

System 75:

Introduction Activities and Results

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In today's competitive world, new and complex communications products need to move from the laboratory development environment to the marketplace in a quick but orderly fashion. The objective of a controlled introduction is to evaluate not only the specific product's performance but also its documentation, training, manufacturing, delivery, service, and customer satisfaction. This paper describes the scope of the controlled introduction of the System 75 office communication system. Topics include customer selection criteria, sales-team support, customer and service training, initial customer and internal corporate installations, and the evaluation process.

I. INTRODUCTION

System 75 is a complex and sophisticated business communications system comprised of advanced software, firmware, and circuits.¹ To ensure that its design met customer needs and was reliable, an orderly but quick-paced introduction program was essential. To provide structure and definition to all the activities of this testing program, a System 75 controlled introduction plan was developed.

This paper reviews several of the major activities associated with the introduction of System 75 and specific results that enhanced the

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product and improved the effectiveness of its delivery and support methods. Section II describes the overall objective of the controlled introduction. Section III focuses on both customer and AT&T support team training. Section IV presents findings from the early installations. Section V describes items related to maintainability. And, finally, Section VI highlights customer and sales team feedback on the system's capabilities and features.

II. CONTROLLED INTRODUCTION OBJECTIVE

The objective on the controlled introduction was to fine tune both the product design and the delivery/support operations before manufacturing large quantities of systems. Prior to early 1984, System 75 had been tested extensively in the laboratory but had not yet been in use under true marketplace conditions. The controlled introduction, in addition to evaluating product performance, was needed to test the ordering, manufacturing, installation, training, and maintenance processes. Customer reaction to the product's capabilities was also important, as were the opinions of the AT&T sales and service personnel. Based on actual field experience, enhancements and/or corrections were added to the product or methods as necessary.

2.1 Principles of controlled introduction

The System 75 controlled introduction's duration and scope was based on experience from previous PBX introductions.² This experience suggested that approximately 60 system-months of in-service testing after system testing were needed to uncover any remaining software or hardware defects affecting production. To meet this criteria, a program was developed that included:

1. Twelve customer installations and two internal AT&T systems, one at Lincroft, New Jersey and the other at Holmdel, New Jersey. The actual deployment is shown in Fig. 1. While a large number of system-months was desirable, there was also a need to limit the number and location of installed systems because of factory production start-up constraints, inventory risk management, a limited number of trained support personnel, and a desire to have quick response time to correct field problems.

2. A stringent set of customer selection criteria (Table I). Adherence to these criteria ensured that each site was conducive to the evaluation of both product performance and support operations.

3. A controlled introduction steering committee that augmented the existing local sales and services team. This committee monitored all pre- and post-cut activities and ensured that all activities proceeded on schedule and according to plan.

At the beginning of this program, marketing staffs in six major U.S.

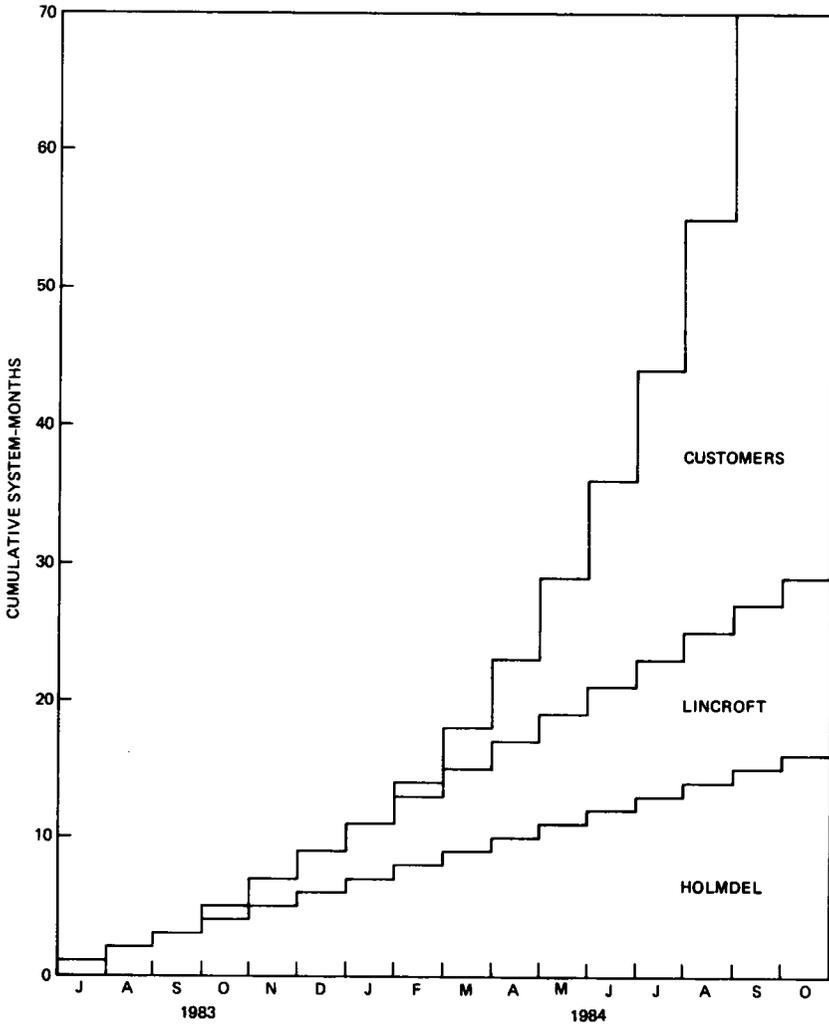


Fig. 1—Cumulative system-months of operation during controlled introduction.

cities were asked to review all their under-320-line accounts and submit profiles for those customers that matched the selection criteria. The list of potential customers was filtered and prioritized by the controlled introduction committee, which produced a list of accounts to contact. Potential customers were contacted by local sales teams, who described the aspects of being a controlled introduction customer. If customers were interested, the negotiations continued, a nondisclosure agreement was signed, and more details of System 75 were discussed. Once a customer requested that a configuration and contract be prepared, a team of product experts from both development and

Table I—Customer selection criteria

Customer Characteristics
First customers will be "smaller," i.e., 50-125 lines
Noncritical (e.g., no hospitals)
Weekend cut; 24-hour access; space for field-support equipment
No new buildings; no moves; equipment room complete
Potential use for wide range of product capabilities
Consider customers of past studies
Should be willing to participate in system management
Deploy a variety of size ranges for lines and trunks
An electromechanical PBX or Centrex replacement
At least one applications processor
Customers with need for Automatic Route Selection (ARS), and station message detailed recording
One System 85 customer
Market Environment
Friendly and flexible customers
Expectations should equal product capabilities
Leaders in their market segment
Large multiple-sales potential

marketing reviewed the proposed equipment order and the customer's intended use of the system. The expert team greatly enhanced the local support by answering detailed questions in an accurate and timely manner. This support is required to introduce products quickly.

III. TRAINING

One of the first activities required during the System 75 introduction was the development and refinement of training techniques and material. In particular, the preparation and delivery of quality customer, sales team, and service technician courses was a major step in assuring a successful product introduction.

3.1 Customer training

Two key ingredients made the customer training program successful. First, similar courses, especially those used for System 85, were reviewed for content and flow. These ideas provided the basis for the System 75 course. And, hands-on sessions with an operational system during the course development allowed the developers to try the material themselves and refine it. The first complete course was given to Lincroft users in September 1983. The first session for external customers was given in early December 1983.

During this course development, improvements were made in several major areas. One, the initial material did not contain enough detail. The customers wanted to know exactly what steps, visual indications, and audible indications were going to occur when a particular feature was used. Two, early material did not describe System 75's data switching capabilities. A thorough description is now included. Three,

feature descriptions alone did not usually convey their value. Initially, a more academic, logical flow method was used to describe features, but students reverted to using their own situations to verify their understanding. Once common business scenarios were presented, students quickly grasped the feature operation *and* its value.

And, finally, each student group seemed to have a focused interest, yet each group's interest was different. This called for a course that was broad based but customizable during each session so that each group could meet its own needs. A problem that is still under investigation is how to package the course material to allow for multiple customers to attend the same course and still allow a unique focus by each customer.

3.2 Sales team training

To ensure that local sales teams had sufficient System 75 product knowledge well before the time of announcement, preparation for sales team training began in November 1983 with the definition of a three-phase program. Representatives from the expert support team and from marketing worked in conjunction with the corporate training organization to develop and deliver the initial course, which covered voice features, data switching, system management, and system architecture. The first phase consisted of one week of lectures and lab sessions for area sales staff. The goal of this phase was to prepare the area staff to conduct their own training sessions for individual sales branch locations in their area. Some important attributes of this training phase were the use of working systems to allow hands-on laboratory sessions, the presence of product experts from the design team, the joint presentation of sales and technical information, and the chance for the sales force to give direct product-related feedback to development representatives.

The hands-on sessions were critical to the success of the entire training effort and greatly enhanced the sales teams' confidence. Aspects of system design or operation, which were difficult to describe in class, were easily clarified by demonstration. In addition, topics not covered in or triggered by the lectures could be easily discussed with the development representatives during the less formal lab sessions. Their expertise provided an added degree of credibility to the material.

The second phase provided three days of training to key representatives from each branch location. The area staff personnel who were already trained then combined with these key representatives to conduct one-day sessions for all the sales personnel at their respective branches.

In the third phase, trainers from the national sales training center visited the largest branch locations to conduct additional lectures and

host question and answer sessions. These last two phases enabled several thousand sales people to be trained quickly.

3.3 Service technician training

Development of the Service Technician training course began in April 1983. As with customer training, lectures and hands-on work sessions were interwoven to form a five-day course.

The first course was given in late 1983 to ten technicians. To verify their training, the first group of technicians helped install the Lincroft system the week immediately following the first course. This installation work identified the need to expand the cross-connect and wiring information in the course. Feedback from subsequent training sessions highlighted the need to improve the built-in diagnostic descriptions, the need to spend more time on feature operation, and the value of hands-on sessions. In general, the hands-on sessions stimulated more interaction between the student and the instructors, which in turn increased the students' understanding.

The final version of the course was completed in mid-1984. In addition to incorporating the suggested course enhancements, all its material was thoroughly checked for accuracy. Results from the field indicate that the training has been very effective.

IV. INSTALLATION

Another crucial controlled introduction activity was determining if System 75 could be installed properly and efficiently. The major elements of the system installation process were well known prior to the start of the controlled introduction. What was required was a way to identify and clarify all the minor aspects of a complete System 75 installation and fix any shortcomings that could delay the completion of an installation.

4.1 Internal sites

The first system to provide such information was a test system installed in Holmdel, New Jersey, during early 1983. This system was an early hardware prototype and contained preliminary feature designs and very limited administration and maintenance capabilities. System functionality as well as the number of users was gradually increased during 1983 and early 1984 as the design became more complete. Because the installation work was completed by developers, this system provided limited information on the minor details of the installation process. However, a second System 75, one that was near production quality and functionally complete, was subsequently installed at the AT&T Information Systems Laboratories in Lincroft,

New Jersey, during late 1983. This installation was more formal and followed standard procedures. The installation of these two internal test systems uncovered a number of missing but very important installation methods, tools, and system piece-parts. Specifically, the experience at these first two sites highlighted several areas needing improvement.

One was the need for a simple checklist that structured the major tasks. This checklist was at first thought to be unnecessary since the installation manual listed all the steps that were to be followed. However, the installers felt much more comfortable if they knew the overall sequence of the major activities, and were able to tell if they were "halfway" or "three-quarters" complete. Such a job aid is now available.

Second was the need for an improved method of keeping the cabling information such as room number and cable identification. During the second installation, it was quickly apparent that many copies of "home brew" forms were used to keep track of and cross-reference names, room numbers, jack identification, and cable numbers. During one part of the installation there were five different types of forms used to reference these data. By analyzing why people were using these various forms and studying their contents, a single form was developed that is now part of the built-in administration routines. Once the normal administrative data is entered into the system, the cable and jack information can be quickly added and only one sheet is needed for the cabling work.

And, finally, during installation there were occasions when only part of the translated equipment was installed. The absence of this equipment would raise alarms and cause confusion between "not connected" and "not working." By adding an alarm-hold command this confusion was eliminated.

4.2 Customer sites

The Services organization tracked various operational metrics associated with the installation of all the System 75 controlled introduction customer sites. The times to install the switch cabinet, wiring, cross-connect hardware, terminals, and labels, and central office connections were collected in a disciplined fashion. Actual times to install were then compared to the estimates used to develop the operations plans. These estimates were based on experience with similar products. Table II shows variations from predicated values for a few key installation activities and the overall total. Negative variation signifies that the actual times were less than the predicted value. Note that on average, the major activities and total times were close to the early estimates. Actual installation times will continue to be monitored, and

Table II—Variation of actual installation times from predicted times (%)

Major Installation Activity	Customer				Average
	C1	C2	C3	C4	
Switch	-24	+15	-35	+29	-4
Terminals	+26	+7	-34	-33	-9
Cross-connects	+43	-23	-61	+16	-6
Total Installation	+26	0	-42	-4	-5

those activities that are significantly above or below expectations will be used to readjust service force training and/or sizing needs.

4.3 Overall results

Throughout the controlled introduction over 50 installation procedures were modified to improve the process and minimize the installation hours. By closely tracking early installations, method changes were made before significant work-force hours were wasted.

V. MAINTENANCE AND PERFORMANCE TRACKING

The next important aspect of the controlled introduction was determining the effectiveness of the system's maintenance capability, its overall maintainability, and its quality and reliability.

5.1 Tracking

In late 1983, a field support group made up of System 75 product developers was established within AT&T Information Systems Laboratories to provide a close coupling between the field sites and the development community. Representatives from the field support group and a national services center combined to serve as backup to the local installation and maintenance technicians. In particular, they provided in-depth technical analysis. They also monitored the operation of each controlled introduction system using built-in remote-access capabilities³ of System 75 as well as specially designed field support tools.⁴ These field tools went beyond the system's diagnostic capabilities and provided more detailed information for sophisticated troubleshooting. When design problems were identified, they were jointly investigated in the lab by developers and the field group. Solutions to field problems were verified first on lab models and system test machines and then soaked in the internal systems at Lincroft and Holmdel. Fixes were installed in customer sites only after the proper operation was verified at one of these internal systems. A modification-request process⁵ was used to track all such problems. This process was completely on-line and could be accessed from the field or the lab.

This database allowed problems to be tracked by release, severity, community (such as hardware, firmware, software), and customer. Such tracking was very instrumental in coordinating fixes in an orderly manner.

5.2 Maintenance improvements

For every maintenance alarm, the maintenance action was recorded and identified as being either effective or not. This “maintainability” score card helped identify not only design flaws but documentation deficiencies as well. As a percentage, 75 percent of the maintenance actions that proved ineffective were due to documentation. Of these, some were due to inappropriate decisions to limit the detail in certain documents. The other 25 percent were actual functional shortcomings in the maintenance strategy and/or routines.

One example where a design change was required was in the amount of status information displayed during system initialization. The early design had moderate amounts of time between externally recognizable events (such as Light-Emitting Diodes [LEDs]* changing state or the tape starting or stopping). By having this system-access terminal display the internal status of the system while it was initializing, the technician could see that each initialization step was being completed.

All information about faults and maintainability discovered during the controlled introduction was used to expand training and documentation. For example, boards with typical field faults were used in the technician training course to demonstrate repair actions.

5.3 Quality and reliability

Detailed records of hardware failures were kept by the services organization. All defective circuit packs were returned to the hardware developers via the field support group for failure analysis. Information on packs with manufacturing defects was forwarded to the factory. The other defects were reviewed and design changes were implemented when needed. This activity continues throughout the life of the product on a special study basis. All results of failure analyses are coupled with factory repair information and used to compare actual field reliability to black box reliability estimates. These statistics highlight where corrective design action may be necessary and are used for inventory management. No design changes have ~~been~~ necessary to date because of reliability factors.

VI. MARKET FEEDBACK

The controlled introduction customers and sales teams provided

* Acronyms and abbreviations used in the text are defined at the back of the *Journal*.

useful product-related feedback. Their comments helped identify System 75's strengths as well as its areas for improvement.

6.1 Customers

Each controlled introduction customer, including the two internal sites, was asked to participate in a user survey. These evaluations were typically conducted four to six weeks after the system was placed into service. Survey questionnaires were distributed to about 40 percent of the user population. Face-to-face interviews were conducted with about 10 percent of the users. The questionnaire focused on training, documentation, and feature usage. A portion of the questionnaire is shown in Fig. 2. These surveys⁶ indicated that

1. Overall satisfaction was high and System 75 was preferred over the customer's previous system.

2. System management emphasizing customer participation was considered the most valuable new capability.

III. FEATURE USAGE

For the features listed below, please indicate your responses by marking the appropriate boxes.

FEATURE	(1) Do you have a button for this feature?		(2) How frequently do you use this feature?			(3) Is this feature easy to use?	
	Yes	No	Often	Sometimes	Never	Yes	Somewhat
◆ Conference	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
◆ Hold	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
◆ Transfer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
◆ Drop	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
◆ Call Forward	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
◆ Leave Word Calling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
◆ Cancel Leave Word Calling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
◆ Send All Calls	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
◆ Call Pickup	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
◆ Automatic Callback	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
◆ Call Park	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
◆ Consult	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
◆ Abbreviated-Dial	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Fig. 2—Sample questionnaire sheet.

3. All attendants were pleased with the console operation and design.
4. User documents were good but could be made less redundant.
5. Training was comprehensive.

6.2 Sales teams

Early interactions with sales teams and area marketing staffs were instrumental in identifying additional capabilities required of the product. For example, one group pointed out the need for line appearance bridging capability. Their insight into system usage was instrumental in adding complete bridging functionality to the system. In another case, a team asked whether or not calls to an active station could be conferenced onto its existing call. The answer was yes, but this fact and various uses of the capability were never stated in user documents or discussed during training. This triggered an addition to both the documents and the training course.

Currently, all product questions from sales teams are sent through the area staff to a national marketing center. This center has become another valuable source of product, documentation, and training needs data. These data are used to guide future product enhancements.

VII. CONCLUSION

In summary, the System 75 testing period spanned approximately 18 months. This included very early and limited service at internal locations followed by full service to 12 customers. Table III summarizes the major milestones. One of the most significant events was the System 75 installation at the Lincroft location. This site included an extensive executive complex as well as a broad range of other users. This provided both the opportunity to discover shortcomings and the pressure to fix them. Next in importance was the availability of an operational demonstration system in an appropriate display environment for training and early customer presentations. Without such a facility most of the training feedback mentioned earlier would have been discovered when it was much more costly to correct.

Table III—System 75 controlled introduction milestones

Date	Event
December 1981	Initial shipment and allocation proposal
November 1982	Controlled introduction plan issued
February 1983	Limited early prototype installed in Holmdel, N.J.
July 1983	Training and demonstration facility in Holmdel, N.J.
October 1983	Full-capability System 75 installed in Lincroft, N.J.
February 1984	First customer system installed
April 1984	Press announcement
May 1984	First system with applications processor installed

Throughout this process of testing, significant enhancements and corrections have been made to the System 75 design and its support methods. While much of the data collected was subjective, it was timely and sufficient to improve the product. By blending it with experienced judgment, System 75 was brought to the marketplace quickly and at the same time fully tuned and ready for rapid manufacturing buildup.

VIII. ACKNOWLEDGMENTS

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