TRAINING NEEDS ASSESSMENT OF THE COPPER ENGINEERING GROUP AT ADC

by
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ABSTRACT

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While the telecommunications industry rapidly expands, so too have the Engineering Divisions of ADC. As the Engineering Divisions maintain pace with the demands of the telecommunications industry, ADC needs to look at developing training methods to deliver effective training and learner solutions. The scope and purpose of this study is to determine the overall technical knowledge of the Copper Engineering group in the core areas of organizational quality practices (ISO/TL 9000), engineering documentation, product development practices, and product testing practices. The analysis was used to measure strengths and weaknesses of the current training program, measure employee

training satisfaction, identify training gaps, and assist management in making decisions about training direction of its people.

The importance of this research project is to provide the Copper Engineering mangement a baseline to make decisions about training direction of its people and prioritize the curriculum development efforts. The data was presented to Copper Engineering management along with recommendations for the future training initiatives.

Of the core areas studied, the data presented in this paper identifies the weaknesses where training should be improved or implemented within the Copper Engineering Group at ADC. The current program places significant emphasis on processes and tools in various technical areas that are critical to the performance of the Copper engineering division. Therefore, it is necessary to identify subject matter experts in the core areas to continually identify training needs as they arise and provide them the support to develop and deliver learning experiences to the engineering community on a continuous basis. The researcher suggests to consider the findings presented in this research and conduct separate assessments of the weakest topics to determine what part of the population is affected, and form curriculum teams to focus on their respective training issues. Not only would these teams identify formal training opportunities but also identify the informal training opportunities like OJT. By reading the written comments, it is apparent that OJT is a prevalent learning tool within the engineering community. It is important that a strategy is identified, and a consistent format be developed and implemented for this learning method to be effective.

To support transfer of learning, a repository of released training materials needs to be developed and centralized so that people can reference the materials on-line when a review is necessary. The training materials database would require a check-in and check-out functionality to ensure the most current materials are available.

ACKNOWLEDGEMENTS

I would like to take this opportunity and thank the Copper Engineering Management Team at ADC and my supervisor, Paul Anderson, for giving me the opportunity to make this study a success. I would also like to thank Dr. Joseph Benkowski for his efforts over the years in helping me complete my degree as a working adult who commuted to classes from the Twin Cities area. Finally, I would like to recognize my parents and family for their support who helped me stay focused on completing my degree.

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CHAPTER 1

Statement of the Problem

Introduction

Knowledge is a global asset and access to information is the key to staying competitive. Now more than ever, organizations rely on people to continually learn new skills, craft innovative solutions to changing circumstances, stay informed and remain responsive to changes in technology that affect the way people perform their jobs. The Copper Engineering Group at ADC, recognizes this as an opportunity to stay competitive in today's telecommunications industry by continually improving and educating its people about engineering processes, procedures, systems and tools. Learning is an integral part of meeting the goals and objectives of the organization and it is the "ADC Way."

ADC is "The Broadband Company™" (ADC, 2000). ADC's fiber optics, network equipment, software and integration services make broadband communications a reality worldwide by enabling communications service providers to deliver high-speed Internet, data, video, and voice services to consumers and businesses. ADC customers include local and long distance telephone companies, cable television operators, Internet/data communications providers, wireless service providers, private network operators and broadcast television operators.

Today, there are hundreds of thousands of independent networks throughout the world. Each of these networks interacts or "internetworks" with others for people to communicate and conduct commerce. Connecting this world of networks is the mission of ADC's Broadband Infrastructure and Access group (ADC Telecommunications, 2000).

Delivering Internet/data, video and voice services to homes and businesses involves extensive highways of fiber, copper, and coax cables. Like any highway system, there are junctions and connection points linking one network to another. Establishing and managing these connections points and cables, while ensuring their level of performance, can be time consuming and costly for a communications provider (ADC Telecommunications, 2000).

From the end of 1997 through 1999, new service providers in the U.S. increased access lines to residences and businesses by 250%. The success of new service providers is resulting in competitive responses from incumbent providers of Internet/data, video and voice services to retain and win customers. ADC benefits from deregulation as a result of our strategic focus on supplying broadband, multiservice network solutions to all types of service providers – incumbents and new entrants – around the globe (ADC Telecommunications, 2000).

With an Internet host created every four seconds and e-commerce sales expected to grow 75% annually over the next five years, the world is in the early stages of a new frontier of tremendous opportunities. In a globally connected, broadband world, everything is accessible in the blink of an eye. As broader bandwidths become available,

communications become digital, increasingly visual and more effective. Consumers and businesses can locate quickly and obtain products and information from almost anywhere in the world (2000, ADC Telecommunications).

Problem Background

ADC's Engineering Divisions are divided into three operating entities – Copper Engineering, Fiber Optics Engineering, and Wireless Engineering. Manufacturing and Quality supports each division as products are designed, prototyped, tested, and manufactured. The engineering groups recognize that they all have similar training needs when it comes to educating its staff on product development, engineering documentation, manufacturing, and product testing processes. Each division guides itself by a common set of operating procedures set up as requirements of ISO 9001 and TL 9000 quality standards.

As new people were employed into the organization, the engineering management needed to rethink the educational process and develop curriculum that would enable people to get the training they needed to perform their jobs. In 1998, an effort by the vice presidents and managing directors of the Copper and Fiber Engineering Groups formed a team to determine the training requirements around the processes and practices of their organizations. Since Wireless Engineering was still in its infancy as an operating entity they would determine their needs at a later date and leverage the curriculum once set up.

With the assistance of Human Resources, the engineering community was broken down into the following 28 job categories:

Table 1. Sample of Engineering Job Categories

BCG Engineering Job Categories			
ME Drafter I-II	EE Drafter I-II	Mfg Eng I	QA Eng I-II
ME Designer	EE Designer	Mfg Eng II	Sr. QA Eng
ME Tech I-II	EE Tech I-II	Sr. Mfg Eng	Tech Pubs Writer
ME Tech III	EE Tech III	Inspection Tech I-II	Software Eng I-II
ME I-II	EE I-II	Inspection Tech III	Software Sr. Eng
Sr. ME	Sr. EE	QA Tech I-II	Software Project Eng
Project ME	Project EE	QA Tech III	Software QA

Each job category was assigned a set of training requirements, which are mapped on a course matrix; refer to Appendix A. Profiles of each job category were set up in the Learning Management System (LMS). Courses not assigned to a specific job category were considered to be an elective, therefore required supervisor approval.

As courses were defined, management assigned internal subject matter experts (SMEs) to develop and deliver the training whenever the demand required it. A formal process was set up where individuals signed up for courses through a web interface called ADClearn. The LMS database administrators generated class rosters, booked

conference/training rooms, and notified instructors. When employees completed a course, the attending individual signed the class roster and the instructor mailed the signed roster back to the training and development group where the data was recorded.

Despite the effort to track employee progress, the data in LMS is not completely accurate because training requirements were also completed informally either through on-the-job training or departmental meetings. Therefore, individuals were not receiving credit for the requirements they completed and management cannot rely on the accuracy of the reports generated from the tracking system. Moreover, management could not clearly identify the training gaps that exist amongst their staff.

Problem Statement

The purpose and scope of this study is to determine the overall technical knowledge of the Copper Engineering group in the core areas of organizational quality, engineering documentation, product development, and product testing practices. The analysis will be used to identify strengths and weaknesses of the group, and assist management in making decisions about training direction of its people.

Research Objectives

The objectives of the research project are:

1. Identify overall technical knowledge of engineering personnel in the core areas of organizational quality practices, engineering documentation, product development practices, and product testing practices.

2. Provide Copper Engineering management with data to make decisions and prioritize activities within the group.
3. Validate the Engineering Development Plan.

Significance of the Research

As ADC's Engineering Divisions maintain pace with the demands of the telecommunications industry, the training solutions delivered to the groups must ensure:

- Individuals learn new skills or acquire knowledge about processes and procedural enhancements in a timely manner
- New employees are effectively assimilated into the culture of the organization
- Just-in-time solutions to immediate problems
- Proper and timely feedback from others on how they are using new skills or knowledge
- Standardized training across geographical locations

The importance of this research project is to provide the Copper Engineering managers a baseline to make decisions about training direction of its people and prioritize the training development efforts. ADC's Engineering Divisions are analyzing the training needs that encompass the product development process. Data from the research can help identify the training gaps in this area and help facilitate the development of a web-based performance support tool that will assist engineers through the phases of product development. One requirement of this type of job-aid is to access training material online, as individuals step through the process.

Limitations

Due to the enormity of the proposed research project and the researcher's obligations in fulfilling the requirements of this research paper on time, the scope of the study is limited to the assessment of the Copper Engineering group. The results of the study will provide the researcher a template to conduct future research with the Fiber Optics and Wireless engineering divisions at ADC including locations in other areas worldwide.

Definitions

ADC - In the early days of the company's history, the company was making audiometers and other devices used to test hearing, and that is where the name "ADC" originated. However, the three initials have stood the test of time and now have become an integral part the name: ADC - The Broadband Company. ADC is now a key supplier of telecommunications equipment and software world-wide.

Learning Management System (LMS) - Software that automates the administration of training events. The LMS registers users, tracks courses in a catalog, and records data from learners; it also provides reports to management.

ISO – A generic, baseline family of quality standards written to be broadly applicable to a wide range of varying nonspecific industries and products. These standards establish the basic requirements necessary to document and maintain an effective quality system (Randall, 1995).

TL 9000 Quality Standard - TL 9000 is a common set of quality system requirements and metrics designed specifically for the Telecommunications Industry, encompassing ISO and 83 additional requirements.

TNA - Training Needs Assessment

CHAPTER 2

Review of Literature

Introduction

Learning is an integral part of meeting the goals and objectives of organizations to stay competitive in global markets. At ADC, learning and training has been part of its culture for many years and continues to be an important organizational strategy.

As part of this research project, the researcher briefly investigated characteristics of learning organizations and why needs assessments are conducted as a way to understand situations before training is implemented.

Characteristics of Learning Organizations

For some, Learning Organization is a philosophical system. At ADC it is viewed as a way of life and business. Devito (1996) adds that a learning organization spans an enormous field: it can aid large corporations to be competitive globally while it offers each individual the opportunity to achieve his or her potential with support from a community of colleagues.

Devito (1996) describes the learning organization as an "hourglass:"

> Think of one end as 'building capacity' and the other end as 'harnessing experience.' Building capacity emphasizes becoming all that is possible like a division, a department, or a team shares a common vision and acts to accomplish that vision. As the group grows, their understanding and action increases, and they achieve more than they originally intended. Applications of the building capacity approach concentrate on developing individual and team

> potential. Harnessing experience stresses the retrieval of learning that can be shared with the rest of the organization such as core processes, technologies, and culture.

The Learning, Training and Development group formed as a strategic initiative to surround ADC with avenues of employee development that encompass learning experiences in Leadership and Management, Sales, Engineering, Products and Technology, Manufacturing, Continuous Improvement, etc. This strategy challenges ADC to use its knowledge as a basis for its ability to be a global organization.

The Copper Engineering Division leverages the experiences of internal subject matter experts to teach others about organizational processes, procedures, and tools. According to Devito (1996), an organization's capabilities, its technologies and work processes are targets for learning. Maximizing the potential of individuals and the company to obtain changing objectives is essential to the success of a learning organization. Transferring learning from one environment to another is the organization's most critical and promising initiative.

Devito (1996) references the work of David Garvin, in which the learning organization revolves around five main activities: Systematic Problem Solving, Experimentation, Learning from the Past, Learning from Others, and Transferring Knowledge. These building blocks are understood by the organization that they are never mastered and will forever need refinement.

- Systematic Problem Solving - Using scientific methods like data collecting, and using simple statistical tools such as histograms, and Pareto charts to eliminate guesswork and assumptions when trying to determine root causes of problems.
- Experimentation - Using experimentation motivated by opportunity as a way to expand horizons. Analyzing existing programs where incremental gains are realized from improvement strategies and capitalizing on demonstration projects where ambitious undertakings are designed from scratch to develop new organizational capabilities.
- Learning from the Past - Reviewing successes and failures systematically, and recording the lessons in a form that employees find open and accessible. The challenge for most companies is installing a database system that catalogs learning and lessons that are easily accessed.
- Learning from Others - This refers to using benchmarking as a way to learn from others. According to Devito (1996), Garvin states that "the greatest benefit comes from studying practices, ways that work gets done (rather than results), and from involving line managers in the process."
- Transferring Knowledge - Learning needs to be considered more than a local affair; knowledge must be spread quickly and efficiently through the organization. According to Devito (1996), Garvin suggests a variety of mechanisms to spur this process like written, oral, and visual reports, site visits and tours, personnel rotation programs, education and training programs, and standardization programs.

Needs Assessment

The term, needs assessment, can mean many things to different people and organizations. According to Rosset and Zemke (1985), most experts recognize many characteristics:

- It comes at the beginning of an systematic approach to training.
- It is done to understand more about performance problems and determine gaps between what is happening and what ought to be happening.
- It is often not done when training is required yesterday.
- It is done through a variety of data collection methods like interviewing, surveys and questionnaires, observation, work samples, records and reports, or any combination thereof.
- It mostly focuses of people's feelings rather than focusing on what sources feel is causing the performance problem.
- It is also used to expand the understanding of new systems and technologies before training.

Rosset and Zemke (1985) adds that training professionals use needs assessments, in detail, to understand the nature of the mission (optimal minus actual); the attitudes or the feelings; and the causes of problems. The search for information varies, depending on what got you started like a performance problem or a task, system or technology.

Johnson (1999) cites the work of Allen and Rosset that a needs assessment and analysis is crucial to any training program and human resource department. Needs

assessment is a process and not a one-time event. Johnson also cites the work of Rothwell that analyzing present conditions is an essential starting point for any improvement strategy, just as it is for strategic planning. Few improvement efforts can be initiated if the information about the organizational environment, work environment, work, and the employee is not first known.

Benefits of a Needs Assessment

The benefits of a needs assessment are critical to both the analyst and the stakeholders in the process. Johnson (1999) cites the work of Kaufmann that a needs assessment provides management direction for useful problem resolution through identifying, documenting, and selecting appropriate problems. Clearly, identifying the problem, and selecting the right solution can maximize the effectiveness of efficiency of any organization and its individuals. Bowman (1988) adds that a properly conducted assessment not only identifies training needs, but also builds participant commitment, generates management support, increases HRD department's credibility and provides data for the sacred process of evaluation.

Conducting a Needs Assessment

Rossett and Zemke (1985) state that there is no robust set of procedures to carry out a needs assessment and that there are various assessment methods and standards for what constitutes a good needs assessment strategy. Sweeney (1999) cites an article found in Public Personnel Management that a needs assessment must be developed unique to the intent of the study.

Below, Rossett and Zemke (1985) identifies a series of prescribe basic steps for a needs analysis:

- Define Objectives - Define the purpose and objectives for the analysis as basis for manager's planning and development decisions. Some objectives may include distinguishing the employees who need training; identifying performance problems, deficiencies, and root causes; secure the support and commitment of management in the process of building and evaluating effective training; generate data that will be useful in measuring the impact of training; prioritize training for the upcoming year and long-range strategic planning.
- Identify the necessary data - Needs assessments require information to identify the need, the solution, the population requiring training and strategies for delivering training. Information may include data collected from surveys, financial statements, job descriptions, performance appraisals, and work samples.
- Choose or design a method for gathering - use various combinations of methods like surveys, interviews, observations, work samples, etc.
- Collect the data - Administer the surveys, conduct interviews, and observe performance on your intended study group or population sample.
- Analyze and confirm the data - If possible compare the data with data collected in past assessments to uncover problems and related trends or patterns. Confirm the results with the people who supplied the information.

- Prepare a final report - In your final report identify problems, strengths and weak areas and recommend strategies for improvement. Using tables, graphs and other support data for findings, design a clear and interesting presentation with well-written materials and attractive visuals.

Summary

ADC recognizes that learning and training is part of its culture and has been for many years in its quest for continuous improvement and employee development. It also is an essential organizational strategy and commitment to ISO and TL 9000 quality standards to provide for the training of all personnel activities affecting quality.

Devito (1996) references the work of David Garvin, who identifies an important trait of a learning organization as one who utilizes scientific methods like data collecting and statistical analysis to eliminate guesswork and assumptions when identifying problems and recommend solutions. A way to uncover training needs and solve problems is to utilize data collected through a TNA. An inventory of skills and knowledge can lead to detailed training where the greatest need exists. McClelland (1992) adds that a TNA provides a means of identifying areas where the organization can obtain maximum value for the training and development dollar. A systems approach can emphasize consistent and flexible ways to achieve ongoing analysis of the organization's human resources and the skills that will be required as a result of changes to a long-range plan.

Although there is no exact science to conducting a TNA, organizations recognize the value of its information in that it produces a snapshot of their human resource skills and

knowledge. Moreover, a TNA provides management direction for useful problem resolution by identifying the problem, and selecting the right solution to maximize the effectiveness of efficiency of its individuals. Bowman (1988) adds, a TNA identifies training needs, builds participant commitment, generates management support, increases HRD department's credibility and provides data for the sacred process of evaluation.

CHAPTER 3

Research Methods

Introduction

The problem of this study was to determine the overall technical knowledge of the Copper Engineering group. The methods and procedures used in this study helped to identify strengths and weaknesses of the Copper Engineering Group, prioritize training development projects, and assist management in making decisions about the direction of the training program.

Research Design

A descriptive research design was used and a survey conducted to collect data from participants in the study population. The goal of this survey was to collect and analyze data from survey participants to determine training needs in the core areas of organizational quality, engineering documentation, product development, manufacturing, and product testing practices. Data from the analysis was used to prioritize training development projects within the engineering curriculum.

A survey was designed by the researcher to assess the technical knowledge of individuals relative to primary job functions; refer to Appendix B. Participants were asked to respond to the statements/questions indicating their level of agreement. They were also asked to assign a level of importance that they felt the statement is to their job

function. If they felt a specific statement is not relevant to their job, they checked the statement as "N/A" (not applicable). Demographic data was also collected.

Population

The estimated worldwide population of the ADC's engineering community is at 1000 people. There are product engineering and manufacturing engineering groups in countries like Mexico, Finland, Scotland, China and Australia. Due to the researcher's obligations in fulfilling the requirements of this research paper, the scope of the study is limited to the Copper Engineering group located in Shakopee, MN. The population of the Copper Engineering group is approximately 180 people. A sample of the population was not used. The study provided the researcher a template to conduct future research with other engineering groups and global locations within ADC. The target population represents the following job functions:

- Mechanical and Electrical Drafters
- Mechanical and Electrical Designers
- Mechanical and Electrical Technicians
- Mechanical and Electrical Engineers
- Manufacturing Technician
- Manufacturing Engineers
- Quality Technicians
- Quality Engineers

- Software Engineers
- Technical Writers
- Engineering Change Administrators
- Office Administrators

Instrumentation

The survey instrument served as the source of data for this research project. The researcher designed the instrument (Appendix B) to measure the respondents' level of agreement to statements and questions considered important to quality, engineering documentation, product development, manufacturing, and product testing practices. Other topics include general comments about what is needed to improve the training program, and demographic items, which are used to identify logistics of the population. The statements in the survey were approved by the Copper Engineering management team.

The survey was delivered to the sample population through e-mail. Detailed information was provided instructing the participants what to do with the survey instrument and how to record the information required for data analysis. To make the survey return process easier, participants entered and saved their information directly on the survey form, and sent it to the researcher through the company e-mail system.

Data Collection Technique

The first section of the survey addressed demographics of the survey participants. The participants were asked a few demographic questions such as their role in company, years of service, etc. Participants rated the survey statements and questions on a scale from 1 to

5. A 1 rating for a particular item corresponds to a strongly disagree response, a 3 rating represents a neutral response, and a 5 rating was equivalent to a strongly agree response. The survey participants also rated the importance of each statement to their specific job function. A 1 rating identified the statement as low importance, a 2 corresponded to somewhat important, and a 3 indicated the statement is highly important to job responsibilities.

The general survey section of the instrument is designed to collect information from individuals about how training can be improved. They responded to statements on a scale of 1 to 5 and a few open-ended questions. The open-ended questions are not weighted and were used to supplement the data as personal thoughts on what might be considered to improve the training.

Pilot Testing the Instrument

Prior to sending the survey to the population, a pilot test was conducted to test the validity and reliability of the instrument. The pilot test group consisted of a cross-section of coworkers – drafters, designers, technicians, and engineers. Pilot testing the survey helped iron out confusion and eliminated ambiguity by fixing problem areas before the survey was sent to the study population.

Data Analysis

The participants in the research project recorded their responses on the survey instrument and returned it to the researcher through the company's e-mail system. As the surveys were returned, the data was recorded in a database by the researcher using

Microsoft Access. Each survey item corresponded to a column in the database. Statistical information was calculated by importing the database into NWA Quality Analysts version 5.1 software program used by the Continuous Improvement training team. The NWA Quality Analyst software program is typically used to analyze variation in manufacturing processes. For the items that are not weighted, they were recorded in the appropriate columns of the database as text entries.

The type of data that the researcher measured is the individuals' perceptions and attitudes of the statements in the survey. Other data collected also include general comments about what is needed to improve the training program, and demographic information about the survey participant. The data was analyzed to acquire sample sizes, means, and standard deviations of each measurable component on the survey instrument. After the statistical analysis was complete, the information was presented to the Copper Engineering management.

Summary

The problem of this study was to determine the overall technical knowledge of Copper Engineering group relative to core business areas like quality, engineering documentation, product development, manufacturing, and product testing practices. The purpose of this research project was to collect and analyze data from survey participants to identify training needs relative to job importance. The survey participants (180 Copper Engineering employees) were asked to respond to statements on the survey instrument,

and return the survey to the researcher. The statistical analysis of the research is presented in Chapter 4.

CHAPTER 4

Research Analysis

Introduction

The goals of the research was to:

- Identify strengths and weaknesses in core areas of quality, engineering documentation, product development, manufacturing, and product testing;
- Provide Copper Engineering management with data to make decisions and prioritize training activities within the group; and
- Validate the Engineering Development Plan.

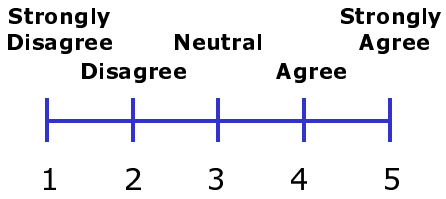
Participants were asked to respond to statements/questions on the survey form indicating their level of agreement (Appendix B). They also identified the level of importance they felt a statement is to their job function. If they thought a specific statement was not relevant to their job, they checked the statement as "N/A" (not applicable). Statements receiving the N/A rating were eliminated from the sample data.

The data was tabulated in a Microsoft Access Database and imported into NWA Quality Analyst version 5.1 software. Statistical data was calculated where sample populations, mean scores, and standard deviations were recorded. Perceived knowledge charts (scatter diagrams) were created comparing the mean scores of Job Importance to Level of Agreement. The data is depicted on the following pages and was presented to the Copper Engineering managers.

Survey Scales & Data Charting

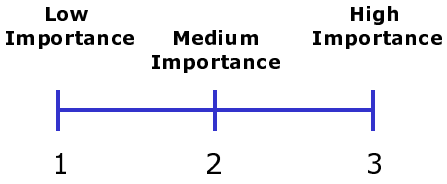
Survey participants rated the survey statements and questions on a scale from 1 to 5, according to their level of agreement (perceived knowledge) (Figure 1). Statements receiving a N/A (Not Applicable) rating got a score of zero and were eliminated from the sample data.

Figure 1. Level of Agreement Rating Scale



They also rated the importance of each statement to their specific job function as depicted in Figure 2.

Figure 2. Job importance Rating Scale

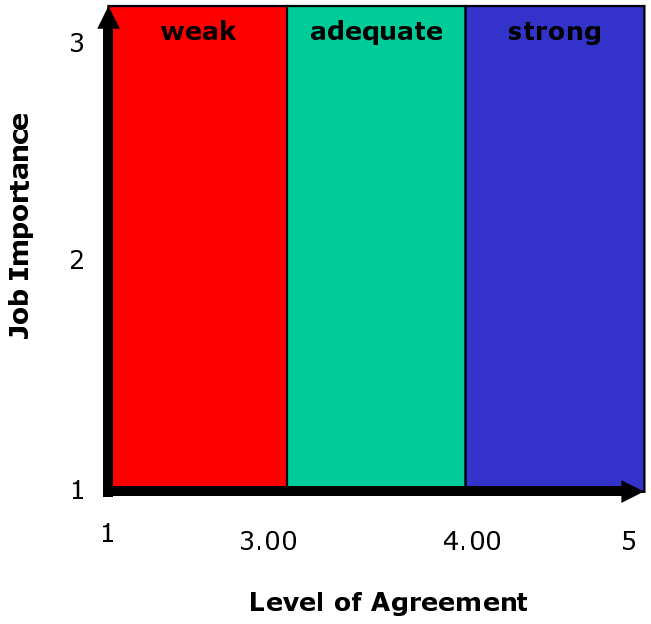


The general survey section of the instrument was designed to collect information from individuals about how training can be improved. They responded to statements on a

scale of 1 to 5 and answered a few open-ended questions. The open-ended questions were not weighted and used to supplement the data as personal thoughts on what might be considered to improve the training program.

The researcher used scatter diagrams to visually show perceived knowledge of the survey population. Using the mean scores from the data (Level of Agreement and Job Importance) the following perceived knowledge chart was developed:

Figure 3. Example of Perceived Knowledge Chart



Survey Demographics

The survey population was defined as the Copper Engineering group located in Shakopee, Minnesota. Of the 180 surveys sent to the group, 84 (47%) were returned.

Years of Service

The survey revealed that 64% of the population surveyed had worked at ADC for five years or less indicating a young work force. The following figure depicts the years of service representative of the survey population.

Figure 4. Years of service of Copper Engineering personnel represented in the survey

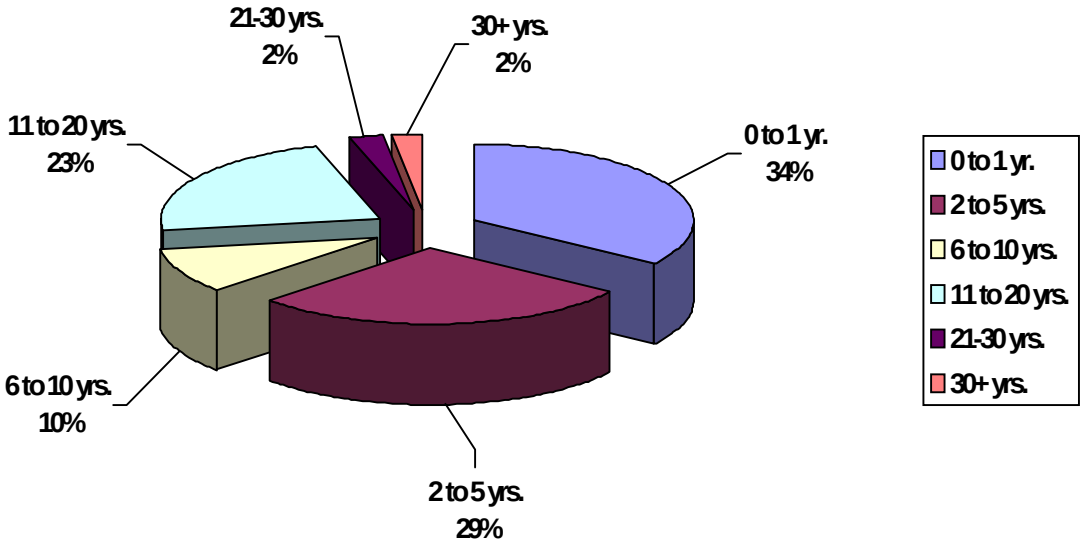


Table 2. Job functions represented in survey results.

Job Function	Participants
Mech. Eng. Designer	10
Mech. Eng. I-II	9
Supervisor/Mgr.	9
Mech. Eng. Drafters I-II	6
Elect. Eng. Drafter I-II	6
Elect. Eng. Designers	5
SR. Mech. Eng.	5
EE Technicians	4
EE I-II	4
QA Tech III	4
CAE	4
QA Eng. I-II	2
ME Tech I-II	2
Project EE	2
Sr. Mfg. Eng.	2
Project ME	1
Project EE	1
Senior EE	1
Mfg. Eng. II	1
QA Tech I-II	1
SW Eng. I-II	1
SW Sr. Eng.	1
ECA	1
APE	1
CTO	1
ECAD Administrator	1

The table shows the survey population in descending order.

Results of the Survey by Core Area

The following pages and figures are the data collected from the core training areas of engineering. General survey items and overall comments are also included in this data set:

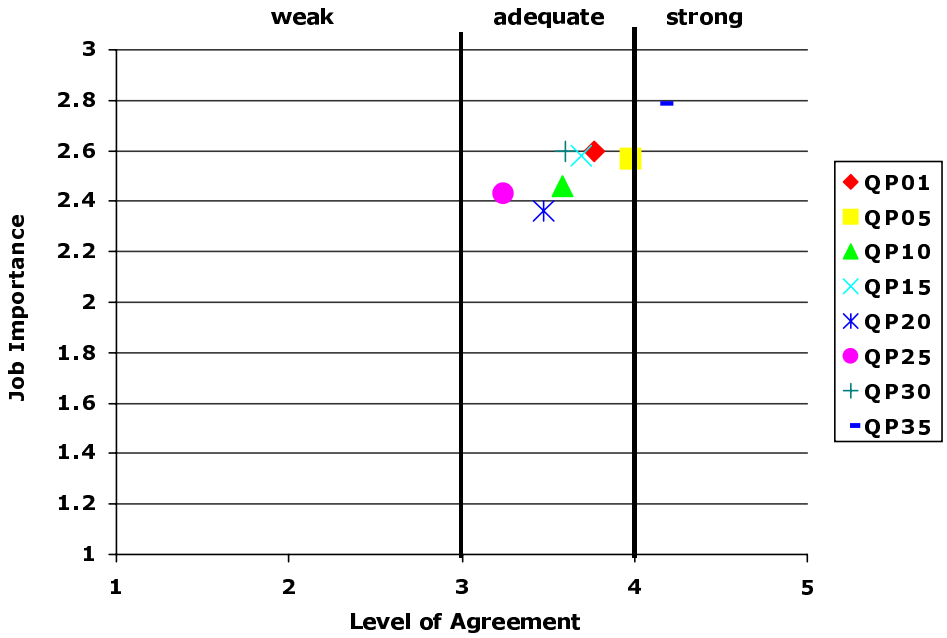
- Organizational Quality Practices
- Engineering Documentation Practices
- Product Development Practices
- Manufacturing Practices
- Product Testing Practices
- General Survey Items
- Overall Comments (Appendix C)

Figure 4. Organizational Quality Practices Data

No.	Statement/Question	Sample Size	Mean (5 point scale)	SD	Mean (3 point scale)	SD
QP35	I know who my internal customers and suppliers are and how my work impacts other groups.	82	4.15	.85	2.79	.43
QP05	I understand ISO 9001 standards, when compliance or registration is required, key requirements of the standard, the documentation pyramid, the role of an internal audit program, with emphasis on individual employee responsibilities.	82	3.98	.88	2.57	.66
QP01	I understand ADC's Quality policies, their relationship to the ISO 9001 Standard and BCG's commitment to quality.	84	3.77	.90	2.60	.53
QP15	I use process improvement methods and tools in my job to support ADC's continuous improvement initiative.	81	3.69	.95	2.58	.62
QP30	I understand the ADC products I work with and their applications in the telecommunications industry.	81	3.60	1.08	2.60	.62
QP10	I understand and utilize the Division Operating Procedures (DOPs) used by BCG for Engineering Change Administration, Product Development, Product Extensions, and Quality. I know where to find DOPs and understand their numbering system.	84	3.58	1.06	2.46	.64
QP20	I understand the basic principles of Economic Value Added (EVA) and how it is calculated. I also know how to use EVA to improve my decision-making.	84	3.47	1.08	2.36	.67
QP25	I know how to find and use industry standards information like Bellcore/Telcordia, IEC, ASTM, ANSI, and TIA.	81	3.24	1.28	2.43	.80
QP40	Overall, I am satisfied with the training I have had relative to Organizational Quality practices in BCG Engineering.	82	3.06	.98		

Organizational Quality practices statistical data are shown in descending order according to mean score.

Figure 5. Perceived knowledge of organizational quality practices.



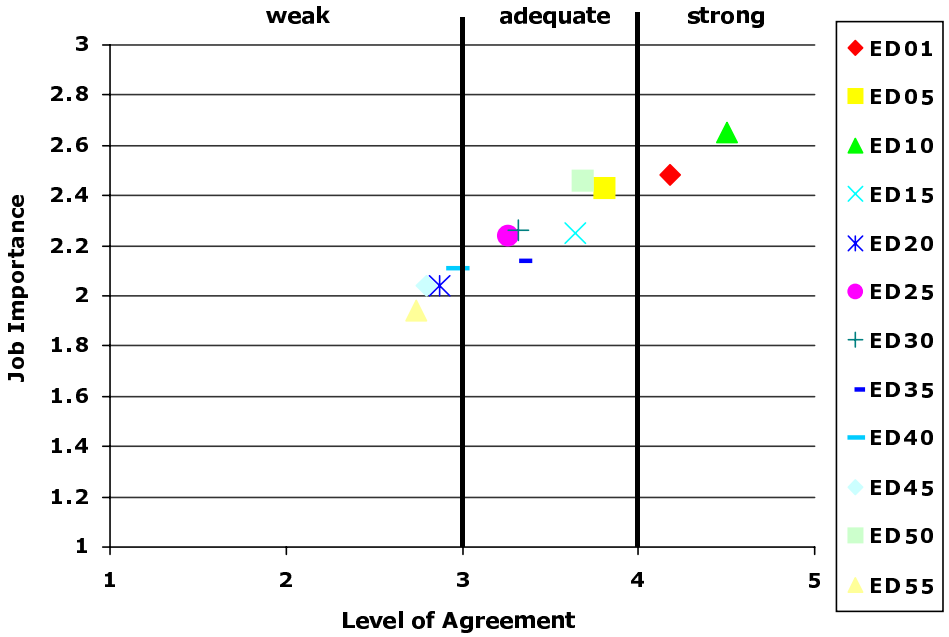
The diagram shows the perceived knowledge of the survey population with respect to Organizational Quality practices within the Copper Engineering group. The mean scores of Level of Agreement and Job Importance were charted to identify areas that are weak, adequate, and strong.

Figure 6. Engineering Documentation Practices Data

Engineering Documentation Practices		***Level of Agreement***			***Job Importance***	
No.	**Statement/Question**	**Sample Size**	**Mean** (5 point scale)	**SD**	**Mean** (3 point scale)	**SD**
ED10	I know how to use the Drawing Viewing System to view online drawings.	80	4.5	.92	2.65	.65
ED01	I know how to use the Information Retrieval System (IRS) to find existing parts and reserve new material numbers.	76	4.18	1.00	2.48	.72
ED05	I know how to use the SAP Web Interface to import, export, and display Bill of Materials (BOM) and retrieve Engineering Change Order (ECO) numbers.	81	3.81	1.20	2.43	.74
ED50	I know the differences between the ECO, Component Qualification Request (CQR), and Manufacturing Deviation Authorization (MDA) forms and what they are used for. I also know how to accurately complete the forms before submitting to engineering documentation.	75	3.68	1.10	2.46	.72
ED15	I also know how to use ER Lite to submit new drawings to the drawing viewing database.	67	3.64	1.41	2.25	.87
ED35	I understand various product structures and hierarchies and know how to select the correct product hierarchy code for my project.	69	3.33	1.26	2.14	.79
ED30	I understand the standards and procedures used to define Pro/Engineer parts, assemblies, and drawings. I know how to use the standard Pro/Engineering configuration files, start models, drawing formats, and naming conventions that are used to create a Pro/Engineering drawing file. (DOP-003)	56	3.32	1.50	2.26	.88
ED25	I understand aspects of Pro/Intralink necessary to manage Pro/Engineer data. I know how to check in/check out files, promote/demote files, search for files, lock files, display tables, copy files, rename files, and identify various icons.	57	3.26	1.51	2.24	.85
ED40	I understand the process of how estimated product release lot sizes are determined and how lot sizing differs between the various manufacturing processes. I know what variables to consider when making reasonable estimates.	67	2.97	1.18	2.11	.80
ED20	I understand BCG's standards for creating and designing artwork for labels and silk screens.	66	2.87	1.27	2.04	.90
ED45	I understand the concepts of product cost estimating and know how to retrieve purchasing information and records to create cost estimates for my projects. I know the difference between a moving average and a standard price, and how a moving average is calculated.	65	2.8	1.16	2.04	.67
ED55	I know how to complete and submit a test request that references Standardized Testing Methods (STMs), industry standard test parameters (ANSI, Bellcore/Telcordia, etc.), and provide specific instructions, fixtures and samples to perform a lab test.	67	2.74	1.29	1.94	.79
ED60	Overall, I am satisfied with the training I have had relative to Engineering Documentation practices in BCG Engineering.	78	3.19	1.02		

Engineering Documentation practices statistical data are shown in descending order according to mean score.

Figure 7. Perceived knowledge of engineering documentation.



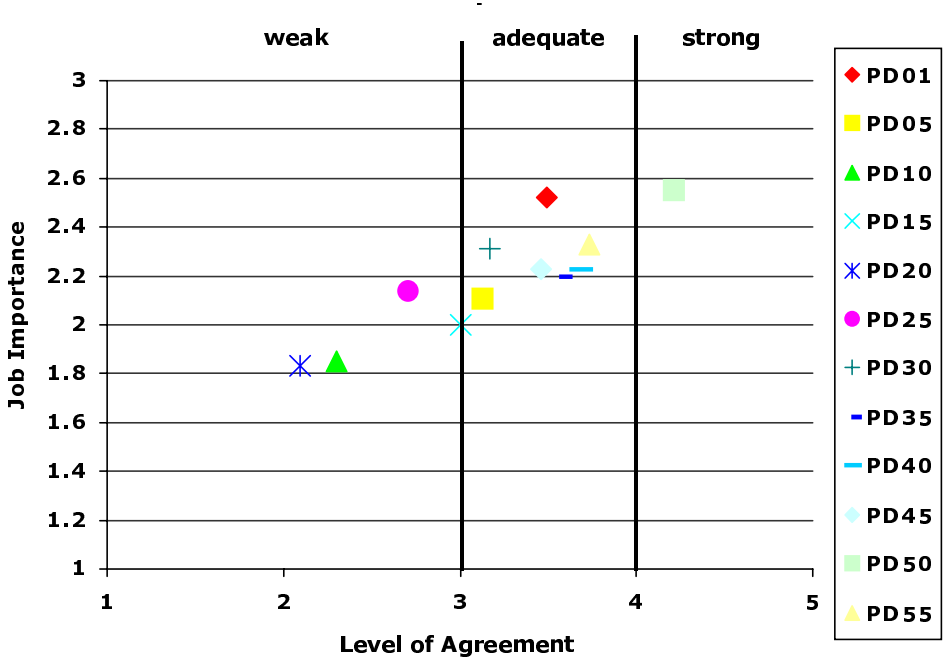
The diagram shows the perceived knowledge of the survey population with respect to Engineering Documentation practices within the Copper Engineering group. The mean scores of Level of Agreement and Job Importance were charted to identify areas that are weak, adequate, and strong.

Figure 8. Product Development Practices Data

Product Development Practices		***Level of Agreement***			***Job Importance***	
No.	**Statement/Question**	**Sample Size**	**Mean** (5 point scale)	**SD**	**Mean** (3 point scale)	**SD**
PD50	I understand the differences and philosophies of a "B" release and an "A" release.	79	4.21	.87	2.55	.61
PD55	I understand the purpose and intent of a formalized Product Development Process.	71	3.73	1.17	2.33	.69
PD40	I know where project data is archived.	72	3.68	1.23	2.23	.74
PD35	I know where to view basic project information like schedules, resources, and related documentation.	68	3.57	1.24	2.2	.75
PD01	I know how to use techniques to identify and evaluate opportunities to remove unnecessary costs from products and manufacturing processes.	69	3.49	1.15	2.52	.65
PD45	I understand the philosophy and differences between design verification testing (DVT) and Qualification or Validation testing.	67	3.46	1.34	2.23	.78
PD30	I understand the three primary phases of the product development process and know the requirements for each phase.	69	3.17	1.3	2.31	.77
PD05	I know how to determine new product prototype lot requests used to support design verification or customer/show samples. I understand the general guidelines for identifying quantities, lead times, and proper documentation. (ref. DOP-2021)	67	3.13	1.09	2.11	.74
PD15	I understand the elements of a Functional Requirements Document (FRD) that identifies following product characteristics of my project: market identification, product description, performance, reliability, durability, aesthetics, commercial or agency requirements, serviceability, user interface requirements, and manufacturing objectives. (ref. DOP-2003)	60	3	1.17	2	.77
PD25	I understand the method for recording required information of a patent and know the types of documentation needed for filing a patent with ADC's Legal Department. (ref. DOP-2006)	64	2.71	1.31	2.14	.87
PD10	I know the four phases in developing a Quality Function Deployment (QFD) plan and understand when to use a QFD to define customer needs relative to existing ADC and competitor products. I know how to use the QFD Workbook to help me develop a QFD Plan. (ref. DOP-2004)	57	2.3	1.01	1.85	.74
PD20	I understand how to interpret a Kraemer Cash Flow Model and write a complete and accurate Product Development Business Plan essential for management and the project team members to make decisions, prioritize tasks, and obtain capital expenditure approval. (ref. DOP-2002)	55	2.09	1.09	1.83	.81
PD60	Overall, I am satisfied with the training I have had relative to Product Development practices in BCG Engineering.	73	2.83	.97		

Product development practices statistical data are shown in descending order according to mean score.

Figure 9. Perceived knowledge of product development practices.



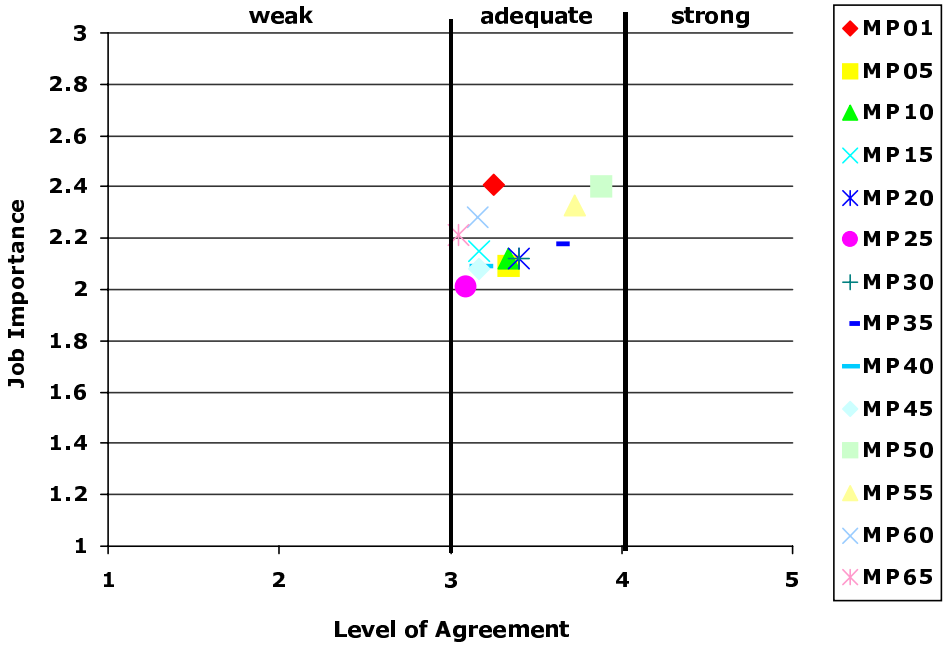
The diagram shows the perceived knowledge of the survey population with respect to Product Development practices within the Copper Engineering group. The mean scores of Level of Agreement and Job Importance were charted to identify areas that are weak, adequate, and strong.

Figure 10. Manufacturing Practices Data

Manufacturing Practices			***Level of Agreement***		***Job Importance***	
No.	**Statement/Question**	**Sample Size**	**Mean** (5 point scale)	**SD**	**Mean** (3 point scale)	**SD**
MP50	I know where to go or who to ask to get manufacturing related questions answered.	70	3.88	.98	2.4	.66
MP55	I know where to go or who to contact to get materials related questions answered.	69	3.73	1.05	2.33	.72
MP35	I understand the uses of cells and standardized tooling to reduce manufacturing costs.	64	3.62	.96	2.18	.79
MP20	I am aware of the stamping capabilities at ADC.	66	3.40	.97	2.12	.83
MP30	I am aware of the finishing capabilities at ADC.	66	3.40	1.02	2.12	.81
MP10	I am aware of the injection molding capabilities at ADC. I am also aware of the types of molding materials available.	66	3.34	1.04	2.12	.83
MP05	I am aware of the screw machine capabilities at ADC.	63	3.34	1.04	2.09	.79
MP01	I reference ADC's Design for Manufacturing handbook for current practices and guidelines when designing a part.	58	3.25	1.35	2.41	.83
MP40	I understand the factors to determine when to use specific machines to produce a part.	61	3.18	1.11	2.09	.83
MP15	I am aware of the sheet metal capabilities at ADC.	66	3.17	.90	2.15	.84
MP45	I understand the method used to match a manufacturing process based on part volumes.	62	3.17	1.22	2.08	.79
MP60	I understand the mechanical assembly methods used at ADC.	67	3.16	1.16	2.28	.75
MP25	I am aware of the die-casting capabilities at ADC.	66	3.09	1.10	2.01	.79
MP65	I understand the electrical assembly methods used at ADC.	71	3.05	1.09	2.21	.75
MP70	Overall, I am satisfied with the training I have had relative to Manufacturing practices in BCG Engineering.	72	3.12	.93		

Manufacturing practices statistical data are shown in descending order according to mean score.

Figure 11. Perceived knowledge of manufacturing practices



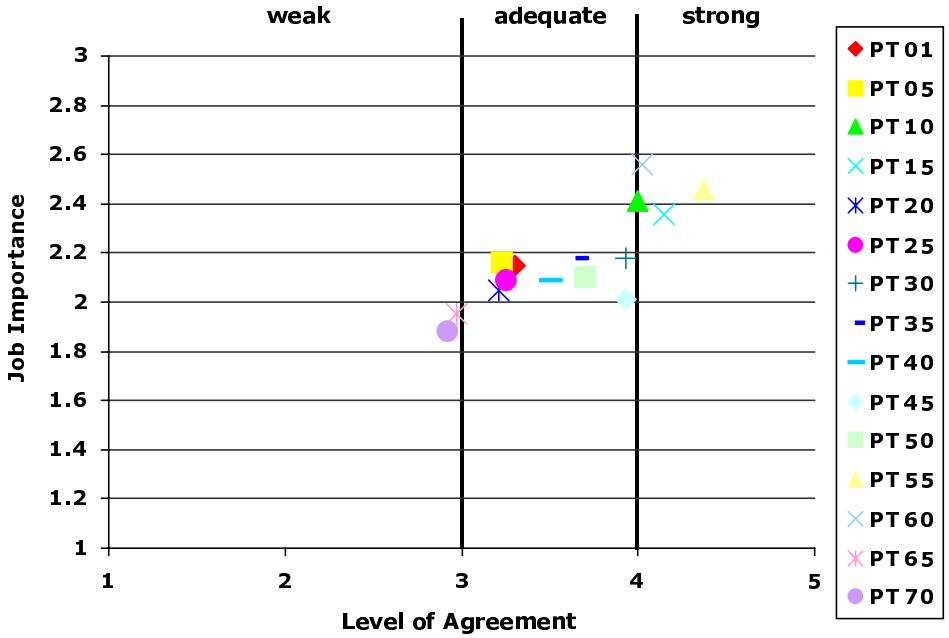
The diagram shows the perceived knowledge of the survey population with respect to manufacturing practices within the Copper Engineering group. The mean scores of Level of Agreement and Job Importance were charted to identify areas that are weak, adequate, and strong.

Figure 12. Product Testing Practices Data

Product Testing Practices		***Level of Agreement***			***Job Importance***	
No.	**Statement/Question**	**Sample Size**	**Mean** (5 point scale)	**SD**	**Mean** (3 point scale)	**SD**
PT55	I know how to accurately read mechanical drawings.	78	4.37	.88	2.46	.73
PT15	I know how to find the Division Operating Procedures (DOP), Quality Assurance Policies (QAP), Laboratory Operating Procedures (LOPs), and Standard Test Methods (STMs) to perform my job.	73	4.15	.93	2.36	.69
PT60	I know how to use SAP to check parts stock, view Bills of Materials (BOM), and read engineering specifications.	78	4.02	1.12	2.56	.61
PT10	I understand the purpose of the Engineering Specification and guidance it provides to qualification and ongoing Quality Assurance requirements.	67	4	1	2.41	.76
PT30	I know how to assess and manipulate test data and communicate the information to others using the software tools in Microsoft Office (i.e., Excel, Word).	58	3.93	1.04	2.18	.84
PT45	I am comfortable using fundamental electronic formulas and conversions like Ohm's Law.	61	3.93	1.20	2.01	.84
PT50	I know how to accurately read electrical schematics.	70	3.7	1.20	2.1	.83
PT35	I know where to store documented results of tests so others can access the information.	60	3.65	1.21	2.18	.83
PT40	I know I can reproduce test results that others have done before me given accurate test documentation.	52	3.5	1.11	2.09	.89
PT25	I know how to write a complete test report that follows standardized procedures, documents test setup, and reports results.	51	3.25	1.29	2.09	.87
PT05	I know the information, fixtures and samples I receive to complete a test requirement is accurate, enabling me to return test results in a timely manner.	56	3.23	1.14	2.16	.86
PT20	I know where to find lab procedures to support the tests that I perform.	52	3.21	1.24	2.05	.84
PT01	I know how to find agency documentation to support the tests that I perform.	59	3.13	1.19	2.15	.82
PT65	I know how to perform proper maintenance procedures on all lab equipment.	45	2.97	1.28	1.95	.85
PT70	I know I have adequate training to operate lab equipment safely and with repeatable results.	52	2.92	1.29	1.88	.85
PT75	Overall, I am satisfied with the training I have had relative to Product Testing practices in BCG Engineering.	66	2.93	1.17		

Product testing practices statistical data are shown in descending order according to mean score.

Figure 13. Perceived knowledge of product testing practices.



The diagram shows the perceived knowledge of the survey population with respect to product testing practices within the Copper Engineering group. The mean scores of Level of Agreement and Job Importance were charted to identify areas that are weak, adequate, and strong.

General Survey Items

The general survey items section was designed to collect data about other aspects of training pertaining to overall satisfaction of the training experience, training availability, manager/supervisor roles, quality of training methods, and preferences of delivery methods. Participants could also enter their own comments about their training experiences at ADC.

Figure 14. Overall Training Satisfaction

NO.	Survey Statement/Question	Sample	Mean	SD
MP70	Overall, I am satisfied with the training I have had relative to Manufacturing practices in BCG Engineering.	72	3.13	.93
ED60	Overall, I am satisfied with the training I have had relative to Engineering Documentation practices in BCG Engineering.	78	3.06	1.05
QP40	Overall, I am satisfied with the training I have had relative to Organizational Quality practices in BCG Engineering.	82	2.98	1.0
PT75	Overall, I am satisfied with the training I have had relative to Product Testing practices in BCG Engineering.	66	2.93	1.17
PD60	Overall, I am satisfied with the training I have had relative to Product Development practices in BCG Engineering.	73	2.83	.97

There were five statements in the survey that were designed to measure level of satisfaction of training in a given core area. The figure shows the results of training satisfaction data shown in descending order according to mean score

Figure 15 - Training Availability

NO.	Survey Statement/Question	Sample	Mean	SD
GS01	I am able to complete the training when I need it the most.	84	3.53	1.02

The figure shows the results of a statement that was added to the survey to measure availability of the training when it is most needed.

Figure 16 - Training Plan Development

NO.	Survey Statement/Question	Sample	Mean	SD
GS05	My manager/supervisor plays a role in developing my training plan.	84	3.29	1.09

The figure shows the results of a statement that was added to the survey to measure manager/supervisor roles when developing training plans.

Figure 17 - Transfer of Learning

NO.	Survey Statement/Question	Sample	Mean	SD
GS10	My manager/supervisor helps me apply what I learned to my job.	83	3.37	1.03

The figure shows the results of a statement that was added to the survey to measure manager/supervisors role in transfer of learning.

Figure 18 - Quality of Training Methods

NO.	Training Method	Sample	Mean	SD
GS15	Classroom/Lecture	84	3.48	.92
	OJT/Mentor	75	3.36	1.09
	Computer-based Training (CBT)	65	2.98	1.11
	Internet-based Training	60	2.91	1.07

The figure shows the results of survey participants when asked to rate (Poor = 1, Somewhat Satisfied = 2, Neutral = 3, Satisfied = 4, Excellent = 5) the overall quality of the following training methods used throughout the organization.

Figure 19 - Preference of Delivery Method

NO.	Delivery Method	Tally
GS20	Classroom/Lecture	62
	OJT/Mentor	31
	Computer-Based Training (CBT)	16
	Internet-Based Training (IBT)	8

The figure shows the results of survey participants when asked to provide their preference of delivery method. Participants could choose more than one selection on this survey question.

Summary

Although the lower scoring statements on the survey may have a higher level of importance to a select group of individuals, the majority of the topics represented fell in the "adequate" range. Ideally, these scores should be between four and five on the perceived knowledge charts. If one were to consider this information to measure the satisfaction level of the overall training product, one would conclude that an adequate rating is not satisfactory and that there is room for improvement in the overall engineering curriculum. Chapter 5 will provide insight on the data presented.

CHAPTER 5

Research Summary and Recommendations

Summary

The focus of this research was to determine the overall technical knowledge of Copper Engineering individuals in the core areas of organizational quality, engineering documentation, product development, manufacturing, and product testing practices. The analysis was used to identify strengths and weaknesses of the current engineering training program, measure employee satisfaction of their training experiences, and assist management in making decisions in prioritizing training activities.

A survey method was used in the study to collect data from the Copper Engineer group at ADC. This approach was used to obtain unbiased feedback from those who have experienced various training sessions in the past and have valuable input into changes that can be made to improve the curriculum. Participants received the survey through the company's e-mail systems and were asked to respond to the statements based on their level of knowledge and experience. They were also asked to check a level of job importance the statement is to their job function. Upon receiving the returned surveys from the participants, statistical data was calculated (sample size, mean score, and standard deviation), graphs were charted to identify to the perceived knowledge of the

group, and written comments were recorded. A total of 84 (47%) employees of ADC's Copper Engineering group participated in the survey.

Conclusions

If one were to consider the data presented to measure the satisfaction level of the overall training product, one would conclude that an adequate rating is not satisfactory and that there is room for improvement in the overall engineering curriculum. The following identifies the major findings of this research project. Although the data collected identified areas of weakness, the comments submitted by survey participants offer valuable insight.

1. As expected, the highest rated area of the study is the overall knowledge of the Quality practices at ADC. Training programs that support this important organizational initiative are readily available to all employees. The Quality program is presented at employee orientation and is presented in formal training sessions throughout the organization. Although this area rated higher than the other areas, comments submitted suggest that the message about quality be presented in a consistent format and at appropriate times. They also suggest that it would help to know how the quality programs impact individual job functions.

   ADC recognizes the fact that to compete in a global market, manufacturing and service organizations are continually improving their processes to meet certification standards. These international standards (ISO and TL9000) place great demands on managers and workers. Consequently, technical training programs need to be

available for people to learn about the standards and the methods for their accomplishment.

2. Four weaknesses emerged in the area of engineering documentation. These practices include:
    - Submitting test requests that reference the proper testing method documentation, industry standard testing parameters and specific instructions to perform to achieve consistent test results (ED55).
    - Knowing where, or who, to contact when generating product cost estimates for projects (ED45).
    - Creating and designing artwork for equipment labels and silkscreens and the proper use of ADC logos according to the corporate branding requirements (ED20).
    - The ability to estimate product lot sizes and the variation of lot sizing depending on the type of manufacturing process used (ED40).
    - Other items that should also be addressed, based on the variation in the data (high standard deviation), include the use of standards and procedures used to define Pro/Engineer parts, assemblies, and drawings (ED30), and the use of Pro/Intralink, which is used to manage Pro/Engineer data (ED35).

    General comments (Appendix C) submitted about engineering documentation suggest that most of the practices identified are self-taught through trial-and-error or are learned by asking questions of co-workers. This type of informal training

produces inaccurate information being shared and should be presented and communicated more formally to produce consistent results. Furthermore, when training is presented in a formal setting the message should be communicated why a certain process is followed and who it affects if it is not performed properly.

3. Of the areas surveyed, product development practices is the weakest area. Three weaknesses emerged in the area of product development. These practices include:
    - How to interpret the Kraemer Cash Flow Model and use the information to write a complete and accurate business plan so management and project team members can make decisions and prioritize project tasks (PD20).
    - How to develop a QFD (Qualified Functional Deployment) plan when defining customer needs relative to existing ADC and competitor products. Participant comments suggested that this practice is not consistently followed (PD10).
    - How to use ADC's method of filing and recording patent information with the legal department (PD25).
    - Other items that should be considered, based on high variation in the data sample (standard deviation), are knowing elements of a Functional Requirements Document (FRD), which identifies product characteristics (PD15); and knowing the phases of product development and their requirements (PD30). Another area that also falls into this group is knowing the philosophy and practice of design verification testing and validation (PD45).

Comments submitted suggest that the product development processes and practices are self-taught or are learned from others. Moreover, this process is difficult to provide formalized training because of how much external influences affect the process and that it varies from one project to the next. It is also suggested that any training developed be targeted towards other job functions (drafters, technicians, etc.) and not only those who are engineers and project managers.

4. Although the data produced no weaknesses in the area of manufacturing practices, knowledge and awareness of manufacturing capabilities at ADC is important to the engineering community. Knowing how to design products according to specific manufacturing equipment capabilities and tolerances can help engineers and designers early on in their projects.

   Comments submitted relative to manufacturing practices suggest that the documentation generated by manufacturing personnel and presented to the engineering community be updated and accessible on the company's intranet web site. Other suggestions include learning more about other ADC's manufacturing facilities located in Mexico.

5. Two weaknesses emerged in the area of product testing. These practices include:
   - Knowing how to operate test equipment safely and with repeatable results (PT70).
   - Knowing how to perform maintenance procedures on lab equipment (PT65).
   - Other items that should be considered, based on variation in the data sample (standard deviation), are knowing where to find lab procedures to perform tests

(PT20); knowing how to write a complete test report (PT25); and knowing where to store completed test reports so others have access to them (PT35).

Again, comments submitted relative to product testing suggest that most of the training is either self-taught or learned by trial-and-error. Although, equipment safety and maintenance seems to be main concerns, product-testing standards differ depending on the engineering department requesting the test. Since multiple product groups use the testing labs, numerous reporting formats and procedures are used making it difficult for lab technicians to adhere to consistent test practices.

6. Data collected from the general survey section produced information to try to identify areas where training can be better supported by either improving manager/supervisor roles in planning, training frequency, or training methods. Data collected relative to frequency and timeliness of training (GS01) is comparable to written comments suggesting that learning experiences need to be offered on a more regular basis to accommodate those with scheduling conflicts or when changes are made to processes and tools.

   The data suggests that managers and supervisors are actively involved in the development plans of their employees (GS05 and GS10). Moreover, an updated learning management system was recently implemented at ADC that can help managers/supervisors plan, track, and identify the training needs of their employees as long as the functionality within the system is used effectively.

A finding that the researcher thought needed to be identified is that the survey participants rated their overall satisfaction level of delivery methods (GS15) was relatively low meaning that none of the methods surveyed failed to reach a satisfied rating (4.00). Classroom instruction rated the highest (*m*=3.48) followed by OJT (*m*=3.36), computer-based (*m*=2.98), and internet-based (*m*=2.91). The latter two were expected, as ADC does not have a lot of training products developed using these media.

When asked to identify preference of delivery method (GS20), survey participants identified classroom instruction as their number one choice, followed by OJT, CBT, and then Internet-based training. This information is interesting because Internet (intranet) -based training is being supported at the corporate level as a cost-effective way to deliver training on an organization-wide basis.

Recommendations

It is important that the engineering curriculum allow employees to achieve the goals of the program. The current program places significant emphasis on processes and tools in various technical areas that are critical to the performance of the engineering division. Therefore, it is necessary to identify subject matter experts in the core areas to continually identify training needs as they arise and provide them the support to develop and deliver learning experiences to the engineering community on a continuous basis. The researcher suggests to consider the findings previously presented and conduct separate assessments of the weakest topics to determine what part of the population is

affected. When completing an in-depth analysis, the data collected from this research can be queried to identify the specific job functions that are affected and form curriculum teams to focus on their respective training issues. Not only would these teams identify formal training opportunities but also identify the informal training opportunities like OJT. By reading the written comments, it is apparent that OJT is a prevalent learning tool within the engineering community. It is important that a strategy is identified and a consistent format be developed and implemented for this learning method to be effective.

To support transfer of learning, a repository of released training materials needs to be developed and centralized so that people can reference the materials on-line when a review is necessary. The training materials database would require a check-in and check-out functionality to ensure the most current materials are available.

Closing Comments

At the time this research took place, the telecommunications industry experienced a tremendous slow-down. To react with the industry slow-down, ADC compensated by restructuring and reorganizing its business units. A more focused ADC emerged.

Despite the competitive nature of the telecommunications industry, management's perception of training is supportive and is recognized as a value-added resource in the education of its employees. However, a more selective and creative approach to develop and deliver the training outside the classroom needs to be addressed so that global engineering groups can receive cost effective training.

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APPENDIX A

Engineering Curriculum Plan

Engineering Curriculum Plan

Engineering Curriculum	ME Drafter I-II	ME Designer	ME Tech I-II	ME Tech III	ME I-II	Sr. ME	Project ME	CAE Eng	ECAD Admin	EE Drafter I-II	EE Designer	EE Tech I-II	EE Tech III	EE I-II	Sr. EE	Project EE	Sr. Project EE	Mfg Eng I	Mfg Eng II	Sr. Mfg Eng	Mfg Project Eng	Process Eng.	Adv. Process Eng.	Sr. Adv. Process Eng.	Inspection Tech I-II	Inspection Tech III
HUMAN RESOURCES																										
New Employee Orientation	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
BCG Basics	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
FINANCE																										
EVA1 (Economic Value Added)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
QUALITY																										
ISO/TL 9000	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
ISO 9001/Quality Assurance	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Industry Standards	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
CONTINUOUS IMPROVEMENT																										
Continuous Improvements		X	X	X	X	X	X	X			X	X	X	X	X	X		X	X	X	X				X	X
The Beer Game		X	X	X	X	X	X	X			X	X	X	X	X	X		X	X	X	X				X	X
Statistical Thinking		X	X	X	X	X	X	X			X	X	X	X	X	X		X	X	X	X				X	X
SAFETY																										
Right to Know	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Electrical Safety	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Engineering Curriculum	ME Drafter I-II	ME Designer	ME Tech I-II	ME Tech III	ME I-II	Sr. ME	Project ME	CAE Eng	ECAD Admin	EE Drafter I-II	EE Designer	EE Tech I-II	EE Tech III	EE I-II	Sr. EE	Project EE	Sr. Project EE	Mfg Eng I	Mfg Eng II	Sr. Mfg Eng	Mfg Project Eng	Process Eng.	Adv. Process Eng.	Sr. Adv. Process Eng.	Inspection Tech I-II	Inspection Tech III
ENGINEERING																										
Engineering Systems																										
Engieering Systems Overview	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Engineering Documentation																										
Eng. Doc. DOPs Overview (0003, 1002, 1003, 1004, 1005, 1007)	X	X	X	X	X	X	X			X	X	X	X	X	X	X		X	X	X						
ER Lite Drawing/IRS/SAP/BOM/ZRev	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Labels Process and Capabilities	X	X			X	X																				
Artwork and Silkscreens	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X						
ProIntralink Data Management	X	X	X	X	X	X	X	X			X	X	X	X	X	X		X	X			X	X	X		
Pro Engineer Model and Drawing Standards (DOP 0003)	X	X	X	X	X	X	X																			
Pro/E User Group - Training/Tips																										
Pro/E Product Release Update Training																										
ORCAD Capture										X	X			X	X	X										
ORCAD Layout																										
Product Release Lot Sizes	X	X		X	X	X	X			X	X		X	X	X	X		X	X	X			X			
Product Costing	X	X			X	X	X			X	X		X	X	X	X		X	X	X			X	X		
ECO Process for Engineering	X	X	X		X	X	X		X	X	X		X	X	X	X	X	X	X	X			X	X	X	X
ECO Process for CCB Reviewers																										
Windchill CQR for ECAs																										
Windchill CQR for Managers																										
Windchill for CQR Reviewers																										
Test Requests	X	X	X	X	X	X	X			X		X	X	X	X	X	X			X		X	X	X		
Continuation Engineering																										
Continuation Engineering DOPs Overview (3000, 3002, 3003, 3005)	X	X			X	X	X																			
Engineering Order Database (EOD)	X	X			X	X	X																			

Engineering Curriculum	ME Drafter I-II	ME Designer	ME Tech I-II	ME Tech III	ME I-II	Sr. ME	Project ME	CAE Eng	ECAD Admin	EE Drafter I-II	EE Designer	EE Tech I-II	EE Tech III	EE I-II	Sr. EE	Project EE	Sr. Project EE	Mfg Eng I	Mfg Eng II	Sr. Mfg Eng	Mfg Project Eng	Process Eng.	Adv. Process Eng.	Sr. Adv. Process Eng.	Inspection Tech I-II	Inspection Tech III
Product Development																										
Product Development Process Overview	X	X	X	X	X	X	X			X	X	X	X	X	X	X		X	X	X						
Product Development DOP's Overview (2001, 2003, 2004, 2005, 2020, 2008, 2007, 3004, 2009, 2010, 2012, 1005, 4007, 4009, 2013, 2014, 2011)	X	X	X	X	X	X	X			X	X	X	X	X	X	X		X	X	X						
Value Engineering		X			X	X	X				X			X	X	X		X	X	X					X	X
Patent Training		X			X	X	X				X			X	X	X		X	X	X						
Prototype Process																										
Developing a Quality Function Depolyment (QFD) Plan																										
Developing a Functional Requirements Document (FRD) Plan																										
Using the Cash Flow Model to Write a Product Development Buisness Plan																										
Design Verification Process																										
Configure to Order																										
Design for Manufacturing																										
Design for MFG /Sheetmetal/ Stamping	X	X			X	X	X											X	X	X					X	X
Design for MFG/Screw Machine/Molding	X	X			X	X	X											X	X	X					X	X
Screw Machine Capabilities and Possibilities																										
EE Design for Manufacturing										X	X	X	X	X	X	X										
PC Board Manufacturing										X	X	X	X	X	X	X										
Design for Assembly Guidelines																		X	X	X					X	X
Tour of 1187 Facility	X	X	X	X	X	X	X			X	X	X	X	X	X	X		X	X	X					X	X
Tour of 1000 Facility	X	X	X	X	X	X	X			X	X	X	X	X	X	X		X	X	X					X	X
Tour of LeSueur Facility																		X	X	X					X	X
Tour of Mexico Facility																		X	X	X					X	X

Engineering Curriculum	ME Drafter I-II	ME Designer	ME Tech I-II	ME Tech III	ME I-II	Sr. ME	Project ME	CAE Eng	ECAD Admin	EE Drafter I-II	EE Designer	EE Tech I-II	EE Tech III	EE I-II	Sr. EE	Project EE	Sr. Project EE	Mfg Eng I	Mfg Eng II	Sr. Mfg Eng	Mfg Project Eng	Process Eng.	Adv. Process Eng.	Sr. Adv. Process Eng.	Inspection Tech I-II	Inspection Tech III
Design for Manufacturing																										
Design for MFG /Sheetmetal/ Stamping	X	X			X	X	X											X	X	X					X	X
Design for MFG/Screw Machine/Molding	X	X			X	X	X											X	X	X					X	X
Screw Machine Capabilities and Possibilities																										
EE Design for Manufacturing										X	X	X	X	X	X	X										
PC Board Manufacturing										X	X	X	X	X	X	X										
Design for Assembly Guidelines																		X	X	X					X	X
Tour of 1187 Facility	X	X	X	X	X	X	X			X	X	X	X	X	X	X		X	X	X					X	X
Tour of 1000 Facility	X	X	X	X	X	X	X			X	X	X	X	X	X	X		X	X	X					X	X
Tour of LeSueur Facility																		X	X	X					X	X
Tour of Mexico Facility																		X	X	X					X	X
Products/Technology for Engineering																										
Introduction to Telephony (Engineers)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Introduction to DSX Lab (Engineers)																										
DSX Components (Engineers)																										
Digital Design (Engineers)					X	X	X							X	X	X		X	X	X						
Introduction to Wirelesss (Engineers)																										
Pots/Splitters/RTA (Engineers)																										
Fiber Product (Engineers)																										
T1 Technical (Engineers)					X	X	X							X	X	X		X	X	X						
Product Qualification and Testing																										
Lab Overview, Procedures, & Policies																										
Measurement Devices and Theory																										
Digital Signal Theory																		X	X	X						
Basic Electronics																										
Radio Frequency (RF) Basics																		X	X	X						
EMI																										

Engineering Curriculum	ME Drafter I-II	ME Designer	ME Tech I-II	ME Tech III	ME I-II	Sr. ME	Project ME	CAE Eng	ECAD Admin	EE Drafter I-II	EE Designer	EE Tech I-II	EE Tech III	EE I-II	Sr. EE	Project EE	Sr. Project EE	Mfg Eng I	Mfg Eng II	Sr. Mfg Eng	Mfg Project Eng	Process Eng.	Adv. Process Eng.	Sr. Adv. Process Eng.	Inspection Tech I-II	Inspection Tech III
Environmental Testing																										
Hot/Cold Humidity Chambers/De-ionized Water System																										
Weather Machine																										
Life-Cyclers																										
Surge Tester																										
Salt Fog Chambers																										
Operational Parameter Testing																										
Network Anylizer																										
Time Domain Reflectometer																										
Oscilloscope																										
Micro-ohmmeter/Contact Resistor Tester/Multimeters/Thermocouplers																										
Bit Error Tester/ Template Testing/Signal Generators																										
Hardness Tester																										
Instron/Chaltillon Base/Load Cells																										
Force Deflection Tester																										
Torque Watches/Torque Tester																										
High Potential/Insulation Resistance Tester																										
Optical Comparator																										
Voyager Measuring System																										
Vibration Machine/ Chatter Box																										
Troubleshooting Aids																										
X-Ray Machine																										
Polisher																										
Pot and Section Processes																										
Soldering																										
Microscopes/Pictures/Measurements																										
Hand Tools/Bench Tools																										
Prototype Testing																										
LPKF Machine																										

APPENDIX B

Engineering Training Needs Assessment Survey

Engineering Training Needs Assessment Survey

Scope of Survey:

This survey is designed to assess the technical knowledge of individuals within the Engineering Divisions relative to primary job functions. The goal of this survey is to collect and analyze data from survey participants to determine training needs in the core areas of quality, engineering documentation, product development, product testing, and manufacturing practices.

Instructions:

1. Respond to the statements/questions in this survey based on your current level of knowledge and expertise.
2. As you read each statement, click a box that corresponds to your **level of agreement** (refer to Key below). Where appropriate, check a **level of importance** that you feel the statement is to your job function. If you feel a specific statement is not relevant to your job function, check the "**N/A**" box.
3. Please be **honest** when responding to statements in this survey. **The survey is for internal use only.**
4. When you complete the survey, **save** and **close** the MS Word document to save your answers. Send your completed survey to:

Jeff Wachter
Learning Specialist, BCG Engineering
BCG Learning, Training and Development
MS 654
Tel: 952.233.6480
Fax: 952.233.6652
Jeff_wachter@adc.com

Key:

Level of Agreement			**Job Importance**	
0.	N/A	Not Applicable	L	Low Importance
1.	SD	Strongly Disagree	M	Medium Importance
2.	D	Disagree	H	High Importance
3.	N	Neutral (Agree nor disagree)		
4.	A	Agree		
5.	SA	Strongly Agree		

Survey Item Example:

	Level of Agreement						**Job Importance**		
Statement/Question	**0 N/A**	**1 SD**	**2 D**	**3 N**	**4 A**	**5 SA**	**1 L**	**2 M**	**3 H**
I understand ADC's Quality policies, their relationship to the ISO 9001 Standard and BCG's commitment to quality.	☐	☐	☒	☐	☐	☐	☐	☐	☒

1. Participant Demographics

I understand that by returning this questionnaire, I am giving my informed consent as a participating volunteer in this study. I understand the basic nature of the study and agree that any potential risks are exceedingly small. I also understand the potential benefits that might be realized from the successful completion of this study. I am aware that the information is being sought in a specific manner so that no identifiers are needed and so that confidentiality is guaranteed. I realize that I have the right to refuse to participate and that my right to withdraw from participation at any time during the study will be respected with no coercion or prejudice.

NOTE: Questions or concerns about participation in the research or subsequent complaints should be addressed first to the researcher or research advisor and second to Dr. Ted Knous, Chair, UW-Stout Institution Review Board for the Protection of Human Subjects in Research, 11 HH, UW-Stout, Menomonie, WI, 54751, phone (715) 232-1126.

a) Name (optional):

b) Select the engineering division you work for:

☐ BCG Copper ☐ BCG Fiber ☐ BCG Wireless ☐ Other (specify):

c) Specify your location:

☐ Shakopee ☐ Mexico ☐ New Jersey ☐ Grass Valley

d) Select a role that best describes your position in the division.

☐ ME Drafter I-II	☐ EE Drafter I-II	☐ Mfg Eng I	☐ QA Eng I-II	☐ CAE Engineer
☐ ME Designer	☐ EE Designer	☐ Mfg Eng II	☐ Sr. QA Eng	☐ Engineering Change Administrator (ECA)
☐ ME Tech I-II	☐ EE Tech I-II	☐ Sr. Mfg Eng	☐ Tech Pubs Writer	☐ Supervisor/Manager
☐ ME Tech III	☐ EE Tech III	☐ Inspection Tech I-II	☐ SW Eng I-II	
☐ ME I-II	☐ EE I-II	☐ Inspection Tech III	☐ SW Sr. Eng	
☐ Sr. ME	☐ Sr. EE	☐ QA Tech I-II	☐ SW Project Eng	
☐ Project ME	☐ Project EE	☐ QA Tech III	☐ SW QA	☐ Other (specify):

e) Select your years of service with ADC.

☐ 0 to 1 year ☐ 11 to 20

☐ 2 to 5 ☐ 21 to 30

☐ 6 to 10 ☐ 30+

2. Organizational Quality Practices		Level of Agreement						Job Importance		
No.	**Statement/Question**	**0 N/A**	**1 SD**	**2 D**	**3 N**	**4 A**	**5 SA**	**1 L**	**2 M**	**3 H**
QP01	I understand ADC's Quality policies, their relationship to the ISO 9001 Standard and BCG's commitment to quality.	☐	☐	☐	☐	☐	☐	☐	☐	☐
QP05	I understand ISO 9001 standards, when compliance or registration is required, key requirements of the standard, the documentation pyramid, the role of an internal audit program, with emphasis on individual employee responsibilities.	☐	☐	☐	☐	☐	☐	☐	☐	☐
QP10	I understand and utilize the Division Operating Procedures (DOPs) used by BCG for Engineering Change Administration, Product Development, Product Extensions, and Quality. I know where to find DOPs and understand their numbering system.	☐	☐	☐	☐	☐	☐	☐	☐	☐
QP15	I use process improvement methods and tools in my job to support ADC's continuous improvement initiative.	☐	☐	☐	☐	☐	☐	☐	☐	☐
QP20	I understand the basic principles of Economic Value Added (EVA) and how it is calculated. I also know how to use EVA to improve my decision-making.	☐	☐	☐	☐	☐	☐	☐	☐	☐
QP25	I know how to find and use industry standards information like Bellcore/Telcordia, IEC, ASTM, ANSI, and TIA.	☐	☐	☐	☐	☐	☐	☐	☐	☐
QP30	I understand the ADC products I work with and their applications in the telecommunications industry.	☐	☐	☐	☐	☐	☐	☐	☐	☐
QP35	I know who my internal customers and suppliers are and how my work impacts other groups.	☐	☐	☐	☐	☐	☐	☐	☐	☐
QP40	Overall, I am satisfied with the training I have had relative to Organizational Quality practices in BCG Engineering.	☐	☐	☐	☐	☐	☐			
QP45	Please write your comments/experiences relating to Quality training:									

3. Engineering Documentation Practices		Level of Agreement						Job Importance		
No.	**Statement/Question**	**0 N/A**	**1 SD**	**2 D**	**3 N**	**4 A**	**5 SA**	**1 L**	**2 M**	**3 H**
ED01	I know how to use the Information Retrieval System (IRS) to find existing parts and reserve new material numbers.	☐	☐	☐	☐	☐	☐	☐	☐	☐
ED05	I know how to use the SAP Web Interface to import, export, and display Bill of Materials (BOM) and retrieve Engineering Change Order (ECO) numbers.	☐	☐	☐	☐	☐	☐	☐	☐	☐
ED10	I know how to use the Drawing Viewing System to view online drawings.	☐	☐	☐	☐	☐	☐	☐	☐	☐
ED15	I also know how to use ER Lite to submit new drawings to the drawing viewing database.	☐	☐	☐	☐	☐	☐	☐	☐	☐
ED20	I understand BCG's standards for creating and designing artwork for labels and silk screens.	☐	☐	☐	☐	☐	☐	☐	☐	☐
ED25	I understand aspects of Pro/Intralink necessary to manage Pro/Engineer data. I know how to check in/check out files, promote/demote files, search for files, lock files, display tables, copy files, rename files, and identify various icons.	☐	☐	☐	☐	☐	☐	☐	☐	☐
ED30	I understand the standards and procedures used to define Pro/Engineer parts, assemblies, and drawings. I know how to use the standard Pro/Engineering configuration files, start models, drawing formats, and naming conventions that are used to create a Pro/Engineering drawing file. (DOP-003)	☐	☐	☐	☐	☐	☐	☐	☐	☐
ED35	I understand various product structures and hierarchies and know how to select the correct product hierarchy code for my project.	☐	☐	☐	☐	☐	☐	☐	☐	☐
ED40	I understand the process of how estimated product release lot sizes are determined and how lot sizing differs between the various manufacturing processes. I know what variables to consider when making reasonable estimates.	☐	☐	☐	☐	☐	☐	☐	☐	☐
ED45	I understand the concepts of product cost estimating and know how to retrieve purchasing information and records to create cost estimates for my projects. I know the difference between a moving average and a standard price, and how a moving average is calculated.	☐	☐	☐	☐	☐	☐	☐	☐	☐
ED50	I know the differences between the ECO, Component Qualification Request (CQR), and Manufacturing Deviation Authorization (MDA) forms and what they are used for. I also know how to accurately complete the forms before submitting to engineering documentation.	☐	☐	☐	☐	☐	☐	☐	☐	☐
ED55	I know how to complete and submit a test request that references Standardized Testing Methods (STMs), industry standard test parameters (ANSI, Bellcore/Telcordia, etc.), and provide specific instructions, fixtures and samples to perform a lab test.	☐	☐	☐	☐	☐	☐	☐	☐	☐
ED60	Overall, I am satisfied with the training I have had relative to Engineering Documentation practices in BCG Engineering.	☐	☐	☐	☐	☐	☐			
ED65	Please write your comments/experiences relating to Engineering Documentation training:									

4. Product Development Practices		Level of Agreement						Job Importance		
No.	**Statement/Question**	**0 N/A**	**1 SD**	**2 D**	**3 N**	**4 A**	**5 SA**	**1 L**	**2 M**	**3 H**
PD01	I know how to use techniques to identify and evaluate opportunities to remove unnecessary costs from products and manufacturing processes.	☐	☐	☐	☐	☐	☐	☐	☐	☐
PD05	I know how to determine new product prototype lot requests used to support design verification or customer/show samples. I understand the general guidelines for identifying quantities, lead times, and proper documentation. (ref. DOP-2021)	☐	☐	☐	☐	☐	☐	☐	☐	☐
PD10	I know the four phases in developing a Quality Function Deployment (QFD) plan and understand when to use a QFD to define customer needs relative to existing ADC and competitor products. I know how to use the QFD Workbook to help me develop a QFD Plan. (ref. DOP-2004)	☐	☐	☐	☐	☐	☐	☐	☐	☐
PD15	I understand the elements of a Functional Requirements Document (FRD) that identifies following product characteristics of my project: market identification, product description, performance, reliability, durability, aesthetics, commercial or agency requirements, serviceability, user interface requirements, and manufacturing objectives. (ref. DOP-2003)	☐	☐	☐	☐	☐	☐	☐	☐	☐
PD20	I understand how to interpret a Kraemer Cash Flow Model and write a complete and accurate Product Development Business Plan essential for management and the project team members to make decisions, prioritize tasks, and obtain capital expenditure approval. (ref. DOP-2002)	☐	☐	☐	☐	☐	☐	☐	☐	☐
PD25	I understand the method for recording required information of a patent and know the types of documentation needed for filing a patent with ADC's Legal Department. (ref. DOP-2006)	☐	☐	☐	☐	☐	☐	☐	☐	☐
PD30	I understand the three primary phases of the product development process and know the requirements for each phase.	☐	☐	☐	☐	☐	☐	☐	☐	☐
PD35	I know where to view basic project information like schedules, resources, and related documentation.	☐	☐	☐	☐	☐	☐	☐	☐	☐
PD40	I know where project data is archived.	☐	☐	☐	☐	☐	☐	☐	☐	☐
PD45	I understand the philosophy and differences between design verification testing (DVT) and Qualification or Validation testing.	☐	☐	☐	☐	☐	☐	☐	☐	☐
PD50	I understand the differences and philosophies of a "B" release and an "A" release.	☐	☐	☐	☐	☐	☐	☐	☐	☐
PD55	I understand the purpose and intent of a formalized Product Development Process.	☐	☐	☐	☐	☐	☐	☐	☐	☐
PD60	Overall, I am satisfied with the training I have had relative to Product Development practices in BCG Engineering.	☐	☐	☐	☐	☐	☐			
PD65	Please write your comments/experiences relating to Product Development training:									

5. Manufacturing Practices		Level of Agreement						Job Importance		
No.	**Statement/Question**	**0 N/A**	**1 SD**	**2 D**	**3 N**	**4 A**	**5 SA**	**1 L**	**2 M**	**3 H**
MP01	I reference ADC's Design for Manufacturing handbook for current practices and guidelines when designing a part.	☐	☐	☐	☐	☐	☐	☐	☐	☐
MP05	I am aware of the screw machine capabilities at ADC.	☐	☐	☐	☐	☐	☐	☐	☐	☐
MP10	I am aware of the injection molding capabilities at ADC. I am also aware of the types of molding materials available.	☐	☐	☐	☐	☐	☐	☐	☐	☐
MP15	I am aware of the sheet metal capabilities at ADC.	☐	☐	☐	☐	☐	☐	☐	☐	☐
MP20	I am aware of the stamping capabilities at ADC.	☐	☐	☐	☐	☐	☐	☐	☐	☐
MP25	I am aware of the die-casting capabilities at ADC.	☐	☐	☐	☐	☐	☐	☐	☐	☐
MP30	I am aware of the finishing capabilities at ADC.	☐	☐	☐	☐	☐	☐	☐	☐	☐
MP35	I understand the uses of cells and standardized tooling to reduce manufacturing costs.	☐	☐	☐	☐	☐	☐	☐	☐	☐
MP40	I understand the factors to determine when to use specific machines to produce a part.	☐	☐	☐	☐	☐	☐	☐	☐	☐
MP45	I understand the method used to match a manufacturing process based on part volumes.	☐	☐	☐	☐	☐	☐	☐	☐	☐
MP50	I know where to go or who to ask to get manufacturing related questions answered.	☐	☐	☐	☐	☐	☐	☐	☐	☐
MP55	I know where to go or who to contact to get materials related questions answered.	☐	☐	☐	☐	☐	☐	☐	☐	☐
MP60	I understand the mechanical assembly methods used at ADC.	☐	☐	☐	☐	☐	☐	☐	☐	☐
MP65	I understand the electrical assembly methods used at ADC.	☐	☐	☐	☐	☐	☐	☐	☐	☐
MP70	Overall, I am satisfied with the training I have had relative to Manufacturing practices in BCG Engineering.	☐	☐	☐	☐	☐	☐			
MP75	Please write your comments/experiences relating to Manufacturing training:									

6. Product Testing Practices		Level of Agreement						Job Importance		
No.	**Statement/Question**	**0 N/A**	**1 SD**	**2 D**	**3 N**	**4 A**	**5 SA**	**1 L**	**2 M**	**3 H**
PT01	I know how to find agency documentation to support the tests that I perform.	☐	☐	☐	☐	☐	☐	☐	☐	☐
PT05	I know the information, fixtures and samples I receive to complete a test requirement is accurate, enabling me to return test results in a timely manner.	☐	☐	☐	☐	☐	☐	☐	☐	☐
PT10	I understand the purpose of the Engineering Specification and guidance it provides to qualification and ongoing Quality Assurance requirements.	☐	☐	☐	☐	☐	☐	☐	☐	☐
PT15	I know how to find the Division Operating Procedures (DOP), Quality Assurance Policies (QAP), Laboratory Operating Procedures (LOPs), and Standard Test Methods (STMs) to perform my job.	☐	☐	☐	☐	☐	☐	☐	☐	☐
PT20	I know where to find lab procedures to support the tests that I perform.	☐	☐	☐	☐	☐	☐	☐	☐	☐
PT25	I know how to write a complete test report that follows standardized procedures, documents test setup, and reports results.	☐	☐	☐	☐	☐	☐	☐	☐	☐
PT30	I know how to assess and manipulate test data and communicate the information to others using the software tools in Microsoft Office (i.e., Excel, Word).	☐	☐	☐	☐	☐	☐	☐	☐	☐
PT35	I know where to store documented results of tests so others can access the information.	☐	☐	☐	☐	☐	☐	☐	☐	☐
PT40	I know I can reproduce test results that others have done before me given accurate test documentation.	☐	☐	☐	☐	☐	☐	☐	☐	☐
PT45	I am comfortable using fundamental electronic formulas and conversions like Ohm's Law.	☐	☐	☐	☐	☐	☐	☐	☐	☐
PT50	I know how to accurately read electrical schematics.	☐	☐	☐	☐	☐	☐	☐	☐	☐
PT55	I know how to accurately read mechanical drawings.	☐	☐	☐	☐	☐	☐	☐	☐	☐
PT60	I know how to use SAP to check parts stock, view Bills of Materials (BOM), and read engineering specifications.	☐	☐	☐	☐	☐	☐	☐	☐	☐
PT65	I know how to perform proper maintenance procedures on all lab equipment.	☐	☐	☐	☐	☐	☐	☐	☐	☐
PT70	I know I have adequate training to operate lab equipment safely and with repeatable results.	☐	☐	☐	☐	☐	☐	☐	☐	☐
PT75	Overall, I am satisfied with the training I have had relative to Product Testing practices in BCG Engineering.	☐	☐	☐	☐	☐	☐			
PT80	Please write your comments/experiences relating to Product Testing training:									

7. General Survey Items

No.	Statement/Question	0 N/A	1 SD	2 D	3 N	4 A	5 SA	
GS01	I am able to complete training when I need it the most.	☐	☐	☐	☐	☐	☐	
GS05	My manager/supervisor plays an active role in developing my training plan.	☐	☐	☐	☐	☐	☐	
GS10	My manager/supervisor helps me apply what I learn in training to my job.	☐	☐	☐	☐	☐	☐	

No.	Statement/Question	0 N/A	1 P	2 SS	3 N	4 S	5 EX	
GS15	Rate the overall quality of the following BCG training methods used throughout the organization. Please mark the N/A column if you have never experienced instruction using a specific method. (P = Poor, SS= Somewhat Satisfied, N = Neutral, S = Satisfied, Ex = Excellent)							
	Classroom/Lecture	☐	☐	☐	☐	☐	☐	
	On the Job Training (OJT)/ Mentor	☐	☐	☐	☐	☐	☐	
	Computer-Based Training (CBT)	☐	☐	☐	☐	☐	☐	
	Intranet-Based Training (IBT)	☐	☐	☐	☐	☐	☐	
GS20	Typically, what type of delivery method do you prefer to use for your training? ☐ Classroom ☐ OJT/Mentor ☐ Computer-based ☐ Intranet-based ☐ other, please explain:							
GS25	If given the opportunity, I would like to be considered as a resource to help develop or deliver training of various engineering topics. ☐ Yes ☐ No If yes, please specify a topic(s) and provide your name as a contact:							
GS30	Please write your comments/experiences relating to ADC/BCG training in general:							

Thanks for completing the survey. (1) Make sure your responses to the statements are complete. (2) Click the File menu and select the Save option to save your responses to the survey. (3) Close MS Word and send the saved file to Jeff Wachter, BCG Learning, Training and Development by clicking the Send button on the return Outlook message.

APPENDIX C

Written Comments and Experiences Relating to Training

Written Comments and Experiences Relating to Training

Survey participants were given an opportunity to provide written comments that they felt were relevant to their experiences with the engineering training program at ADC. The following is a summary of the comments that were written and used to supplement the data presented to Copper Engineering management.

- The courses I have attended provide general information often times did not provide the right information for me to apply to my job.
- The training I have had has been minimal at best, and it rarely pertinent to my job or specific needs.
- Most of my training in the development engineering area has been self-taught by trial and error or by asking questions of others. Often times the information I gathered from others was misinformation and resulted in a lot of rework time.
- Working for a division with a strong mechanical background, we often lack some of the basic requirements of an electronics lab. This applies to intangible as well as tangible items.
- My supervisor has ensured that I receive all the training my mind can hold and our budget can afford. He has encouraged our group to be well rounded and informed. Unfortunately, it seems that we are not receiving some of the basic quality/continuous improvement training we need. We are not receiving adequate training on ADC policies and standards and there does not seem to be much in place to make it easier for the new employee to know what he needs to learn.

- Overall good - well structured.
- Have not had any formal training in the last 8 years - mostly self-taught.
- In general, training is good. However, there is usually a significant period between when hire begins and when the mandatory training is available. We would benefit from basic courses being offered monthly rather than quarterly.
- I have been designated as my groups "mentor" although I have not received adequate training on most topics. I feel very uncomfortable being in a position to train our engineers and drafters because I feel that I am not qualified. However, I would not mind developing a training plan for drafters and engineers.
- ADC has a lot of good ideas and intentions. It would be nice to see these followed through. Not just the first time but to keep them updated and offered as needed.
- External courses I have taken by outside vendors have excellent. The internally developed courses have been good, not excellent.
- The training I have received so far has been good, but this survey has shown me that there is much more to learn. My supervisor has provided me with most of my training (OJT), but he does not have the time to cover all the subjects in detail that are listed on this survey. ADClearn is a good way to schedule training, but unfortunately most courses that I would like to attend are never scheduled! I would like to see more interactive training that is web-based, so that it can be used when needed. I would also like to see a formal training outline for individual job functions, so it's known what/when applicable training is available.

- I feel that the training supplied to me has been adequate in most areas. Poor in few. I guess I believe that most of the training a person gets in any job comes from OJT. It is very hard to train people in specific areas. I think the best way to train people is to make sure they have a resource person who can point them in the right direction to get the information that they need. ADC needs to do a better job of identifying resource people who are knowledgeable in a variety of areas.
- I think the first priority is to develop a process to save and access archived 'master' training material. I think this is the biggest trick to improving training.
- Personally, I do not do well at any kind of class or training. When the training is for product or procedure. Training should make me familiar with the program. I learn how to use it when I have a real problem to run it on. The best training for me is overview of what it is, why it's important, who needs the information, a print out of examples and choices available, or on line help. Then real life applications.
- Some training provided is good while others lack. I think the question about method for training is tough to answer because for some applications, a mentor works just fine, other times a mentor combined with classroom works. It depends on the difficulty of the material covered and how often it is used. When classes are offered once a year, the material is clear, but I do not use it for another couple of months and it is like starting over.