

Planning Front-End Analysis Report for MFS Network Control Center Technician

Prepared by
Ann Nicholson

The Operant Group

Section 1: Executive Summary

A. Project Goal

Conduct a human performance needs analysis on the new job of Network Control Center (NCC) Technician, specialty: Network Switching/PBX (Private Branch Exchange).

B. Interviewed/Observed

In November 1994, I visited the MFS NCC located at the InfoMart in Dallas, Texas. I met with and observed the following accomplished performers: Steve Rowe (1st shift) and Rodney Fletcher (2nd shift).

C. Documentation Reviewed

1. Ericsson Operation and Maintenance (O&M) Manuals
2. Ericsson Training Student Workbooks (Maintenance, Signal Transfer Point (STP) Basic Method of Operations)
3. Four job aids developed by Ericsson NIT (Log into the LAN, MSS, & TMOS; Monitoring the Network; NCC Audit Checklist; and Check for Posted Activities)
4. Steve Rowe's personal notebook
5. Employee training schedule for Ericsson courses
6. MFS Call-Outs book

D. Major Accomplishments

ACC. A: NCC Technician with information from previous shift ready for current shift

- ACC. B: Network (switch/route) operational after alarm
- ACC. C: Switch operational after routine maintenance
- ACC. D: SS7 routes with no disturbances, blockages, or failures (I-NET) after alarm? After installation?
- ACC. E: PBX system operational after alarm
- ACC. F: PBX monitoring system operational to standards
- ACC. G: PBX system secure from toll fraud

E. Summary of Recommendations

1. Determine minimum skill levels for the various accomplishments and bring each NCC Technician to those levels.
2. Develop standardized procedures for the processes specified in the report and document those procedures using job aids.
3. Design work flow processes to minimize work environment barriers, such as uncertainty as to who is to respond to which alarms and who is to work on which alarms; notification of management requirements; and access to switch-engineering documents/updates.
4. Prior to implementing new functions and equipment, determine staffing requirements and skill levels, and then develop procedures.
5. Determine criteria for the various tasks and develop a way to measure how well each NCC Technician performs the tasks. Develop a method for management to inform the NCC Technicians of their performance.
6. Prepare performance-based job descriptions.

Section 2: Task Lists

- A. ACCOMPLISHMENT: NCC Technician with Information from Previous Shift Ready for Current Shift
1. Obtain information by verbal report from previous shift personnel.
 2. Obtain additional information from whiteboard notices, TMOS messages, MSS Call Logs, Trouble Reports (TRs), Customer Service Reports (CSRs), and email.
(Information to obtain: Network status, expected calls, calls to make (call-backs), work in progress, scheduled tests, scheduled maintenance, and any other information pertinent to monitoring the network and diagnosing/resolving alarms.)
- B. ACCOMPLISHMENT: Switch/Route Operational after Alarm
1. Monitor switching network
 2. Diagnose cause of alarms
 3. Resolve alarms
 4. Refer/escalate alarm to Switch Engineering (Tier II) Department and/or Ericsson Technical Assistance Center (TAC)
 5. Document calls, TRs, and CSRs
- C. ACCOMPLISHMENT: PBX System Operational after Alarm
1. Diagnose cause of alarm
 2. Fix the problem
 3. Refer problem to branch
- D. ACCOMPLISHMENT: PBX Monitoring System Operational to Standards
1. Check modems and screens
 2. Check battery back-up
 3. Check system for capability to log in via LAN

- E. ACCOMPLISHMENT: PBX System Secure from Toll Fraud
 - 1. Identify pattern of excessive calls
 - 2. Identify origination of call
 - 3. Notify appropriate personnel about possible toll fraud
- F. ACCOMPLISHMENT: Switch operational after routine maintenance (*Data not available.*)
- G. ACCOMPLISHMENT: SS7 routes with no disturbances, blockages, or failures (I-NET) (*Data not available.*)

Section 3: Influences

- I. Ericsson provides training for the following:
 - A. Surveillance
 - B. Alarm Resolution
 - C. Automatic Quality Service Control (AQSC)
 - D. Routine Maintenance
 - E. TMOS
 - F. Translations
 - G. Software
 - H. Other aspects of the switch directly or indirectly related to the NCC Technician job accomplishment (see Attachment A for the Ericsson curriculum, which lists job skills)
- II. I-NET provides training for SS7 Route Monitoring
- III. I observed the following positive influences at the NCC:
 - A. Accessibility to documentation
 - B. Accessibility to training
 - C. Accessibility to Tier II staff

- D. Accessibility to Ericsson staff and Technical Assistance Center (TAC)
- E. Immediate supervisor willingness to facilitate interdepartmental interactions and to provide information about scheduled events

IV. Negative influences observed at the NCC:

A. Skills/Knowledge

- 1. Some NCC Technicians are not competent to determine the cause of alarms by system elements not part of the Ericsson switch.
- 2. There is a wide range of skill levels among the NCC Technicians, thus making staffing and scheduling more difficult for supervisors and, possibly, causing the more competent technicians to be inequitably burdened with the more difficult and time-consuming problems.

B. Environment

- 1. Lack of clearly defined job responsibilities/descriptions.
- 2. Lack of internal procedures for the following:
 - a. Escalation of network switching alarms/problems (forward escalation and backward notification)
 - b. Shift turnover/notification
 - c. Call Log standardization
 - d. Who handles what alarms
- 3. Next shift NCC Technician has too many "bins" in which to look; difficult to get both network status information and work in progress timely and efficiently
- 4. Task interference from having to resolve alarms and notify higher-level management in the event of a serious problem. Serious problems must be resolved immediately. NCC Switch Technician has to try to notify and resolve problem at same time.
- 5. No clear chain of notification to higher-level management in the event of a serious problem.
- 6. It is difficult and takes too much time to locate/notify Tier II support staff when help is needed, thus increasing response time.
- 7. Lack of problem status notification from higher-level support (Tier II) to NCC Technician

8. Different switches across the network have different maintenance windows and different standards of maintenance, which makes it difficult for the NCC Technicians to schedule on-site tests and back-ups.
 9. Any phone can be answered by any NCC Technician, resulting in disruption of work.
 10. All calls come to NCC, even if call is not NCC-related.
 11. Noisy work environment (“yelling” across room, multiple conference calls, meetings).
 12. A little frustration on the part of some NCC Technicians on not having all the tools (enough PCs, HPs with floppy disk drives, ROTL test equipment) and standardized procedures to perform job efficiently.
 13. No instrument(s)/mechanism to identify devices/facilities not part of the Ericsson switch.
 14. No instrument(s)/mechanism to test devices/facilities not part of the Ericsson switch (that is, can only acknowledge a Quality Supervision alarm, cannot identify the cause of it).
 15. For software alarms, no reference database to cross check whether any other NCC Technician has performed software dump.
 16. Not enough PCs.
 17. Not enough HP workstations with floppy disk drives.
 18. Workload too heavy for the current staffing.
- C. Other negative influences observed by Randy Hester for the PBX accomplishments:
1. Heavy workload
 2. Not enough time
 3. Not enough people
 4. Frequent interruptions
 5. Technical assistance not available for Rolm equipment
 6. No feedback system
 7. No recommendation/reward system

8. NEC documents difficult to read due to translation from Japanese to English
9. Task avoidance due to fear of affecting service or causing delays
10. Criteria are unclear for what should and should not be fixed
11. Power supply difficult to access
12. Occasionally, the data from the SEB system is wrong (bit errors)

Section 4: Recommendations

A. Skills/Knowledge

Issue	Recommendation
<p>A. Different levels of experience/expertise exist among the NCC Technicians.</p>	<ol style="list-style-type: none"> 1. Determine skill levels of each NCC Technician and the skill/staffing levels needed to provide specific service levels. Then determine training and assignment requirements by individual technicians. 2. Determine which modules in the Ericsson Curriculum each NCC Technician should complete (see Attachment A). 3. Prepare a skill matrix by technician; set up a training schedule as per Expert OJT for each technician so that supervisors can better identify skill deficits and training times for each technician. 4. Develop job aids for internal procedures not part of Ericsson curriculum (escalating problems, notification of network maintenance/testing events, backward notification from Tier II to NCC, Call Log entry standardization). Designate the accomplished performer who can assist in the design of job aid process and a technical accuracy authority to review completed job aids.

B. Environment

Issue	Recommendation
<p>A. The main performance problems within the NCC stem from not having clearly defined internal procedures in place. The following problems can occur: Alarms are not cleared, thus affecting subscriber service; Maintenance not performed, potentially could cause loss of both subscriber and billing information; loss of productivity (chasing information); and lower employee morale due to frustration.</p> <p>B. For those procedures that are in place, either not all parties are aware of them, or the parties have “variations” in how those procedures are implemented.</p>	<ol style="list-style-type: none"> 1. Document job process(es) to identify customers, suppliers, customer requirements, supplier requirements, inputs to the process, outputs of the process, and gaps in the process so that every technician knows who provides them with what they need to do their jobs and, in turn, they know what to provide the people downstream. Processes to document: <ol style="list-style-type: none"> a. Call Log entry: All entries use the same format, at-a-glance notification of outstanding problems, and at-a-glance notification of problems that need immediate attention. b. Escalating a problem c. Shift turnover d. Downloading information from UNIX platform to PC platform e. Notification from Tier II back to NCC on the status of a problem 2. Develop process measures to determine how well the process is functioning (that is, number of alarms, response time, resolution time, time it takes to escalate, how many problems are escalated, and so on).

Table Continued on Next Page

Environment (Continued)

Issue	Recommendation
<p>C. An alarm may go unacknowledged for longer than the expected response time. For example, if all technicians are working on problems and an alarm comes in, it is not clear who should work on the new alarm.</p>	<p>Develop a procedure so that someone is always monitoring the alarm panel, especially when other technicians are working on problems. For example, devote one workstation to screen alarms and refer them to other NCC Technicians. The person performing the screening will <i>not</i> be responsible for resolving the alarm.</p>
<p>D. As for environmental issues that hinder performance, the “telephone” problem seems to have the most impact. For example, if the NCC Technician is working on a problem and the phone rings, s/he is required to answer the phone. Many times either the phone call is for someone else or the caller wants to know the status of a problem. If the NCC Technician is not the one who was working on the problem, s/he has to “yell” across the room trying to locate the technician who is working on the problem. Then, either the call is transferred, or the NCC Technician has to work with the caller.</p>	<p>Create a job function for answering/ screening/transferring incoming calls to the NCC (similar to a receptionist or first-level help desk). The person who performs this function should have real-time access to work in progress so that s/he knows who is working on what problem and what the current status of the problem is.</p>

Table Continued on Next Page

Environment (Continued)

Issue	Recommendation
<p>E. There are new functions added to the NCC that involve installation of new equipment and reengineering of workstations.</p>	<p>Before any NCC Technicians take on new responsibilities, determine manpower requirements, get the training completed for the new and existing personnel, and get standardized procedures in place.</p>
<p>F. When beginning a shift, it is difficult for the NCC Technician to look at the Call Log and immediately identify current and ongoing problems.</p>	<ol style="list-style-type: none"> 1. <u>Short-Term</u>: Create a mechanism to flag those headings/entries in the Call Log as “current” or “hot”, and so on, so that the next shift can identify readily and easily current problems/alarms. (See Attachment B for Call Log headings.) 2. <u>Long-Term</u>: Develop a notification system within the Call Log so that during the login process, the system automatically alerts the NCC Technician of any outstanding problems (or “hot” problems) that require immediate attention. 3. Modify the existing Call Log software so that it is more “real-time” and universal in its use, and it should include tracking capabilities in cases of escalation. It should also be able to bring up a list of “open” problems so that technicians don’t have to waste time hunting for work to be done.

Table Continued on Next Page

Environment (Continued)

Issue	Recommendation
<p>G. When an escalated problem is resolved, Tier II needs to report back to the NCC that the problem can be closed. Currently, Tier II “says” it notifies via email, but this is ineffective because not all NCC Technicians log on to email on a regular basis and not all NCC Technicians have ready access to a PC at all times.</p>	<p>Develop standardized process for the following tasks: Escalating a problem to Tier II, and Notifying NCC Technician of resolved problem that was previously escalated to Tier II. The process should include up-to-the-minute status update on any problem. Preferably, this process should tie in to the Call Log revision (see recommendation immediately above).</p>
<p>H. The Tier II staff is not always readily accessible by the NCC Technicians. It sometimes takes considerable time to notify Tier II to escalate problem or get technical assistance.</p>	<p>Physically position the Tier II staff closer to, preferably within site of, the NCC Technicians. Modify the NCC so that there are two sections divided by a glass wall: One section should contain the NCC Technicians and HP workstations; the other section should contain the Tier II staff and their workstations.</p>
<p>I. If a problem is severe, upper-level management (Directors and VPs) want to be notified. However, the NCC Technicians main task is to get the switch up and running. If the technicians are spending time on the phone notifying management (who the technicians feel cannot contribute to solving the problem), then the technicians are not able to fix the problem in a timely and efficient manner.</p>	<ol style="list-style-type: none"> 1. The NCC Technicians should be removed from the “notification” process, except to notify their immediate Supervisor. 2. Develop a new notification process that does not require the NCC Technician’s time.

Table Continued on Next Page

Environment (Continued)

Issue	Recommendation
<p>J. There is no standard reporting mechanism for events that are occurring; that is, testing (Ericsson Test System), on-site technicians performing repair, testing, or maintenance at various switch sites, WilTel working on routes, Tier II working on problems, and so on. The whiteboard is being used somewhat, but not effectively.</p>	<ol style="list-style-type: none"> 1. Develop a process to notify NCC Technicians of events that are occurring. The whiteboard can be effective if everyone uses it, and uses it the same way. Otherwise, revise the Call Log to include an area for upcoming network events, and so on. 2. The Supervisor should periodically inspect several times during the shift to ensure the whiteboard is being used effectively
<p>K. NCC Technicians do not have access to switch engineering records. When a switch is first engineered, facility records are documented and kept at the switch. Also, because the network is not a static environment, switch and facility records are constantly updated, as devices/routes are added/removed from the switch. These documents and updates are not standardized and getting back to the NCC.</p>	<ol style="list-style-type: none"> 1. Develop a process whereby each switching site provides its current engineering records to the NCC, specifically for facilities/devices/routes. 2. Develop a process whereby each switching site provides engineering updates, specifically for facilities/devices/routes. These engineering updates should be on a standard form so that all switching sites use the same form. (See Attachment D for Steve Rowe's recommendation of what he would like to have.)

Table Continued on Next Page

Environment (Continued)

Issue	Recommendation
<p>L. For those devices not directly part of the Ericsson switch, little or no methods for identifying and/or testing those devices exist. For example, many “Seizure Quality Supervision” alarms occur (see Attachment C-1). This means that a user picked up the phone (thus seizing a route), and then hung up within 60 seconds. Either the user had a quick conversation or had a bad connection and hung up to try the call again. In the case of the latter, the NCC Technician would like to call the on-site switch technician and have him/her perform tests on the route. Because no facility records (for routes, devices, T-1 spans, and so on, between switches) exist and no testing equipment exists, the NCC Technician does not have the information needed to have the route/device tested. (See Attachments C-2 and C-3 for problem examples.)</p>	<p>Purchase Remote Office Test Line (ROTL) equipment and other testing equipment for the NCC.</p>

Table Continued on Next Page

Environment (Continued)

Issue	Recommendation
<p>M. Not all TMOS HP workstations have floppy drives. Several times a day (for software alarms), the information has to be downloaded from the UNIX platform (TMOS) and uploaded into the PC/DOS platform (MSS). If the HP workstation does not have a floppy disk drive, the NCC Technician has to go to another workstation (possibly interrupting another from his/her work), then perform the downloading from there.</p>	<p>Purchase enough 3½-inch floppy disk drives so that each HP workstation contains a floppy disk drive.</p>
<p>N. Tier II does not have HP workstations and network management software (TMOS). When the NCC escalates a problem, a Tier II staff member has to use one of the HP workstations in the NCC. This may interfere with another NCC Technician performing his/her job.</p> <p>O. The NCC Technician has to export information from the UNIX environment to the DOS environment. This takes time away from monitoring the network and resolving other alarms that come in.</p>	<p>Purchase HP workstations for the Tier II staff.</p>

Table Continued on Next Page

Environment (Continued)

Issue	Recommendation
<p>P. Tier II technicians do not always notify the NCC Technician of the status of escalated problems. The Tier II staff uses email for backward notification of escalated problems, but unless everyone has ready access to a PC (with LAN Manager and a login ID for LAN Manager), it should not be used for problem-related work.</p>	<ol style="list-style-type: none"> 1. Develop a universal problem/tracking/call log/trouble-ticket system with real-time capabilities for logging, and escalating problems. 2. The tracking/sign-off system should accomplish the following objectives: <ol style="list-style-type: none"> a. Provide feedback to the NCC Technician on the appropriateness of the escalation b. Alert the NCC Technician on the status of an escalated problem (resolved, ongoing, and so on) c. Relieve the NCC Technician from further action on the problem unless directed by Tier II Tech or Supervisor 3. Use email to find out about company events, department meetings, and so on, but not for problem notification, escalation, and so on.

C. Motivation/Incentive

Issue	Recommendation
A. Most tasks do not have criteria on how well to do the task; therefore, each NCC Technician may set his/her own standards on how well the task should be performed.	<ol style="list-style-type: none">1. Develop criteria/standards (completeness, accuracy, thoroughness, speed, frequency, and so on) for each task, and then develop measurements for each task to determine how well the tasks are being performed.2. Examples of specific criteria are: When to refer a problem; who should handle the problem; how often should a task be performed; how complete/thorough Call Log documentation should be, and so on).
B. There is no method of evaluation/feedback for individual performance on individual tasks (management only gets what it inspects for).	Implement task evaluations as described in the Job Description. Evaluations should be performed in a manner that will enhance performance and morale and promote a positive working environment (no "snoopervision").

D. Personnel Selection and Recruitment

Issue	Recommendation
<p>A. There is not an adequate staffing level to efficiently monitor the switching network. On a shift where only one technician is on duty, no back-up technician exists if the first technician has to leave either for a personal break or a family emergency. There is also a potential violation of work labor laws if a technician cannot take a break for a minimum time period.</p>	<ol style="list-style-type: none"> 1. Hire at least four personnel that have the following skills: <ol style="list-style-type: none"> a. Diagnosis and resolution of switching alarms, preferably on the Ericsson switch b. Diagnosis and resolution of transmission problems c. Identification of telephony network components (that is, switches, trunks, lines, interconnections of trunks, lines, and switches) d. Microsoft Windows experience, word-processing, and basic PC skills e. UNIX operating system and workstation experience desired, but not required (TMOS runs on the UNIX platform, but it is similar to Windows) 2. Develop a system that selects technicians with the minimum probability of turnover for 18 months. 3. All recruiting should be done nationwide, through one office. 4. Obtain data on what recruiting efforts work.
<p>2. No job descriptions exist.</p>	<p>Write job descriptions with clearly defined accomplishments, standards and ways to evaluate, interactions, tools used, and a description of the environment.</p>

Section 5: Plans for Next Phase

1. Determine which recommendations to implement and their priority.
2. For the procedures selected to be designed and documented, designate the accomplished performers and other resources to provide input to the instructional technologists.
3. Designate the technical accuracy authority to review each newly developed and documented procedure.
4. Determine the appropriate managers to work with the performance engineers to develop the specific elements for the recommendations relevant to the work designs, work environment, personnel selection, and the motivation/incentive system.