

Fall 1998

An Evaluation of John Deere Waterloo Works Internal Quality System Audit Process with Recommendations for Improving its Effectiveness

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An Evaluation of John Deere Waterloo Works Internal Quality System Audit Process with Recommendations for Improving its Effectiveness

Abstract

The objective of this paper is to evaluate the internal quality system audit process at the John Deere Waterloo Works. This evaluation is necessary to identify improvements to ensure continued quality system registration and make the auditing process as efficient and effective as possible for improved business performance.

AN EVALUATION OF JOHN DEERE WATERLOO
WORKS INTERNAL QUALITY SYSTEM AUDIT
PROCESS WITH RECOMMENDATIONS FOR
IMPROVING ITS EFFECTIVENESS.

A Research Paper for Presentation to the
Graduate Faculty of the
Department of Industrial Technology
University of Northern Iowa

In Partial Fulfillment of the Requirement
for the Non-thesis Master of Arts Degree

by

Karl J. Bultsma, Sr.

Fall 1998

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CHAPTER I

Introduction

Background of the Problem

The name John Deere has been synonymous with quality since its beginning in 1837. John Deere said "I will never put my name on a product that does not have in it the best that is in me." This is just as true today as it was when he said it.

Today John Deere along with all other organizations recognizes that quality takes a concerted effort by every employee. There are planned activities, specific duties, and procedures within an organization to achieve the goals set for each quality metric.

John Deere has developed and refined its quality activities and procedures over the years. They have tried to develop and implement a quality system on their own, with the aid of consultants, and most recently registered their quality system to the international standard ISO 9000, Quality Systems-Model for Quality Assurance in Design, Development, Production, Installation, and Servicing.

John Deere Waterloo Works quality system registration process took eighteen months. A team of six individuals with support of several others in the organization converted the old quality system into the format required by ISO 9001. This was just the beginning. If left untouched, the quality system will deteriorate rather than improve, as it should. An internal quality system audit

procedure was developed, written, and implemented as part of the quality system to monitor the quality activities and identify improvements between the annual surveillance audits by a third party. Also, ISO 9001 requires an organization to perform internal quality system audits.

Internal quality system auditing was new to John Deere Waterloo Works when the procedure was written. No one in-house had the expertise to develop a fine tune auditing procedure. Over time the organization developed its internal quality system auditing expertise. During that time the organization changed and the quality system matured. In an interview with Dave Wieland, John Deere Waterloo Works ISO Quality System Management Representative, he stated that the whole organization is more knowledgeable and has a better understanding of the quality system (personal communication, December 7, 1998). Also, lead auditor Paul Bartelt concluded in his December 17, 1998 audit final report that "Areas assessed were well prepared, cooperative and viewed the internal assessments as opportunities to drive improvement in their respective areas. This is a positive comment on the organization's maturing view of the quality system as an integral part of our business".

Statement of the Problem

The objective of this paper is to evaluate the internal quality system audit process at the John Deere Waterloo Works. This evaluation is necessary to identify improvements to ensure continued quality system registration and make

the auditing process as efficient and effective as possible for improved business performance.

Statement of Purpose

The primary reason for maintaining an internal quality system audit process is because auditing is a requirement of ISO 9001 (1994). "The supplier shall establish and maintain documented procedures for planning and implementing internal quality audits . . ." (p. 9).

Internal quality system audits verify the organization's conformance to the quality system. And they demand corrective action for non-conforming activities. Audits also legitimize the organization's continuous improvement of the quality system.

Statement of Need

The John Deere Waterloo Works has developed long-range goals, Target 2001, shown in Figure 1.

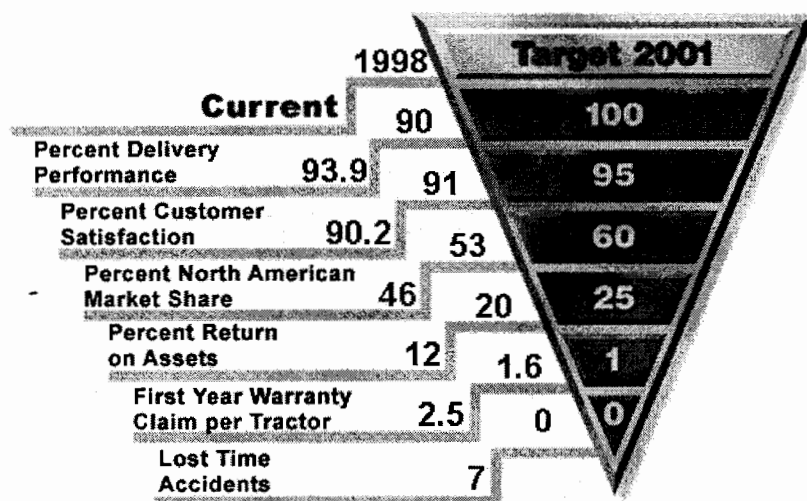


Figure 1. John Deere Waterloo Works Target 2001 Goals

Successful achievement of the goals by year 2001 requires the organization to change the way it operates. The execution of the quality system, which internal quality system auditing evaluates, impacts each of the goals. The quality system has the greatest impact on Delivery Performance, Customer Satisfaction, and Warranty Claims per Tractor because they are directly impacted by poor quality.

Internal quality system audits also provide management several other benefits (ASQ Audit Division, 1997). Audits provide management pure facts for their decision making, point out areas of opportunity, evaluate training effectiveness, and visibly show management's support of the quality system. Also, a problem can be detected sooner. Management can then quickly respond, and implement corrective action to ensure the problem will not reoccur.

Research Questions

This study will answer the following questions:

1. How can the auditor selection process be improved to ensure the selection of qualified auditors?
2. How can the training process be improved to provide auditors the skills and confidence they need by their first assessment?
3. What improvements can be made to make auditors more effective?

Assumptions

The following assumptions were made when conducting this study.

1. John Deere Waterloo Works will manage and perform their own internal quality system audits. They will not hire a third party to perform the internal quality system audits.
2. Internal quality system auditors will perform audits in addition to their regular assignments. The employee's supervisor will allow them time away from their regular work responsibilities to perform two internal quality system audits per year.
3. Internal quality system auditors will be selected from all levels - wage, salary, and management - within the organization.
4. Internal quality system auditors will be selected from all business units – Donald Street Site, Drivetrain, Foundry, Product Engineering Center, and Purchasing - within the organization.
5. Internal quality system auditors will serve a three-year term. They may audit for a longer time if approved by their supervisor.

Delimitation

This study was delimited to internal quality system auditing at the John Deere Waterloo Works facilities. This study was also delimited to the auditing requirements of ISO 9001.

Statement Procedure

The procedure for this research study consisted of the following:

1. Review of current literature to determine and identify:
 - Internal quality system auditor qualifications and selection criteria.

- Training of internal quality system auditors.
 - Elements that make an effective audit.
2. Review John Deere Waterloo Works internal quality system audit process and procedures.
 3. Recommend changes to John Deere Waterloo Works internal quality system audit process and procedures to improve its efficiency and effectiveness.

Definition of Terms

Assessment – The same as audit. John Deere Waterloo Works uses the term assessment in place of audit for the planned evaluation of the quality system because of the negative connotation the term audit has in referencing to industrial engineering auditing a work standard.

Audit - An evaluation that is planned, systematic, and independent to determine if the quality activities and results are effective and comply with documented procedures.

Auditee - A person or organization who is being audited.

Auditor - A person possessing the necessary skills and training who performs the audit.

Compliance - A positive indication or judgment that the auditee meets the requirements of the relevant specifications, requirements, contract, or regulation.

Corrective Action Request - A formal written document given to the auditee. The auditee is required to investigate, identify root cause(s), and

implement a solution to eliminate the deviation or nonconformance from reoccurring.

Finding - A significant conclusion made by the auditor based on observed facts.

Independence - No connection between the auditor and auditee to eliminate any bias or influence on decisions.

Lead Auditor - The audit team member who has the responsibility to supervise the other auditors and has ultimate responsibility for all phases of the audit.

Management Representative – A person appointed by upper management to ensure that a quality system is established, implemented, and maintained and reports on the quality system's performance to ensure improvement.

Objective Evidence – Information gathered through interviews, examination of documents, and observation of activities and conditions used to prove or disprove the performance of required activities.

Qualification - A position a person or organization receives when showing fulfillment of the necessary requirements.

Quality System - The combination of organizational structure, responsibilities, procedures, processes, and resources required to implement quality management.

Root Cause – The fundamental factor for the occurrence of an event.

Site Coordinator - A quarter time position appointed by management for each major business unit within John Deere Waterloo Works to assist the assessment coordinator in planning the details of each audit.

Standard - A document developed by a recognized authority who outlines the necessary requirements for the intent of commonality.

Third Party Audit – Audit conducted by an organization that has no relationship to the auditor or auditee.

Verification - Confirmation of a corrective action to ensure that the root cause was identified and a solution was implemented to eliminate reoccurrence of the nonconformance.

Working Documents – The auditor's documents to assist in investigation, documentation, and reporting of the results.

CHAPTER II

Review of Related Literature

Josh Hammond (1996) defines auditing as “. . . an examination and discovery process that adheres to a strict set of procedures, requires patience and discipline and, among other things, uncovers mistakes, . . .”. Auditors must have specific personal skills, characteristics, and training to be effective in performing an internal quality system audit. A common misconception is that anyone can be an auditor.

Auditor Selection

The first critical part of an audit is selecting the audit team. Each member needs to be selected based on experience, skills, and training. One belief is that the only thing any person needs to do to perform an audit is to just follow the audit checklist. This is absolutely wrong (Pysh, 1995).

An auditor should have many important personal attributes. They include tact, objectivity, diplomacy, integrity, honesty, patience, inquisitiveness, tenacity, and professionalism. The auditor must be a good communicator, use sound judgment, and be unbiased in drawing acceptable conclusions based on the audit observations (Pysh, 1995) (Okes, 1995) (ISO 10011-2-1994). For corporate audits, the auditor must also be knowledgeable about the total process and well respected by division personnel (Pysh, 1995).

The auditor must perform the audit without offending auditees (Okes, 1995). They must also deal with concerned auditees to achieve the best

possible results (ISO 10011-2-1994). The auditor must remember they are auditing a quality system, not people (Okes, 1995).

The lead auditor must have the same personal attributes as an auditor and those necessary to lead an audit team. An auditor must participate in a minimum of three audits before being considered for a lead auditor position. They must also possess effective oral and written communication skills (ISO 10011-2-1994). National Steel Corporation requires a person to either successfully pass an ISO lead Auditor course and/or be a Certified Quality Auditor through American Society for Quality and participate in five corporate audits before being considered for a lead auditor position (Pysh, 1995).

Duane Bennett, a trained auditor and instructor, stated in an interview that there is no real test that can be given to determine if a person will be an effective auditor. The best way is to observe the person in an auditor training class and listen to how they answer questions (personal communication, December 05, 1998).

The organization's pool of trained auditors should represent as many departments and levels of the organization as possible. The auditors should not all come from the quality assurance department. This will avoid the audit police connotation quality assurance personnel would have (Okes, 1995).

Auditor selection is not dependent on a person's function or hierarchical position within the organization. The auditors will be more respected if selected

from within their own ranks. Thus each department should ask for nominees who possess the personal attributes of an effective auditor (Okes, 1995).

The pool of auditors should be rotated on a regular basis in two ways. This rotation is illustrated in Figure 2. First, the rotation occurs with the assignment of audits to teams. An audit team needs to rotate some members off and add other auditors for each audit. Second, each time a pool of auditors is selected there needs to be members carried over from the previous time period. This ensures an overlap of audit teams and pools to provide continuity and a fresh group of auditors (Okes, 1995).

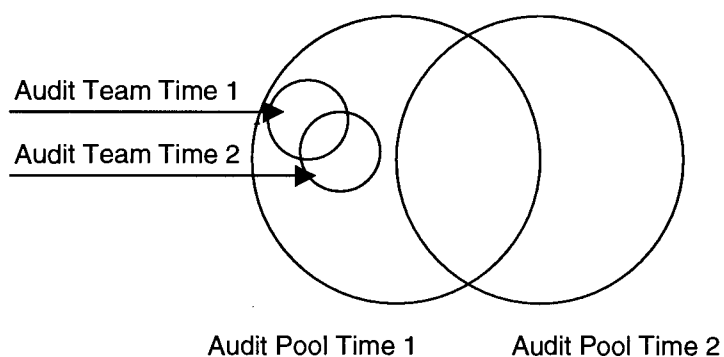


Figure 2. Auditor Assignments

Dave Wieland stated in an interview that the third year assessor digs deeper (personal communication, December 7, 1998). The veteran auditors go beyond the initial information that an auditee gives. The auditor seeks additional information and more details about the information initially given. Dave sees a challenge to make the first year assessors as effective as the third year assessors in gathering more detailed information.

Auditor Training

The best way to become a good auditor is to learn the fundamentals of auditing, understand the process and its purpose, then practice, practice, practice (Watson, Sampson, 1995). Thus training is the first step to becoming an effective auditor.

Effective auditor training must first follow adult learning principles. Second, it should be experientially based rather than lecture or theory. Third, the learners should be allowed multiple opportunities to share their own insights and experiences. Forth, the training should include the skills necessary for the auditor to be able to interact effectively with other people (Okes, 1995).

The adult learner brings a totally different perspective to the learning process than what is expected from the traditional age student going through the formal education system. There are four important assumptions that must be made about the adult learner. First, the adult learner's self-concept of learning moves from one of dependence to one of being self-directing. The adult learner directs their learning process rather than being lead. Second, the adult learner is continuously gaining a large background of experiences that becomes a resource for learning. Third, the adult learner's readiness to learn is dependent on their developmental task of social role. Forth, the adult learner's timing of training changes from learning material which will be applied sometime in the future to the application of the newly gained knowledge immediately. They seek training when it is needed and can be applied very shortly after the training rather

than at some unknown time in the future. Also, the focus of training moves from subject-centered training to problem-centered training (Knowles, 1974).

The list below is some additional considerations for training adults (Deere & Company class: Needs, Objectives, & Evaluations, 1991).

1. Adults must want to learn.
2. Adults will learn when they feel a need to learn.
3. Adults learn by doing and participating.
4. Adults learn by solving realistic problems.
5. Adults learn best in an informal environment.
6. Adults want feedback; but not grades.
7. Adults are influenced by experience.
8. Adults learn at different rates.
9. Adults want to know what direction they are headed and what's expected of them when they get there.

A tool Duane Bennett uses in his auditor training class is a pretest and posttest, which are not graded (personal communication, December 5, 1998).

The pretest is primarily used to give the students an idea what topics will be covered in the class. It also provides a measure of prior auditing knowledge the students come to class with. The posttest is used for the student's own purpose to measure what they have learned in the class. It is also a review because the answers are discussed in class. The pretest and posttest are the same and consist of multiple choice and true/false questions.

Considering adult learning principles and the ability for employees to break away from their jobs for training, Duane Bennett holds four-four hour long classes. This is better than two eight-hour sessions since it minimized the time away from the job at any one time so that others in the organization can cover if necessary. Also the time between the four sessions allows the students some time to do home work. The homework usually consists of preparing for the audit that is done as part of the class (personal communication, December 5, 1998).

Duane covers of the following topics in his class.

1. Review the twenty elements of ISO 9001.
2. Discuss how to prepare for audit.
3. Discuss the audit cycle, audit tips, and definitions (language the auditor uses in auditing). Only a vital few definitions are presented. The many other definitions are covered in a follow-up training session.
4. Discuss how to develop a audit checklist and its contents.
5. Perform a complete audit from opening meeting to closing meeting. The class is given a procedure to audit, Corrective Action Request form, and generic audit checklist questions (tell me, show me, how do we tell). The audit takes about 10 of the 16 hours.
6. Discuss the audit to review what happened and what improvements could be made (personal communication, December 5, 1998).

The Guidelines for Auditing Quality Systems ISO 10011 (1994) states that auditors should maintain their auditing competency by attending a refresher

class or having their performance reviewed. This can be accomplished in what Duane Bennett describes as the next level of training following the basic audit class and some audit experience. It would be a combination of mentoring with an experienced auditor and networking with other trained auditors. He also recommends that the lead auditors attend a specific lead auditor training class because they require additional skills unique to their role (personal communication, December 05, 1998).

Audit Checklist

Basic auditor training includes the creation and use of checklist as one of the auditor's working documents. The checklist is a critical part to the success of an audit. The auditor should not consider attempting an audit without a one. The checklist is a key element in preparing for an audit. Its purpose is to plan the sampling and gathering of information and data. A good checklist helps ensure a good audit (Scharchburg, Boulerne, 1995).

The checklist should be designed so that it does not restrict additional audit activities or investigations. The checklist needs to allow the auditor to deviate from the scheduled path and follow any leads to probe deeper and gather more detailed information (ISO 10011, 1994).

The checklist is used in every step, from planning to reporting, of the audit. It is a guide to keep the auditor focused on the audit purpose and schedule. The checklist also provides a review of the audit observations for

reporting the audit and status of corrective action. Future audit teams also use past checklist to plan audits (Rosecrane, Modine, 1995).

The process to develop a checklist consists of the following steps (Scharchburg, Boulerne, 1995).

1. Review the applicable sections of ISO 9001 standard that will be audited.
2. Review applicable company and department documents that relate to the audit. This includes previous audit reports and open corrective action request.
3. Review previous audit checklist.
4. Create checklist from a combination of past checklist and new questions the audit team develops based on the audit scope.
5. Review the audit checklist before performing the audit. The checklist is typically shared with the auditee for an internal audit.

The checklist consists of brief questions or statements accompanied by references to the standard or internal procedure. The reference can then be quickly located to answer a question or document a nonconformance (Burr, 1997) (Rosecrane, Modine, 1995).

The checklist questions must focus on the following items (Scharchburg, Boulerne, 1995).

1. Does the quality system exist and is it documented?
2. Is the quality system implemented and maintained?
3. Is the quality system effective in achieving the quality objectives?
4. Is there evidence of improvement in the quality system?

An effective, easy-to-use audit checklist will include more than just questions and references to the quality system. The checklist must have evaluation criteria and a list of what needs to be verified. Lines are also added to designate what information to collect and how many samples are required (D. Bennett, personal communication, December 05, 1998) (Brown, 1997).

The audit checklist must have space available for additional auditor observations. These include recording the auditee's verbal response to questions, and supporting documentation shown by auditee to demonstrate quality system compliance. The auditor must also document all of the individuals who were interviewed, their position, where the interviews took place, additional areas that need to be investigated, and related observations suggesting noncompliance in other sections of quality system. The auditor must ensure that all the necessary information is collected on the checklist so that it can be found to correct a nonconformance (Rosecrane, Modine, 1995) (Burr, 1997).

The information the audit team collects on the checklist are observations of facts substantiated by the objective evidence gathered. From the observations findings, which are important conclusions based on one or more observations, are identified (Rosecrane, Modine, 1995).

The checklist identifies each observation as a strength, conformance, nonconformance, or follow-up required. Follow-up required is used because it leads the auditee to believe that some action needs to be taken (D. Bennett, personal communication, December 05, 1998).

Special marks can be used to code the information for easy reference while auditing and writing the final report. The mark may identify additional information that must be investigated in another area, an observation of a nonconformance, follow up is required, or some element the auditor wants to note as working well (Rosecrane, Modine, 1995).

Audit Questioning

Duane Bennett uses the flow chart in Figure 3 as a questioning aid for training new auditors. Duane stated, "When an auditor is given an answer to a question they either accept it or explore it" (personal communication, December 05, 1998). It identifies the process the auditor goes through when asking questions and evaluating the answers.

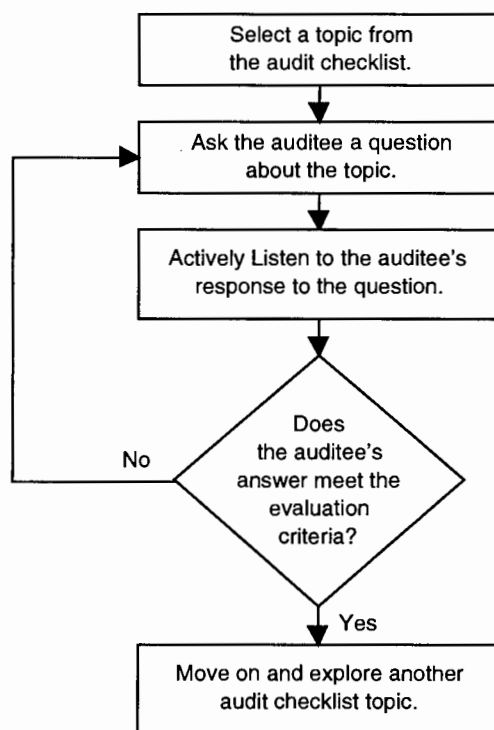


Figure 3. Auditor Questioning Flow Chart

The auditor uses the flow chart and evaluation criterion from the checklist to guide their interview process. Either the auditor asks an additional question to explore the checklist question further or the auditor accepts the answer and move on to another question on the checklist.

A common failure of most audit checklist is the type of question that is asked. To often the simple yes/no close-ended question is used. The primary problem is that very little information is obtained when a yes or no answer is given. Thus further questioning is required. A more effective questioning style, particularly for an inexperienced auditor, is to phrase the question so that a narrative response is required. The auditor should use words such as describe, what, how, who, where, when, review, verify, assure that, identify, and show the evidence in their questions to an auditee.

Sometimes a close-ended question is acceptable. If it is necessary to ask a yes/no question, the auditor should expand on it to get more information by asking the auditee show me, describe the process, or where's the proof (Brown, 1997).

Audit Value Adding

Internal quality system audits are performed for the organization's management. They want the audit to be value adding. This can be accomplished in several ways. First, the single biggest value-adding item is for the auditors to get past the what is wrong and identify why it is wrong. This does not have to be a full-blown root cause analysis for each item in the audit report.

When the nonconformance is identified the auditor is in the right place and time to help identify the why. To often when management goes back to investigate a nonconformance something has changed and the true cause cannot be identified.

Second, to provide value to management, the auditor must put audit findings in perspective. The audit team must consider the impact of the audit findings on the organization. It should not be a list of “nits” that have no real impact on effective work performance. If it is truly a “nit” then report it as such. Value added auditing not only reports the audit findings but also the impact of the condition on effective work performance by asking two questions. What if the discrepancy is left uncorrected? What will be the advantage of implementing corrective action or this recommendation?

Third, audit value adding deals with one of the primary reasons for performing internal audits. The audit team must make sure the audit helps improve the process (Johnson, 1995).

Audit Techniques

The efficient auditor must maintain control during the audit. This is accomplished by choosing who to interview, which documents will be sampled, and time management. The auditor should stay on schedule by arriving and leaving on time. The auditor must remain objective and should not try to solve the auditee’s problem during the audit. Corrective action maybe discussed after

the audit. The primary responsibility for corrective action lies with auditee management (Burr, 1997).

Observation by the auditor is a very important tool to help ensure success. First, the auditor must be observant of their own body language to ensure it does not judge any answer. The auditor is there to observe and collect objective evidence. The judgment or evaluation will take place at the end of the audit not during the interviews.

Second, the auditor must observe the auditee's body language. It may say something different than what the auditee says verbally.

Third, the auditor must observe the surroundings. Half of the information comes from seeing not hearing. Even though observation is very important the auditor must avoid the wandering eye because it is impolite and indicates ineffective listening. The auditor should look around after the interview or have a partner auditor look around while interviewing the auditee (Burr, 1997).

Accademia Qualitas (1995) states in their training that communication between the auditor and auditee comes in three forms. The breakdown for each contributing to the total communication process is:

Through words	7%
Face and body	55%
Tone of voice	38%

Thus the greatest portion of communication comes from nonverbal forms that the auditor needs to be observant of.

The auditor will ask more questions than what are on the checklist. The questions should be open-ended because more useful and relevant information is obtained quicker. Rhetorical questions such as “You understand what I mean by this, don’t you?” should not be asked. The auditor does not expect an answer to this type of question so do not ask it. Also, questions about something the auditors assume the auditee does or knows should not be asked. This includes leading questions.

A good questioning technique the auditor can use is a hypothetical question, “If a given situation would occur what would you do?”. This type of question eliminates accusation. Or the auditor could use a dumb question, “I do not know anything about the process could you tell me about it or describe it?”. A few dumb questions are useful but do not ask too many because the auditee may believe it is true.

Sometimes the questions do not have to be express. The auditor can use a nonverbal question (body language) such as raised eyebrows, half smile, or use the statement, “Oh.”. It sounds like the auditor really understands the process.

The basic objective of the interview is to get the auditee to talk freely and guide the discussion with questions. No matter why type of question is asked or how it is asked, the best question is one that encourages the auditee to talk freely about what the auditor wants to know (Burr, 1997).

The auditor should minimize note taking during an interview because the auditee wants to know what is being written, especially if they are insecure about their answers. Some people may even feel threatened by the auditor taking notes. The auditor should write a few key words and fill in details between interviews.

The auditor must avoid trying to understand the process. The purpose is to determine if auditee understands the process. The auditor must use the checklist and ask about things that are unusual, out of order, or does not make sense (Burr, 1997).

CHAPTER III

Report of Findings

John Deere Waterloo Work's has the following quality system elements to document internal quality system assessments.

Quality Manual

- QM1700 Internal Quality Assessments

Quality Procedure

- QP1710 Assessor Training
- QP1720 Assessment Planning
- QP1730 Performing Internal Assessments
- QP1740 Assessor Selection

Work Instruction

- WI1730.001 Findings Meeting
- WI1740.001 Assessor Evaluation and Selection

Quality System Form

- Quality System Assessor Application Form

Assessor Selection

Dave Wieland's responsibilities include coordinating internal assessments. Dave described the internal assessor selection process for this current year as follows. (personal communication, December 7, 1998)

1. Site coordinators identify which quality system elements will be assessed and how often. They also determine how many assessors are required for each

assessment. This assessment plan determines the total number of assessors required for the next assessment year.

2. Dave identifies how many assessors from the current pool of assessors will continue for the next assessment year.
3. Dave uses this information to identify how many new assessors will be required for the next assessment year.
4. Dave meets with the Executive Quality Council to obtain approval for the next years assessment plan and request new assessors.
5. Dave determines how many new assessors are needed from each business unit once the assessment plan is approved. This is based on the percent of total employees in each business unit.
6. Dave sends out a note to the Business Review Group (middle and upper management) requesting the number of assessors required from their business unit. Appendix A list the desired assessor qualifications Dave published in his note. The qualifications are documented in procedure QP1740 Assessor Selection.
7. Managers pass the request out to their employees.
8. Employees identify their desire to apply for the open assessor positions by completing the Quality System Assessor Application Form found in the quality system. The applicant's supervisor approves the application and sends it to Dave.

9. Dave received thirty-nine applications for the thirty-three open assessor positions in 1998/1999 and reviewed the qualifications of each applicant. All applicants met the assessor qualifications. Thirty-three assessors were selected based on which business unit they were from to obtain a cross section of the organization. The remaining six applicants will have initial consideration next year.
10. The Executive Quality Council approved the complete list of assessors.
11. Dave assigns the assessors two assessments for the year. This is done based on previous assessments the assessor has been involved in or the skills and strengths listed on their Quality System Assessor Application Form.

Assessor Training

Once the assessment plan is complete for the coming year, Dave arranges training for the new assessors. The training is done in-house by John Deere Waterloo Works employees who are Certified Quality Auditors from American Society for Quality. The class materials are purchased from Accademia Qualitas which has an affiliation with John Deere Waterloo Works' registrar QMI.

Assessor training consists of two parts. The first part is a two-day classroom session covering the assessment process and ISO 9001 Quality Systems-Model for Quality Assurance in Design, Development, Production, Installation, and Servicing. The specific topics for each day are listed in the Appendix B. John Deere Waterloo Works has used this material since 1994 when the quality system was initially registered.

The instructors have continuously improved the curriculum based on class evaluation feedback and their assessing and training experience. An improvement identified from the latest training class is to reduce the amount of time spent on topics that the assessors do not get directly involved with such as assessment planning and scheduling. This would allow more time to provide guidance in preparing the questions/checklist for the "mock" assessment.

The second part of the assessor training is to have each new assessor observe an assessment. The new assessor shadows an experienced assessor and is encouraged participate as the day progresses. The observation assessment provides the new assessor a chance to transition from the classroom to an actual assessment.

When the assessor completes the training and goes out on their first assessment a support, experienced, assessor accompanies them. The support assessor provides assistance and feedback to the inexperienced assessor.

Dave Wieland has recently developed a training session for site coordinators and lead assessors. The training covers the quality system experts, the assessment process, and the tie between quality initiatives and the quality system. The training provides additional information on assessment administration that is not covered in the basic assessor training session (personal communication, December 7, 1998).

Assessment Process

Each assessment begins with the management representative meeting with the site coordinators to identify the scope, purpose, and schedule of each assessment. The site coordinators identify specific auditees the assessors will interview. The Quality Assurance managers may request a specific focus for the assessment based on a known quality problem they want investigated.

The management representative and site coordinators document the scope, purpose, and auditee information on the assessment report. Then the lead assessor completes the assessment report and sends it to the auditees as a notification of the assessment details.

The lead assessor organizes and chairs a pre-assessment meeting with the assessment team. The lead assessor ensures the assessors understand the scope and purpose of the assessment and their assignments. The assessment team then develops a checklist for their specific assessment using previous checklist. A technical advisor may be invited to attend the pre-assessment meeting if the team needs additional expertise in the area they will be assessing.

Each assessment team creates a unique checklist that typically is a modification of previous checklist. Most checklists have only a list of questions the assessors need to gather information on. A few assessment teams have developed a more extensive checklist to help encourage the proper data collection.

All assessments, except process control, are performed within one day. The assessors perform the interviews and data gathering in the morning. After lunch the team holds the findings and closing meetings. The objective of the findings meeting is to combine the team's observations into findings. The findings are presented in three categories – Elements Working Well, Improvement Opportunities, and Nonconformance. The objective of the closing meeting is to ensure the auditees understand the findings.

CHAPTER IV

Summary

This study sought to evaluate the internal quality system audit process used at the John Deere Waterloo Works. The evaluation made recommendations about auditor selection, auditor training, and improving auditor efficiency.

This evaluation was accomplished by performing a review of literature on the research topics, reviewing John Deere Waterloo Works internal quality system audit process, and made recommendations to improve auditor selection, training, and efficiency.

Recommendations

Auditor Selection

The auditor selection process meets the requirements identified in the literature and auditing standard by selecting auditors from all areas and levels within the organization. The criteria established for the number of assessors required from each business unit helps ensure that this will occur. Also, the auditor self-nomination and selection process identifies the candidates' experiences and skills and evaluates them against a list of desired auditor qualifications listed in Appendix A.

A recommend change results from the difference between the auditor selection process Dave Wieland described in an interview and the auditor selection process described in procedure QP1740 Assessor Selection and work

instruction WI1740.001 Assessor Evaluation and Selection (personal communication, December 7, 1998). The procedure and work instruction states that a panel of the Quality Assurance Managers is involved in the auditor selection process. The auditor selection process described by the Dave Wieland does not include the Quality Assurance Managers in the process (personal communication, December 7, 1998). Instead Dave reviews the applications and selects the auditors, which is then approved by the Executive Quality Council.

The owners of the auditor selection procedure and work instruction must review the current process and the one outlined in the quality system documents. They must then determine what the process should be and make the necessary changes so the actual selection process and written process agree.

Auditor Training

Accademia Qualitas did the John Deere Waterloo Works internal quality system auditor training initially. Currently John Deere employees train new auditors using training materials purchased from Accademia Qualitas. The instructors have continuously improved the class based on class evaluations.

It is recommended that a revolutionary rather than evolutionary change be made to the auditor training process. John Deere Waterloo Works should no longer purchase off-the-shelf training materials. The purchased training material is generic to the industry. It covers all aspects of auditing and does not address the specifics of the John Deere Waterloo Works internal quality system audit process.

The evolutionary change in auditor training involves three changes. First, divide the training into shorter segments. Second, change the sequencing of training activities. Third, eliminate topics not relevant to the auditor and add some specifics about the John Deere Waterloo Works auditing process. The revised auditor training sessions outlined in Appendix C can be developed from learning objectives developed by Training and Development and internal audit experts. The training sessions and materials can be developed by an audit professional within John Deere Waterloo Works or at a local community college and modeled after adult learning principles.

Dividing the auditor training into small segments minimizes the disruption of the employee being away from their work area. Also, it allows reflective time between sessions and provides the students time to work on some activities outside to the training sessions. The smaller segments introduce the new material over a longer time period to minimize overload of new topics. This also allows other employees to take a segment of the total training.

The training sequence revision will provide a more logical flow to the training process. Moving the observation audit before basic audit training allows the new auditor to view the audit process before learning the details. This will eliminate some of the, what is going to happen, questions and have the students focus more on the how to accomplish the auditing task. Also, more emphasis will be placed on the role of the support auditor as a mentor to help hone the new auditor's skills and techniques. The support auditor will use the checklist in

Appendix D to ensure consistent evaluation. The support auditor checklist will document the new auditor's skills and areas of improvements.

The support auditor's checklist can be used in future years, if necessary, to reevaluate an auditor's skill to ensure that a minimum acceptable skill level is maintained, evaluate previously identified improvement areas, and identify additional improvements opportunities.

The audit coordinator will review all support auditor checklists to ensure that the improvements are followed up on. Also, the audit coordinator can identify improvements in auditor training or the need for additional auditor training if reoccurring improvement activities are identified which can be resolved through training. Ultimately the training and continuous improvement activities should ensure that two auditors examining the same objective evidence would draw the same conclusion.

Revising audit training session topics includes both eliminating and adding topics. Audit training topics about the different types of audits and audit administration will be eliminated. They are not relevant to the auditors. Internal auditors need to learn how to audit and not global audit issues. Also, topics regarding John Deere's quality system, audit scheduling, and auditor assignments need to be added to auditor training.

Several auditors will also be a lead auditor which requires additional responsibilities and skills. The training session to prepare lead auditors also requires changes. The John Deere Waterloo Works' in-house lead auditor

training does a very good job of describing quality system experts, the internal quality system audit process, and the tie between quality initiatives and the quality system. The lead auditor training is missing information on how to lead an audit team, prepare the audit team, chair the pre-audit and findings meetings, identify audit findings, and write an audit report.

The lead auditor training can be accomplished in two ways. One option is to have them attend a lead auditor class developed and taught by a professional organization. The advantages include time savings in having not to develop the training, the training is done by experienced professionals, the training is automatically kept up-to-date with changing auditing methods, and the lead auditors can network with several other organizations.

The other lead auditor training option is to enhance the current in-house class. The topics and class logistics are listed in Appendix F. The main advantage is that the training can be tailored to fit with John Deere Waterloo Works' internal quality system auditing process and not cover lead auditing in generic terms which a outside training organization would do. Also, the in-house lead auditor training would eliminate the expense of travel and the class can be scheduled and taught when it is needed rather than when an outside organization scheduled the training. The greatest disadvantage is the need to develop an in-house lead auditor expert with the necessary training skills to develop and deliver the lead auditor training.

Auditor Efficiency

Once the auditor has been selected and trained they need assistance in performing their audit function to ensure maximum efficiency. Appendix E provides checklist for the auditor, lead auditor, site coordinator, and audit coordinator. The checklist is a tool to assist each of the audit functions to ensure that all of the necessary activities occur. The checklist is useful because auditing is done infrequently which increases the possibility of forgetting a required activity. The checklist also ensures consistency in preparation and performance of the audit activities.

The audit checklist of questions is similar to the preparation checklist since it ensures that all audit topics are covered with each auditee interviewed. A well-prepared checklist can greatly improve the efficiency of the auditor. Thus an experience auditor on the team should prepare the checklist, which is probably the lead auditor, to ensure it is developed correctly.

The checklist should include a reference to what quality system element is being addressed, what is the expected answer, what sample size needs to be taken, what objective evidence must be collected, and what verification is necessary. The checklist must also provide adequate space for recording the objective evidence.

The auditor must follow the process outlined in Figure 2, Auditor Questioning Flow Chart, when interviewing the auditee. The flow chart will help

the auditor determine if more questions are necessary to gather the appropriate objective evidence to support the team's findings.

The flow chart helps the auditor decide when to move on to another audit checklist topic; but it does not help the auditor to get there as quickly as possible. The art of questioning techniques must be employed to get the most information from the auditee in the most efficient means. This includes identifying the different type of questions the auditor can ask and what question type works best in a given situations.

The flow chart and questioning techniques must be included in auditor training and preparation. During auditor training, the instructor can cover the flow chart, review some examples, and have the auditors do some role playing to practice the different questioning techniques. During auditor preparation the auditor can review the different types of questions and prepare some specific questions to ask. To ensure this occurs the auditor checklist includes a reminder for the auditor to reviewing questioning techniques.

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APPENDIX A
QP1740 ASSESSOR SELECTION

Desired Assessor Qualifications:

- Interviewing skills
- Comfortable giving oral reports
- Able to communicate at all organizational levels
- Empathy
- Willing to trace leads
- Able to write clearly
- Good planning skills
- Good organizing skills
- Trusted judgment
- Open minded
- Diplomatic
- Self disciplined, able to hold temper
- Honest
- Unbiased
- Good listener
- Patient
- Industrious
- Inquiring mind
- Analytical
- Unafraid of unpopularity

APPENDIX B
INTERNAL AUDITOR TRAINING COURSE ISO 10011 BY ACCADEMIA
QUALITAS

Day One

- Introduction
- Audit Basics
- Preparing the audit
- Case study on Preparing Checklist
- Conducting the Audit

Day Two

- ISO 9001 Requirements
- Qualifications and Behaviors
- Closing Meeting
- Summarizing and Presenting
- Reporting and Follow up
- Planning and Scheduling
- Mock Audit
- Exam graded by Academia Qualitaus. The results are sent only to the student.

APPENDIX C
REVISED AUDITOR TRAINING SESSIONS

#1 Internal Quality System Auditor Orientation Session

Class Length

- 1.5 hours

Topics

- Introduction internal quality system audits.
- Review the training process.
- Review audit schedule and help the auditors identify their specific audit dates.
- Review the internal quality system audit process at John Deere Waterloo Works.

Instructional Methods

- Lecture style

Pework

- Locate and review the internal audit schedule and auditor assignment worksheets on the fileserver.

Logistics

- The class is taught by the audit coordinator.
- Audit coordinator and Training and Development make all necessary arrangements.

Additional Comments

- This session should be held within a month after assessors are selected.

#2 Awareness of ISO 9001

Class Length

- 4 hours

Topics

- Review the twenty elements of ISO 9001.
- Identify John Deere Waterloo Works quality system elements for each of the twenty elements.

Instructional Methods

- Lecture style.
- Discussion of prework assignment.

Pework

- Orientation to John Deere Waterloo Works Quality System.
- Exercise to identify a quality system element for several audit findings.

Logistics

- Class will be taught by Management Representative.
- Audit coordinator and training and Development make all necessary arrangements.

Additional Comments

- This session is to be held before the observation audit.
- Breaking this material out will help eliminate some of the information overload in the auditing class.

- This session will also be used to train quality assurance personnel and any other person who needs a more in-depth knowledge of ISO 9001 and John Deere Waterloo Work's quality system.

#3 Observation Audit

Class Length

- 2 hours Audit preparation
- 2 hours Pre-audit meeting
- 8 hours Audit day

Topics

- Participate in an internal quality system audit.

Instructional Methods

- Auditor observes an actual audit.

Pework

- Participate in pre-audit meeting.
- Read appropriate quality system elements.

Logistics

- Audit coordinator schedules new auditor to shadow an experienced auditor.

Additional Comments

- New auditors observe an audit before attending the basic auditing class. This will give the auditor a macro view of the internal quality system audit process before learning the details (micro view). The observation audit will answer typical questions about what occurs during an audit so the auditor can focus questions and attention on how to perform an audit during the next class.

#4 Basic Auditing Class

Class Length

- 12 hours

Topics

- Pre-audit meeting
- Checklist development
- Questioning techniques
- Listening techniques
- Auditing tips
- Root Cause Analysis
- Sampling principles
- Behaviors
- Audit language (definitions)
- Summarizing audit observations into findings
- Perform an audit

Instructional Methods

- Lecture
- Discussion
- Team activities
- Practice exercises
- Role playing

Pework

- Read ISO 10011 and prepare questions.
- Review the procedure to be audited in class.
- Prepare a checklist.

Logistics

- Audit coordinator and Training and Development make all necessary arrangements.

Additional Comments

- Divide the class into three four-hour sessions and hold them over several days. The auditors can work on some class materials between sessions. Also, work disruptions will be minimized.

#5 Audit with Support Auditor

Class Length

- 2 hours Audit preparation
- 2 hours Pre-audit meeting
- 8 hours Audit day

Topics

- Perform an internal quality system audit with an experienced auditor (mentor).

Instructional Methods

- Experienced auditor identifies strengths and improvement opportunities for new auditor with use of the Support Auditor Checklist in Appendix D.

Pework

- Participate in pre-audit meeting.
- Read appropriate quality system elements.

Logistics

- Audit coordinator schedules auditors.

Additional Comments

- The purpose is to encourage continuous improvement.
- This format can be used to identify improvement opportunities for other auditors if necessary.

APPENDIX D
SUPPORT AUDITOR CHECKLIST

Support Auditor Checklist

Support Auditor: _____

You are scheduled to be a support auditor for _____ on _____ 19____. The pre-audit meeting will be held about two weeks before the audit. (The lead assessor will schedule the meeting on schedule plus). The audit will cover the quality system elements listed below.

Please read the quality system elements and QP1730, Performing Internal Assessments, before the pre-audit meeting.

The purpose of this checklist is to document specific examples of how the auditor performs and identify strengths and improvement opportunities.

Please return completed form to the audit coordinator (_____).

Questioning techniques - did the auditor use appropriate question techniques to obtain the necessary information. (For one interview count how many of each type of questions listed below the auditor ask.

Closed	Hypothetical
Factual	Rhetorical
Leading	Direct
Justifying	General
Alternative	Controversial

Objective evidence - was all of the necessary information collected to document the auditors findings? (Please explain)

Audit leads -what leads did the auditor follow-up on and which were not followed-up.

Effective use of time - did the auditor use the limited interviewing time wisely. (Please explain)

Initial/final statements - did the auditor begin and end each interview by putting the auditee at ease, stating his purpose, providing an overview of what was going to take place, and giving a summary. (Please give examples)

Auditor preparedness - was the auditor prepared for the audit. (Please give examples)

Checklist - how did the auditor use the checklist to maintain audit focus and collect the appropriate objective evidence.

APPENDIX E
AUDIT CHECKLIST

Auditor Checklist

You are scheduled to perform an internal quality system audit on _____ 19_____. The pre-audit meeting will be held about two weeks before the audit. (The lead assessor will schedule the meeting on schedule plus). The audit will cover the quality system elements listed below.

- Bring safety equipment (Hearing/glasses/shoes) and wear auditor shirt.
- Read the quality system elements covered by the audit.
- Read QP1730 Performing Internal Assessments.
- Review checklist and identify potential objective evidence and quality system record information which needs to be collected.
- Become familiar with the scope and purpose of audit.
- Prepare interviewing techniques (introduction/questioning/exiting comments).
- Review listening skills.
- Review questioning techniques. (What type of question to ask when.)
- Review audit interview and meeting schedule.
- Take audit notes in pen and fill in all blanks.
- Give all working documents to the lead assessor at the end of the audit.

Lead Auditor Checklist

You are scheduled to lead an audit on _____ 19_____. The audit will cover the quality system elements listed below.

- Schedule pre-audit meeting approximately two weeks before the audit.

Invite the audit team, audit coordinator, and cc site coordinators.

- Schedule findings and closing meeting rooms.

- Complete audit report and send out with a cover letter to auditees, quality system element owners, and appropriate management identified by site coordinators.

- Complete final report and sent out within five working days after the closing meeting.

- Complete CAR forms, if necessary, and send out within five working days after the closing meeting.

- Prepare for pre-audit meeting.

- Review past audit report.
- Prepare site coordinator sheet (Names & Phone numbers).
- Review past audit checklist.
- Determine if there are any open CARs to investigate.
- Review working papers from the latest audit on similar quality system elements (from audit coordinator).
- Read Quality Manual and Procedures the audit team will audit.

- Read QP1730 Performing Internal Assessments.
 - Prepare a draft checklist.
- Hold pre-audit meeting. Proposed Agenda:
- Introductions.
 - Review scope and purpose of audit.
 - Review key points from quality system elements to be audited.
 - Review auditor assignments.
 - Review latest audit working papers.
 - Discuss draft checklist.
 - Review final report elements. (Elements Working Well, Improvement Opportunities, CARs, System Effectiveness)
 - Review objective evidence and quality system records that needs to be collected.
- Review short term response on CAR(s) from auditee.
- Gather all auditor working papers and send to audit coordinator.
- Send thank you to audit team.
- Prepare for closing meeting.
- Closing Meeting Sign-up sheet
 - Overheads of scope, purpose, and audit schedule.
- Prepare for findings meeting.
- Print blank CAR forms.
 - Determine how to organize auditor findings.

- Copy of WI1730.001 Findings Meeting Agenda
- Save electronic files of the audit report and blank CAR form on disk.

Audit Site Coordinator Checklist

An internal quality system audit is scheduled for _____ 19_____

on the quality system elements listed below.

- Select departments and people/job functions to be audited based on.
 - Scope and purpose of the audit.
 - How much the department has been audited in the past?
 - What are the future plans/audit potential for these areas?
- Complete draft audit report with auditee names, interview times, and list appropriate management the audit report needs to be sent to.
- Verify auditees are ready for the audit a couple days before the audit.
- Maintain a spreadsheet of which department was audited when for which quality system elements.
- Coordinate auditor escorts, if necessary.

Audit Coordinator Checklist

- Meet with Quality and Reliability Managers to determine special focus of the audit.
- Input audit scope, purpose, and special focus on the draft audit report.
- Identify how many auditees each auditor will interview.
- Input audit team on draft audit report.
- Verify site coordinators have identified auditees.
- Gather and file audit working papers.
- Attend findings meeting with a copy of the quality system.
- Provide auditor contact list to lead assessor.
- Put checklist, final report, and CAR(s) in quality folder on the file server.
- Identify which auditor will audit the areas identified.
- Line up process experts for pre-audit meetings.
- Send draft audit report to lead auditor.
- Verify closure of CAR(s).
- Attend pre-audit meeting.
- Attend audit findings and closing meetings

APPENDIX F
REVISED LEAD AUDITOR TRAINING SESSION

#1 Internal Quality System Lead Auditor Training Session

Class Length

- 6 hours

Topics

- Quick review of important basic auditing skills.
- Demonstrate how to follow documentation trails.
- Review the internal quality system audit cycle and the lead auditor's responsibilities in each step.
- Review the lead auditor checklist.
- Discuss some basic facilitation skills needed for the pre-audit and findings meeting.
- Discuss preparing for and leading the pre-audit, findings, and closing meetings.
- Discuss sample sizes and techniques.
- Discuss how to determine if audit observations should be reported as an audit finding.
- Review the elements of an audit report.

Instructional Methods

- Lecture
- Discussion
- Team activities
- Practice exercises

- Role playing

Pework

- Review basic auditing class materials.
- Review audit working papers from a previous audit.

Logistics

- An in-house expert teaches the class.
- Audit coordinator and Training and Development make all necessary arrangements.

Additional Comments

- The auditor must have a minimum of one-year auditing experience before being selected as a lead auditor. Also, the additional skills required by lead auditors should be identified.