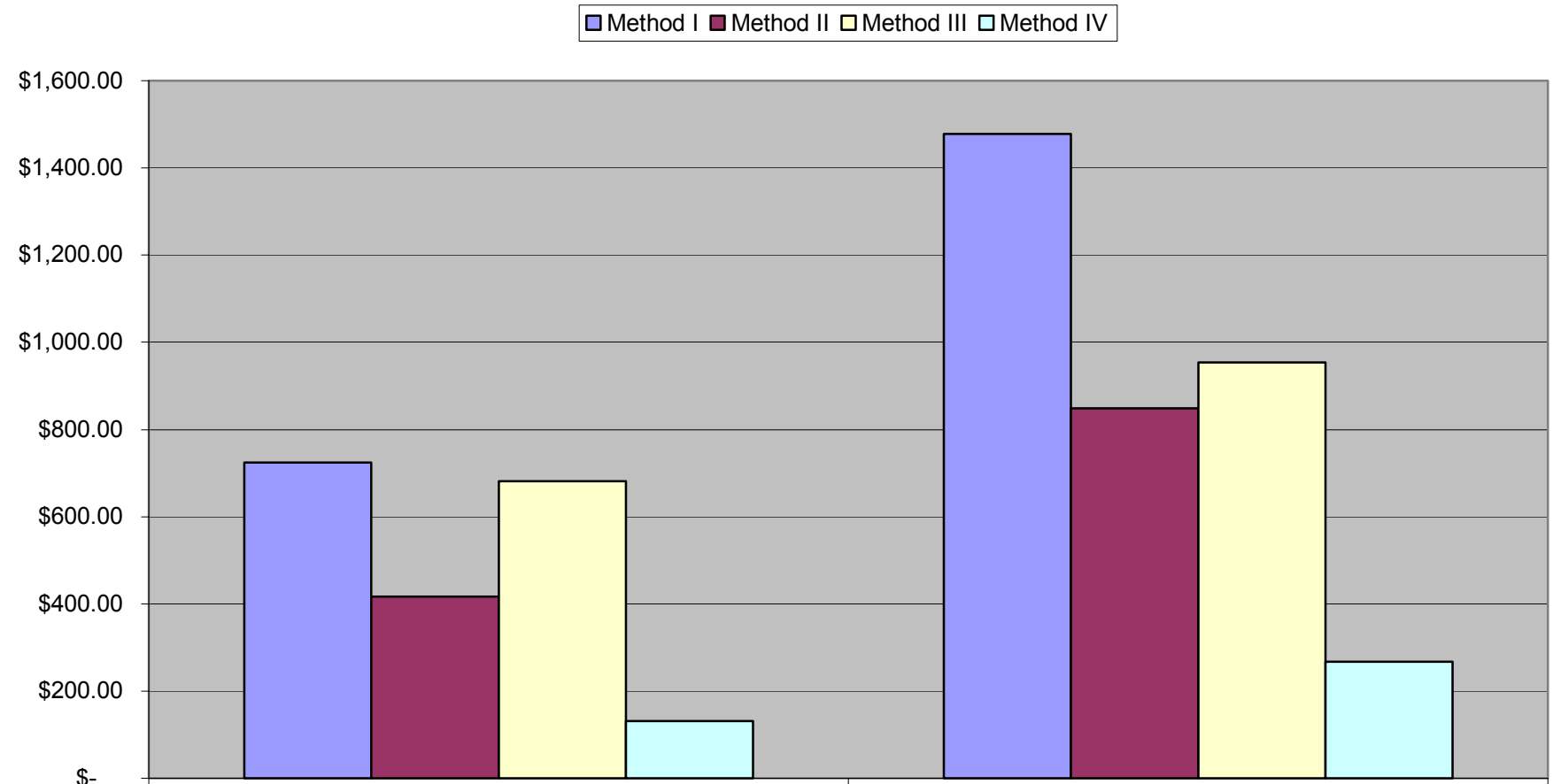
Observed value of Chi Square is less than the critical values of Chi Square, therefore there is a significant difference by occupation for impact of Internet access on job related productivity.

Time vs. Method of Presentation Delivery



	Total Time- Hrs.
Method I	33.22
Method II	19.07
Method III	13.57
Method IV	6

Cost of Presentation (Salary Range: Firefighter OT-Chief) and Cover Engine For Method III



	Salary-FF Presenter & Cover Eng.	Salary-Chief Presenter & Cover Eng.
Method I	$724.53	$1,477.96
Method II	$415.99	$848.57
Method III	$681.72	$953.88
Method IV	$130.86	$266.94

Time and Mileage

Travel Distance and Time Between Fire Stations and the Joint Service Facility

	Distance	Travel Time at Speed Limit Less Traffic Light Wait Time One Way	
	Miles	Minutes	
Station 71	0	0	
Station 72	5.1	7.02	
Station 73	7.2	15.62	
Station 74	5.2	7.04	
Station 75	3.1	4.52	
Average Travel Time 1-Way		34.2	

Cover Engine Cost is $75/hour

Staff Cost	
FF OT Aver	$ 21.81
PARA OT Aver	$ 24.86
Bat.Chief	$ 25.22
Div.Chief	$ 38.27
Chief	$ 44.49

	Method I	Method II	Method III	Method IV
Travel Time Cover Eng. Hrs.	0	0	0.78	0
Travel Time Presenter/Crew(hrs)	3.22	1.07	0.78	0
Presentation Time (2hr)	30	18	12	6
Total Time- Hrs.	33.22	19.07	13.57	6
FF OT-Presenter	$ 724.53	$ 415.99	$ 261.72	$ 130.86
Cover Crew $75/hr			$ 420.00	
Salary-Cover Eng. & Presenter	$ 724.53	$ 415.99	$ 681.72	$ 130.86

	Method I	Method II	Method III	Method IV	
Total Time- Hrs.	33.22	19.07	13.57	6	71.86
	46%	27%	19%	8%	100%
	5.53666667				

	Method I	Method II	Method III	Method IV
Travel Time Cover Eng. Hrs.	0	0	0.78	0
Travel Time Presenter/Crew(hrs)	3.22	1.07	0.78	0

Presentation Time (2hr)	30	18	12	6
Total Time- Hrs.	33.22	19.07	13.57	6
Chief Wage-Presenter	$ 1,477.96	$ 848.57	$ 533.88	$ 266.94
Cover Crew $75/hr			$ 420.00	
Salary-Cover Eng. & Presenter	$ 1,477.96	$ 848.57	$ 953.88	$ 266.94

	Method I	**Method II**	**Method III**	**Method IV**
Salary-FF Presenter & Cover Eng.	$ 724.53	$ 415.99	$ 681.72	$ 130.86
Salary-Chief Presenter & Cover Eng.	$ 1,477.96	$ 848.57	$ 953.88	$ 266.94
	5.53668042			
	5.53667491			