An Early Management System for Subscriber Equipment Installation

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Abstract: The *Journal* revisits an historic paper from 1970 detailing the introduction of a computer-based Subscriber Installation Management Control System.

Keywords: History of Australian Telecommunications, Subscriber Installation Management Control System, SIMS

Introduction

The historic paper (Keighley & Higgins, 1970) details the introduction of a computer-based Subscriber Installation Management Control System (SIMS) in Adelaide by the Australian Post Office (APO, now Telstra) in 1970. The paper was chosen as an early example of a computer management system in Australia and complements the special-issue section on "Perspectives on Machine Learning" in this issue of the *Journal*.

Subscriber equipment installation and rearrangement was the mainstay of services provided by the APO in 1970. It involved two different staff groups: lineman installers under the local Lines organisation; and technician installers under divisional management control. The technician installer activities present supervision problems, given the installers are in small groups dispersed over wide areas and have a wide variety of equipment and building types to deal with.

The SIMS system was designed to improve the scheduling of field staff, balance the work loads of groups and depots in the division, detect non-productive effort and time, and assess work content in significant categories for management purposes. The paper states "the proposed system allows labour resources to be accurately matched to work loadings and provides meaningful information to supervisors and engineers to pinpoint areas and conditions that may warrant improvement".

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The working time needed to be divided into direct and indirect work categories. The indirect work was further divided into lost time and overheads. An Activity Definition Manual was developed and the acceptable times for activities were workshopped and agreed with representatives of the technicians and management. These agreed times were centrally controlled for accuracy reasons and could be applied with confidence by field personnel. The installers were also issued with a pocket-sized handbook to facilitate the correct coding prior to reporting information to the depot.

The SIMS system had two fundamental segments, namely the work scheduling phase and the information system. The depots filled out CE60 computer source documents detailing the work achieved for the period and these were forwarded to the divisional Costing Section. Duplicate CE60s were forwarded to a computer service bureau for transcription into computer punch cards.

Some of our readers may not be familiar with computer punch cards but they were the input interface to mainframe computers at the time. Computer service bureaux ran programs on their computers on behalf of customers (often overnight or over several days), then couriered the output results by way of large printouts (the striped fanfold pages, which were standard at that time) back to their customers. The SIMS system provided four types of output reports: performance, costing, survey and control.

After the 12-month trial period, the SIMS system could boast of making available information to operational personnel for the previous period, within three working days of the end of that period. This seems extraordinary, given today's "real time" resource management systems. Divisional and supervisory management were also provided with sufficient information to enable them to assess performance and initiate corrective action, where necessary. Work scheduling and the reallocation of resources were made easier, as well as the identification of inefficient procedures.

The SIMS system was designed and implemented within the South Australian division of the PostMaster General's Department (PMG), to be used by all APO subscriber equipment installers in the PMG at that time. The aims of achieving better planning and control of work were realised, as well as the most efficient utilisation of the available resources.

References

Keighley, R., & Higgins, P. (1970). The Subscriber Installation Management Control System. *Telecommunication Journal of Austr*alia, *20*(2), 135–143.

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The Historic Paper

THE SUBSCRIBERS INSTALLATION MANAGEMENT CONTROL SYSTEM

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INTRODUCTION.

In the Australian Post Office the work of installing or rearranging telephone equipment in subscribers' premises is carried out by two different staff groups. Linemen-installers undertake the less complex installations, whilst technician-installers undertake the more complex work. The latter group work entirely on internal equipment and operate from subscribers' installation depots with a line of control through senior and supervisory technicians to an engineer with overall responsibility for the Subscribers' Installation function. The former group work on both internal and external plant, and operate from what is usually called a Line Depot with a line of control through Line Foremen and Line Inspectors usually to an Engineer with overall responsibility for External Plant installation and maintenance (District Works).

Technician-installer activities, which range over a wide variety of equipments and building types, present the usual supervision problems which arise when several small work groups are dispersed over wide areas at locations which are changing frequently. (Ref. 1).

The system described in this article was designed to test means of improving the supervision and management of technician-installer activities.

SYSTEM OUTLINE.

The objectives of the system are to supplement and strengthen the supervision of the depot supervising and senior technicians and to provide them, and engineering management, with an information and control system having the following features:

(i) Scheduled allocation of work to field staff.
(ii) Work load balancing between working groups and depots within a division.
(iii) Detection of non-productive effort and time.
(iv) Work content assessment in significant categories for management purposes.

The proposed system allows labour resources to be accurately and continually matched to work loadings and provides meaningful information to supervisors and engineers to pinpoint areas and conditions which may warrant improvement.

* Mr. Keighley is Engineer Class 3, Industrial Engineering and Training, Headquarters. See Vol. 20, No. 1, p. 82.
**Mr Higgins is Engineer Class 2, Industrial Engineering and Training, Headquarters. See Vol. 20, No. 1, p. 82.

WORK MEASUREMENT.

In order to initiate the required work measurement, the total working time was broken down into direct and indirect work. The indirect work was further divided into lost times and overheads whilst the direct work was divided into clearly defined elements called activities. The total time to perform a task is also dependent on such variables as environment, class of service (provide, remove or disconnect) and type of service (internal or external). In the case of environment, a sample survey led to the description of five types of building situations, from single-storey houses or villa residences to multi-storey houses, offices and factories.

The Activity Definition Manual is an important document in the establishment of acceptable times for activities employed in the system. It must be centrally controlled to ensure that the integrity of the derived information is maintained and that the full system remains meaningful to management. The manual is divided into Commonwealth standard activities and activities of local (State) significance only.

The activity definitions have been made available at field level in two different formats. The full manual is used to estimate major and minor works, to schedule work to the installers, and to calculate work load figures for staff balancing. A condensed pocket-size handbook is issued to all installers for quick reference to identify tasks and determine the correct coding prior to reporting information to the depot.

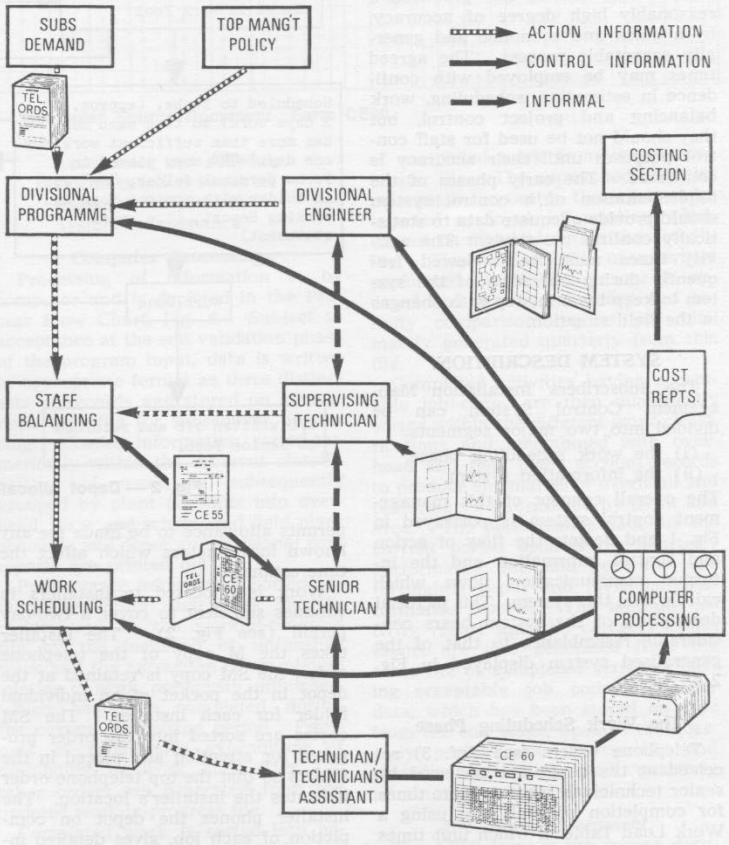

Fig. 1 — Subscribers Installation Management Information and Control System (SIMS).

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Journal of Telecommunications and the Digital Economy

The activity manuals are used initially to establish acceptable performance times for each defined activity and these times will ultimately be used for job allocation and management. The activity times have been determined by the 'agreed times conference' technique. Representative technicians, senior technicians, supervising technicians and engineers who are familiar with the activities being discussed and who are capable of assessing the work content, form the conference, which is chaired by an impartial officer who is familiar both with the activities and the requirements of work measurement, generally an Industrial Engineer.

The procedures of the conference require that all representatives consider each activity in turn, confirm the definition and then agree to an estimate of the normal time taken by a qualified technician, operating under normal conditions, to perform the activity. This method has produced a reasonably high degree of accuracy, by a quick and economic and generally acceptable process. The agreed times may be employed with confidence in estimating, scheduling, work balancing and project control, but they should not be used for staff control purposes until their accuracy is confirmed. The early phases of the implementation of a control system should provide adequate data to statistically confirm the times. The activity times must be reviewed frequently during operation of the system to keep them in step with changes in the field situation.

SYSTEM DESCRIPTION.

The Subscribers' Installation Management Control System can be divided into two major segments.

(i) the work scheduling phase,
(ii) the information system.

The overall concept of this management control system is portrayed in Fig. 1 and depicts the flow of action and control information and the informal communication flows which exist within this system. This pictorial description of the system bears considerable resemblance to that of the generalised system displayed in Fig. 2 of Ref. 2.

The Work Scheduling Phase

Telephone orders (see Ref. 3) received at the depot are reviewed by senior technicians, who estimate times for completion of each job, using a Work Load Table in which unit times are derived from the basic activity times. This facilitates scheduling and permits allowance to be made for any known local factors which affect the time estimate.

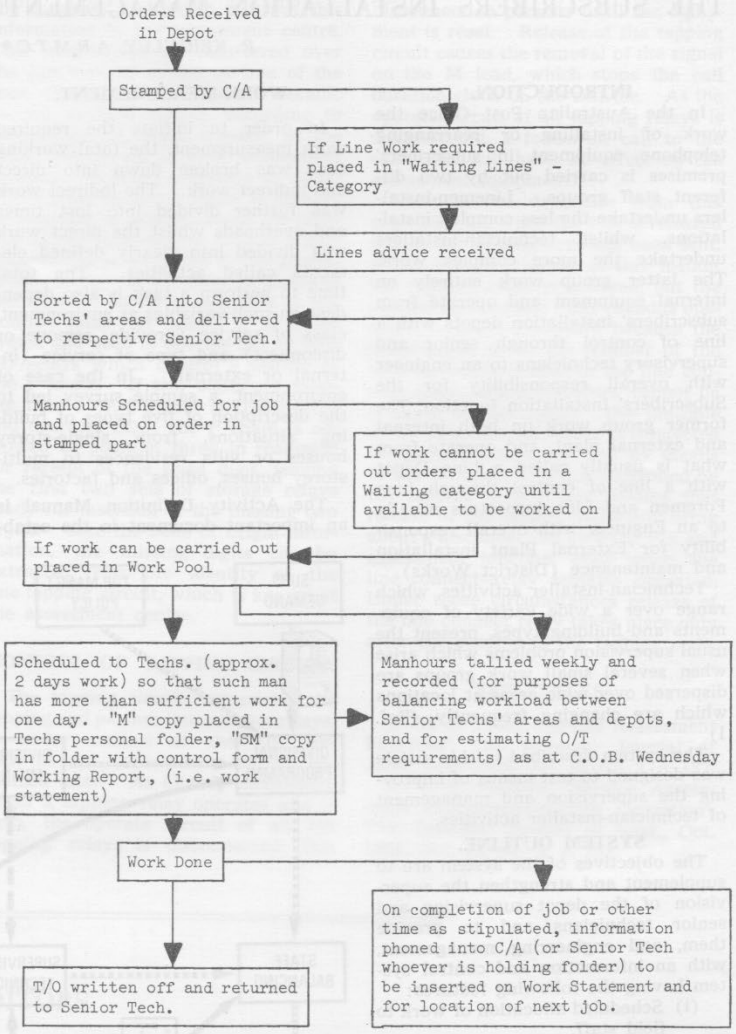

Fig. 2 — Depot Allocation of Telephone Orders.

Work is allocated to installers in volumes sufficient to cover a two-day period (see Fig. 2). The installer takes the M copy of the telephone order; the SM copy is retained at the depot in the pocket of an individual folder for each installer. The SM copies are sorted into the order proposed for attention and placed in the folders so that the top telephone order indicates the installer's location. The installer phones the depot on completion of each job, gives detailed information about the job and nominates his next location; these details are transcribed on to form CE60 (see Fig. 3), which is held in each installer's folder.

The CE60 form, in the initial phases of the system development, is completed in duplicate, the carbon copy (which replaces the working report WP1) being subsequently forwarded to Costing Section, as the work statement, at the end of each period. The SM copy of the order is marked 'completed' and placed beneath the incomplete orders in the folder so that the uppermost order, clearly visible in the pocket, is the one for the job in hand. M and SM copies of completed telephone orders are subsequently reunited for normal depot pro-

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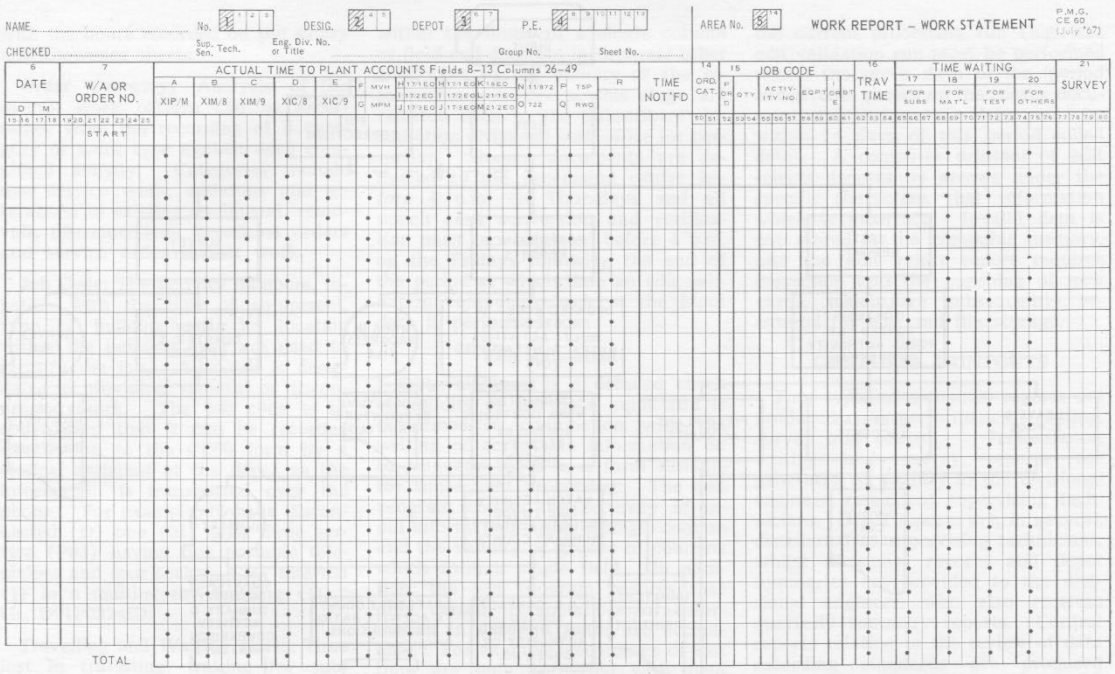

Fig. 3 — Computer Source Document. Form CE60.

cessing and despatching. A yellow slip is associated with the M copy and provides a record of information passed to the depot by the installer. Sample checks by the senior technicians ensure that installers are coding accurately and providing all the required data.

At the end of each week the CE60 forms are checked by the respective senior technicians and the two copies are forwarded to the divisional office, whence one copy is routed to the Costing Section, the other to the computer service bureau for transcription to computer punch cards.

The Information System.

The information system has been developed to meet the Subscribers' Installation Measurement System (SIMS) specification — Version 'A,' which details the requirements of data processing and includes the following information:—

- System description
- Source document and associated input forms
- Punching instructions
- Computer punch card verification schedule
- System analysis/flow process diagram
- Processing requirements
- File description
- Computer printout formats
- Acceptance test schedule
- Documentation required
- Basis for calculations
- System maintenance

Computer Processing.

Processing of information is by computer and is depicted in the Process Flow Chart, Fig. 4. Subject to acceptance at the edit validation phase of the program input, data is written in appropriate format as three distinct sets of records and stored on a magnetic tape file for subsequent processing. Costing information, sorted numerically within the different classifications of work, is subsequently grouped by plant accounts into overhead, leave and school, and field plant accounts and depot and divisional cost reports are printed out.

Performance information, sorted numerically within each work classification, updates the work-in-progress file by the inclusion of unfinished work and the extraction of man-hours relating to work, previously unfinished, which has been completed during the current processing period. Printouts of progressive expenditure of man-hours to work authorities and other orders are generated from the updated work-in-progress file.

Completed work is sorted into activity number sequence and the activity time is matched to each record of completed work from the activity master file. The unmatched activities printout incorporates those job codes inserted as input information which cannot be matched within the activity file. The summary file of activities performed within the quarter is updated and activity summary and activity comparison reports are ultimately generated quarterly from this file.

Completed activities having acceptable job codes are then numerically sorted within the different work classifications and recombined with overhead and field plant account records to produce summaries of overhead and performance information by depot and area. The performance data for the current period updates the quarterly performance file and generates the fortnightly depot and divisional performance reports. The multiple activity report and the category count report are also generated from the same file of completed activities having acceptable job codes. Survey data, which has been stored on tape from the edit stage, updates the quarterly performance survey file and provides fortnightly and quarterly printouts of survey statistics.

The Source Document.

The CE60 form is the source document from which data is transcribed

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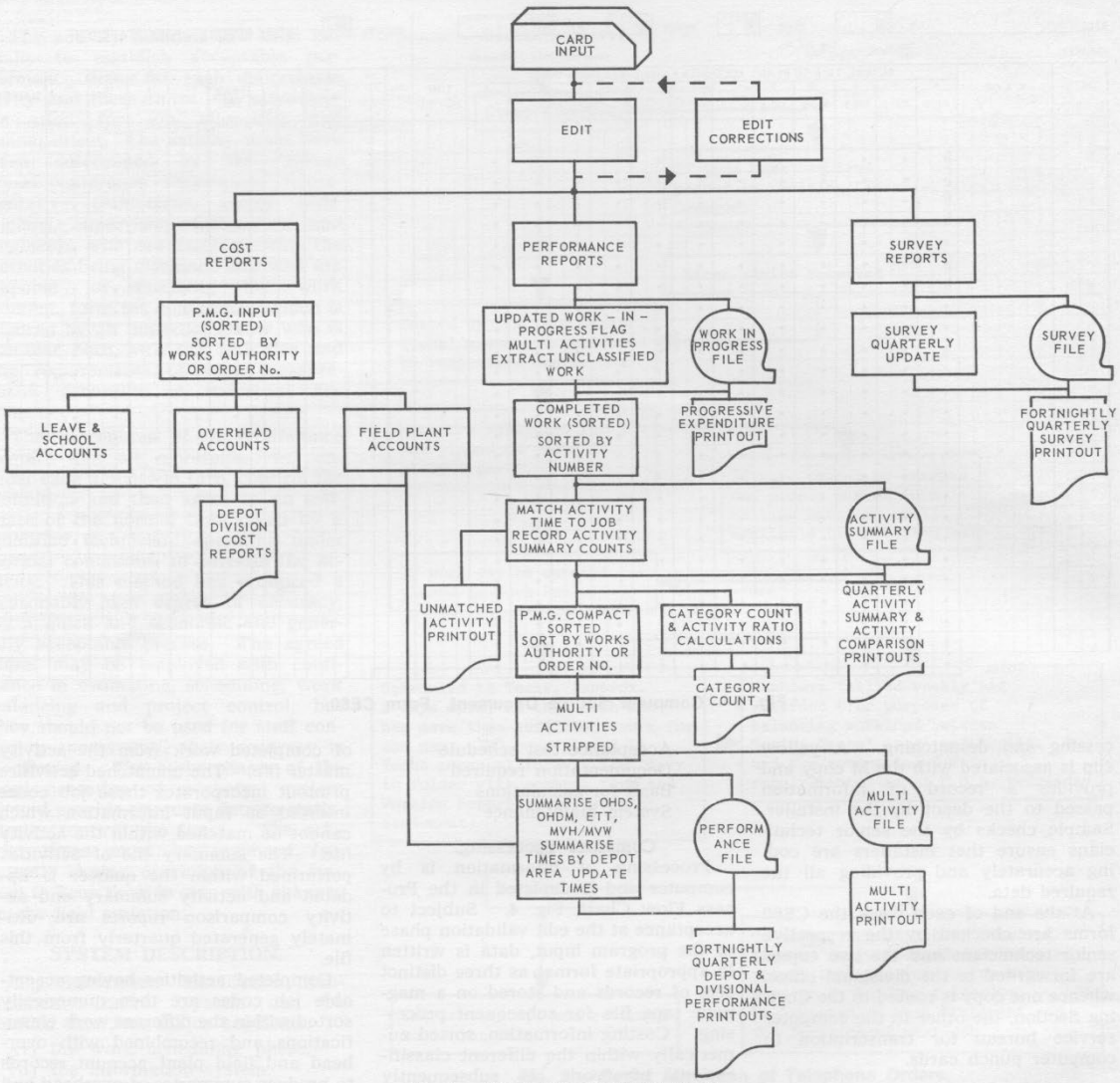

Fig. 4 — SIMS Process Flow Chart.

to computer punch cards as the computer input. Personal identification information is recorded in the header of the form. The body of the form makes provision for specific and detailed entries peculiar to each job performed.

Particular reference should be made to certain information fields of the source document.

Designation: Technicians-in-training are distinguished from other installation staff by the insertion of designations T1 to T5 for first to fifth year trainees. Other staff are designated T0. Designation factors are specified for each in accordance with costing procedures (T1 = 0; T2 = 0.4; T3 = 0.55; T4 = 0.70; T5 = 0.85 and T0 = 1.0), such that the effective work performed is assessed by multiplying actual time expended on the activity by the appropriate designation factor.

W/A Or Order No.: The telephone order or works authority number describes the activity on which work is being performed. Differentiation between the various works authorities and different types of telephone orders is possible by self-explanatory prefixes to the numbers. Supervisory overheads (OHDS) and miscellaneous overhead activities (OHDM), excess travelling time (ETT) and time expended on vehicles denoted by the vehicle number (e.g., BH 345) can also be recorded in this field as desired.

Actual Time to Plant Accounts: Times are recorded in hours to one decimal place in the appropriate plant account columns. Some columns make provision for alternate plant account entries and for the insertion of other plant accounts as desired. The recording of plant account times by columns permits their ready summation by the Costing Section. The daily hours recorded for each member of staff on the CE60 form must coincide

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with the hours recorded on the salary and allowance sheets.

Order Category: Analysis of the overall work pattern can be ascertained from the recording of a category or work type against each completed activity. Categories include new service work, additions and alterations to existing equipment, removals, disconnections, broadcast orders and service order docket work.

Job Code: The activity numbers, together with the type of equipment, type of building and the location within the building area are used to identify the job. All work is designated as providing, removal or disconnection work. The job code is so constructed that it can be recorded directly on to the CE60 form by a clerical assistant at the depot as the information is transmitted over the phone. For example, "I have disconnected (D) one (01) plan three service (P03) having two portable telephones and four sockets (24) internal (I) in a multi-storey building (D)," i.e., D01P0324ID.

Travelling and Waiting Times: Time lost in travelling, waiting for subscribers, waiting for material and waiting test are recorded on the source document. A further column 'waiting others' provides management with the facility to study any particular aspect of lost time desired.

Survey: Columns have been made available to permit the special study of any desired item of interest by the insertion in these columns of data information which can be processed, under direction to the service bureau, to provide the desired printout. The original survey performed has studied the times expended in testing subscribers' services using the exchange test desk by comparison with line test robots.

PROCESSING OF SOURCE DOCUMENTS

Source documents are processed and the various computer printouts are generated fortnightly and quarterly and dispatched to the divisional office for distribution to supervising and senior technicians at each Subscribers' Installation depot. Source documents are initially converted to computer punch cards at the Service Bureau and are subsequently machine verified before input to the computer. A verification schedule for conversion to punch cards has been drawn up which refers to information omitted or outside specified limits. The verification phase is restricted to checking within the limits of a single column or field and does not incorporate other checks as to the validity of the information. Errors at this stage are referred back to the Subscribers' Installation divisional staff office for correction. Source documents are delivered to the processing centre before 4 p.m. on Thursdays and all punch card conversion and verification must be completed before 4 p.m. on the Fridays following the end of the period at which time an edit validation computer check of the input data is performed.

Edit Validation

Edit validation is a detailed check of validity of the data input and is performed in conjunction with the writing of acceptable information on to magnetic tapes in a form suitable for subsequent processing. The edit program checks the accuracy of input information within a single column and the validity of groups of columns which form a single field. In addition, the edit program ensures that only certain combinations of information in different fields are acceptable. For example, recordings of lost time are only permitted with field plant accounts; leave and training school entries relate only to certain specified plant accounts, as do motor vehicle and overhead costs; works authority and telephone order identification numbers must meet specific constraints, and only certain combinations are acceptable in the formation of the job code. Time checks are incorporated into the edit validation run to ensure that only source documents for the previous period are included in the current processing run (e.g., the edit validation run must be performed within the seven days of the 'period ended' date shown on the source document and performance dates must be within 14 days of this period ended date). A computer printout of edit rejects denotes by arrows under the specific characters, that information which is incorrect. Invalid data is not stored in the computer memory, and the edit reject report requires correction and the punching of new cards, which are subsequently re-entered for edit and file storage.

COMPUTER PRINTOUTS

Four types of computer reports are produced — performance, costing, survey and control. Performance, costing and survey reports are generated fortnightly to the divisional engineer and depot supervising technicians. Depot reports are, in general, distributed to supervising technicians, whilst divisional reports and depot summaries are provided to the divisional engineer, who also receives quarterly summary reports. Control reports relating to the review of data recording standards are produced fortnightly and other control reports providing for the review of activity time standards are generated quarterly. The distribution of printouts is depicted in Fig. 5.

Costing Report.

Depot and divisional summaries of costing reports are generated fortnightly. Reports are divided into three sections — field plant accounts, overhead plant accounts and leave

	REPORT	DIVISIONAL ENGINEER	SUPERVISING TECHNICIAN	SENIOR TECHNICIAN	COSTING SECTION	HEADQUARTERS
FORTNIGHTLY REPORTS	EDIT VALIDATION REPORT	*				
	UNMATCHED ACTIVITY REPORT	*				*
	COSTING REPORT	S	*		*	*
	PROGRESSIVE EXPENDITURE OF MANHOURS REPORT	*	*	*	*	*
	PERFORMANCE REPORT	S	*	*		*
	WORK TYPE REPORT	S	*			*
	SURVEY REPORT	S	*			*
QUARTERLY REPORTS	ACTIVITY SUMMARY REPORT	*				*
	ACTIVITY COMPARISON REPORT	*				*
	PERFORMANCE REPORT	S	*	*		*

S = SUMMARY

Fig. 5 — Distribution of Computer Print-outs.

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and school accounts — and each is further subdivided to the actual plant accounts. Hours (adjusted for trainee contribution) are shown, together with cost expenditure to each plant account. The duplicate copy of the CE60 form provides information to Costing Section which was previously recorded on the WP1 forms, from which plant account expenditure can be processed by the Costing Section. Ultimately the costing report may be the only working document provided to the Costing Section and the duplicate CE60 form will not be needed. This by-product of the SIMS system could lead to considerable staff savings within the Costing area.

Progressive Expenditure of Man Hours to Works Authorities

Man-hours expended against works authorities are recorded progressively and the printout summary depicts man hours expended to date against each plant account (adjusted for trainee contribution) on current work. Progressive expenditure reports are provided each fortnight to depot supervising technicians and highlight the senior technician area(s) in which the work is being performed.

Unmatched Activity Report.

The activity codes and their associated activity times are stored in the computer's activity master file and activity codes recorded as input data are checked against this file. Only certain combinations of information which form the activity code are acceptable, and although each segment of the job code may in itself be correct, combinations which do not form acceptable job codes are incorporated in this Unmatched Activity Report.

This reject report occurs during the computer processing run and complete rejection of the data at this stage would result in the loss of considerable amounts of otherwise acceptable data, including actual manipulative times, essential to the reconciliation of costing information. Accordingly the source data should not be rejected and, in practice, the unacceptable job code is treated as having zero activity time for performance calculations and all times expended are incorporated in the costing reports.

The Unmatched Activity Report identifies the job and the depot from which the source document originated. Investigations may show a need for further training of the staff concerned. A downward trend in total hours recorded against unmatched activities would indicate a steady improvement in the operation of the system by field staff.

Maintenance Update Report.

Amendments to the master file are punched on cards for input to the computer. Whenever the content of the master file is changed or the activity times within the master file are amended, a maintenance update report is generated, indicating the acceptable amendments performed to the activity master file, together with edit listing of errors relating to unacceptable input data introduced in the update operation.

Performance Report.

The divisional engineer is provided with a fortnightly summary of performance reports produced for each depot, which are subdivided within each depot report into senior technicians' areas. A typical depot performance report is depicted as Fig. 6.

Two measures of performance are generated, manipulative performance and overall performance. Manipulative performance — the comparison of standard activity times with the equi-

SUBSCRIBER INSTALLATION MEASUREMENT SYSTEM A D E L A I D E

DEPOT PERFORMANCE REPORT CITY DEPOT PERIOD ENDING 26/03/69

AREA	ACTIVITY TIME	ACTUAL TIME	MANIP PERFORM	TOTAL LOST TIME	TRAVEL TIME	SUBS	WAITING TIMES MATERIAL	TEST	OTHER
			XXXXXX %					PM60	
A	296,00	351,87	84%	25,50	20,60	1,10	0,80		3,00
B	566,50	610,95	93%	43,40	33,80	2,20	1,00		6,40
C	221,50	171,40	129%	27,70	21,50	1,00	1,50	1,80	1,90
D	203,25	206,20	99%	51,30	29,60	7,90	6,80		7,00
E	537,25	586,12	92%	84,90	44,20	24,20	4,60		11,90
F	156,00	115,36	135%	18,90	7,40	2,30	2,50		6,70
G	57,25	56,50	101%	5,00	3,50	1,50			
DEPOT TOTAL	2037,75	2098,40		256,70	160,60	40,20	17,20	1,80	36,90
OHDM TIME		599,20							
OHDS TIME		792,00							
ETT TIME									
UNCLASS ACTY TIME		334,29							
VEHICLES TIME									
TOTAL		3823,89							

DEPOT PERFORMANCE STATISTICS

OVERALL PERFORMANCE 53%

MANIPULATIVE PERFORMANCE 97%

Fig. 6 — Typical Computer Print-out.

KEIGHLEY & HIGGINS — Subscribers Installation Management Control System

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valent actual times for completed jobs — is provided for each senior technician's area. Overall performance— which incorporates depot overheads — is produced for each depot. Actual times expended on defined activities, travelling and waiting times, are itemised for each senior technician's area, whereas supervisory and depot overheads, ETT and motor vehicle times, are summarised on a depot basis.

Category Report.

Completed activities are categorised by work types for each depot and division and the activity ratio provides a measure of the percentage distribution of time between the different categories. This report highlights the relative emphasis on the different work types for such diverse purposes as the measure of effectiveness, cost/benefit analysis and loading and grading. For example, the prime function and major work content of Subscribers' Installation divisions might be considered to be the installation of new services. Analysis in Adelaide indicates that the installation of new services accounts for 6 per cent., provision of additional equipment to an existing service, 54 per cent., and alterations to existing installations, 25 per cent. of the work performed by the technician-installer staff group.

Activity Summary Report

The quarterly activity summary shows the number of occurrences of each activity on each type of work performed. This report provides information which is useful for material ordering.

Activity Comparison Report

The quarterly report is designed as a control report for continuing review of activity times initially determined at the Agreed Times Conference. The average actual time and the frequency of occurrence of each activity are tabulated, together with the variation of actual time from the activity time. The variation index is specified as:—

$$\frac{\text{Activity Time} - \text{Actual Time}}{\text{Activity Time}}$$

PRESENTATION OF INFORMATION

Analysis of information generated by computer printouts is assisted by the graphical recording of such information and the review of trends to detect changes in the various measures of performance. Action to effect productivity improvement could result from the review of these trends and the instigation of analysis and subsequent action to arrest unsatisfactory trends. It must be emphasised at this point that the computer processing of information and subsequent transcription of printout information to graphical format will never in itself result in productivity improvement. Essential to any productivity improvement is the need to analyse the information in detail, compare actual results in relation to the previous trends and anticipated results and instigate corrective action, where necessary. Control is the essence of all productivity improvement and the necessity for continuing control must be emphasised at all levels of supervisory management. To this end a three-section compendium has been provided which, in addition to graphical recording, has provision for recording of statistical data relating to depot and divisional reports and a reference to the distribution of computer printouts. The statistical information is arranged in such a manner that divisional summary totals are readily portrayed down the right-hand column of each page, the widths of which have been staggered such that all divisional information is immediately visible. The equivalent information relating to each depot is obtained simply by raising the appropriate flap, where such information is shown in the left-hand portion of each page.

Senior technicians are encouraged to perform their own recording from the depot printouts and to analyse the information in order to instigate corrective action.

IMPLEMENTATION OF THE SYSTEM.

This system was implemented as a trial in the Subscribers' Installation Division (SID), Adelaide. Field procedural manuals were prepared and pre-implementation training courses established. The scheduling of work to installers and the subsequent recording of data on to forms CE60 was introduced from the second period of January, 1968. During the next five months, programming and testing were completed in accordance with the SIMS specification and processing of current data commenced from 4th July, 1968. During these interim months, training of recorders and installers proceeded, with information recorded on the CE60 form being continually checked, firstly by the respective depot senior technicians and subsequently by the specialist senior technician nominated to provide assistance in the development of the system. Errors and omissions detected were referred back to the originating source and further explanation and guidance provided as an integral part of the training of recorders and installers towards the generation of accurate and complete input information.

Acceptance testing of the computer program was satisfactorily completed during the first week in June and corrected information generated in the interim period, transcribed on to punch cards, was processed progressively at the rate of two to three computer runs per week during the remainder of the month, primarily to create the necessary historic data within the computer files. In addition, progressive processing of back data further checked the capability of the program to handle large volumes of data, to correctly process and update information and to generally accommodate the variety and combinations of information which might normally be experienced in practice.

System Stability.

The effectiveness of the system in increasing the productivity of Subscribers' Installation activities has been assessed only after confidence had been gained in the trial system and it had become stable. To achieve this confidence, four criteria were aimed at:

(i) Errors produced by human action should be reduced to a low level.
(ii) Installers should be conversant with the concept of correct coding of jobs.
(iii) The identification of activities should be competently performed by installers.
(iv) The initial standard activity times which form the basis of the control function should be reasonable and acceptable times for the defined activities.

Monitoring of these criteria has been provided by control reports designed into the information system. The control features inherent in the information system are as follows:

Input Edit: Rejects are listed during the edit validation run prior to normal processing and a statement of total error rejects, together with total cards read, is provided. The ratio of errors to cards read has decreased from over 10 per cent. during the early periods of the system to less than 1 per cent. since August, 1968.

Uncompleted Work: The volume of uncompleted telephone order work should remain fairly constant if staff levels and overtime are reasonably steady and this feature is used to ensure that completed work is being coded off as required in the design of the system.

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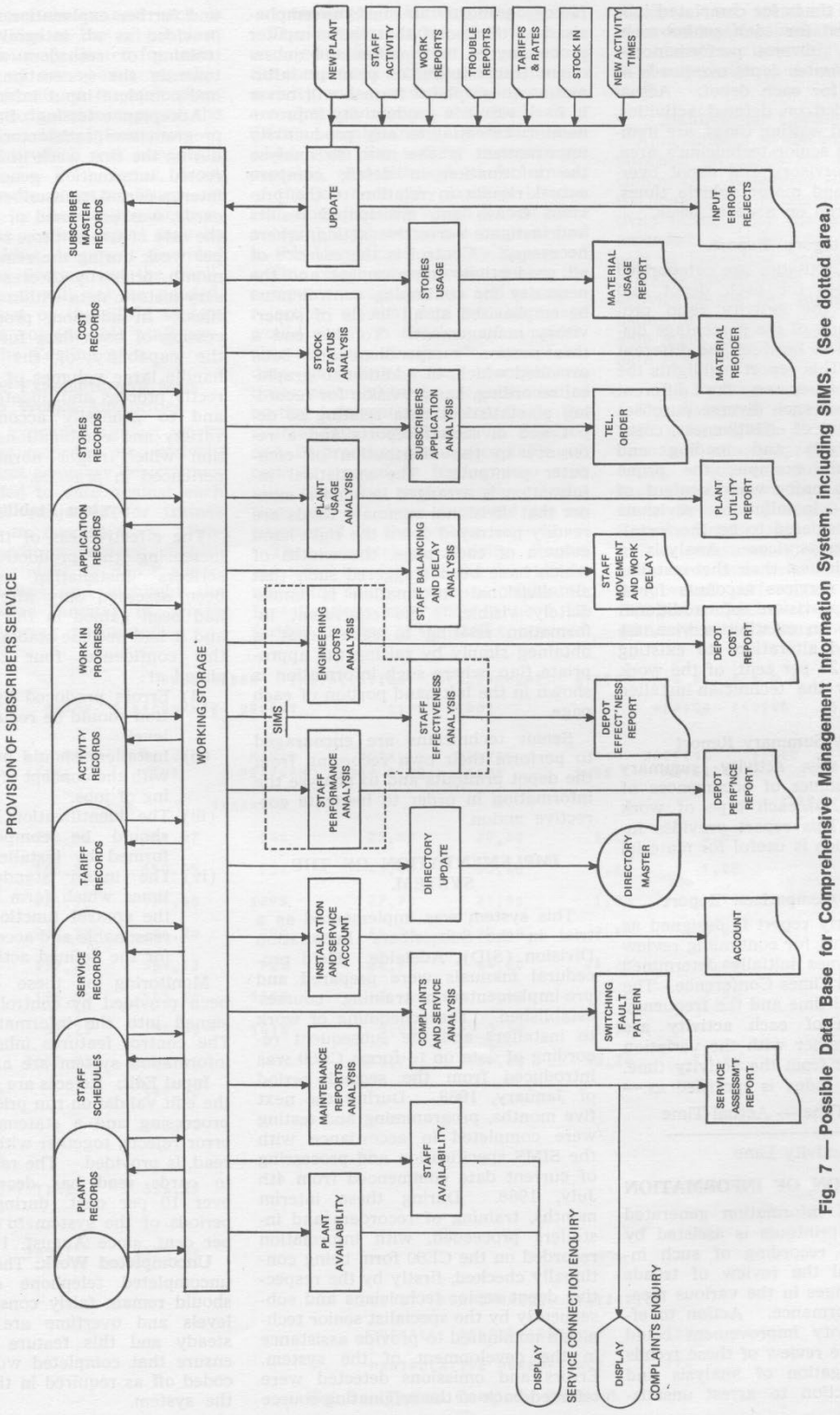

Fig. 7 — Possible Data Base for Comprehensive Management Information System, including SIMS. (See dotted area.)

KEIGHLEY & HIGGINS — Subscribers Installation Management Control System

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During the early periods of the system many jobs were not being cleared by the reporting of the appropriate job code, which was indicated by a substantial buildup of uncompleted work. Job codes were subsequently inserted for these completed jobs and the volume of uncompleted work was thus reduced and has since remained fairly stable at about 5000 manhours per period.

Unmatched Activities: A number of codes are employed in describing a completed job, and the unmatched activity report depicts unacceptable codes. Reduction in the number of these indicates that the installers are translating the job identification into correct codes.

Activity Variation: The credibility of any control system rests on the accuracy of the standards employed in relation to the recorded data. Accordingly, the actual time for the activities are compared with the standard time and the variation of the average (expressed as a percentage) from this standard is listed. Variations greater than a predetermined limit indicate that the standard is at fault or that factors external to the system are affecting the activity times. This check is performed periodically. A variation index is employed to highlight the relativity of the actual to standard activity time, but because of the generally positive skewness of the statistical distribution of these recordings, the mode or median may be more appropriate.

RESULTS ACHIEVED.

Considerable benefits have been experienced by the management in Adelaide. Particular improvements achieved during the first 12 months of the trial were as follows:—

(i) Information relating to the previous period is available within three working days of the end of that period.

(ii) Divisional and supervisory management are provided with sufficient information to enable them to adequately assess performance and initiate corrective action when necessary.

(iii) Inefficient procedures which result in excessive time spent travelling, waiting for material, subscribers, test, etc., are highlighted.

(iv) Management is provided with costing details within three working days at the end of the period. Senior technicians also can more closely control expenditure on works authorities in progress.

(v) Supervising and Senior technicians become more management conscious.

(vi) Work scheduling can be performed more effectively, and staff locations can be readily ascertained from the depot by means of the work allocation procedures.

(vii) Facilities to effect work balancing and reallocation of staff reduce the build-up of backlogs of work at particular depots or areas.

CONCLUSION.

This article has described a complex management control system designed to suit the telephone subscribers' installation function. The system has taken just over three years from survey to audit of the trial situation, and present indications are that it will make a significant contribution to productivity improvement. The information generated by the system provides middle and top management with better opportunities to control their work, particularly in the following areas:—

(i) Budget control procedures may be implemented at sectional level.

(ii) The effect of the introduction of new equipment, methods or practices can be shown.

(iii) Staff loading and grading can be more accurately checked and updated.

(iv) Those areas of activity which offer the greatest prospect for productivity improvement can be identified.

(v) Material usage and therefore material ordering can be more accurate and stocks can be maintained at a lower level with safety.

The system has been designed with sufficient capacity to be used in all subscribers' installation units throughout the Commonwealth and with the information output integrated for the highest levels of management. Also, it was recognised that the information derived from the system is a small element in a larger, more comprehensive system for provision and service of the telephone subscriber (see Fig. 7).

The system aims at achieving better planning and control of work. The gain from the field staff point of view is reduction in frustrations at the work face caused by inadequate control using existing methods. Information made available to all levels allows all to participate in the continuing search for the most effective and efficient use of the available resources.

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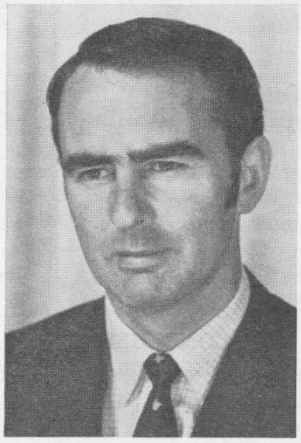

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