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Training of Personnel by Swiss PTT Telecommunications¹

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1 The need for training

- If the technically complex telecommunication installations are to function properly, the personnel must be thoroughly trained.
- A single period of training, however, does not suffice since in the technical and administrative sectors progress is continuous.
- Continued training is the key to keeping up-to-date.

Forty years ago telecommunication engineering was still relatively simple. On-the-job training of personnel sufficed, and the PTT was able to take over qualified staff from the suppliers. With the progress of technology and the resulting proliferation of the most diverse equipment, the situation has changed fundamentally. The personnel must be well trained both on the theoretical and practical levels and be always ready to learn something new, for progress never stops. Those who join PTT Telecommunications must be prepared to learn a «second trade» even if they already hold a certificate of proficiency in another.

2 Training objectives

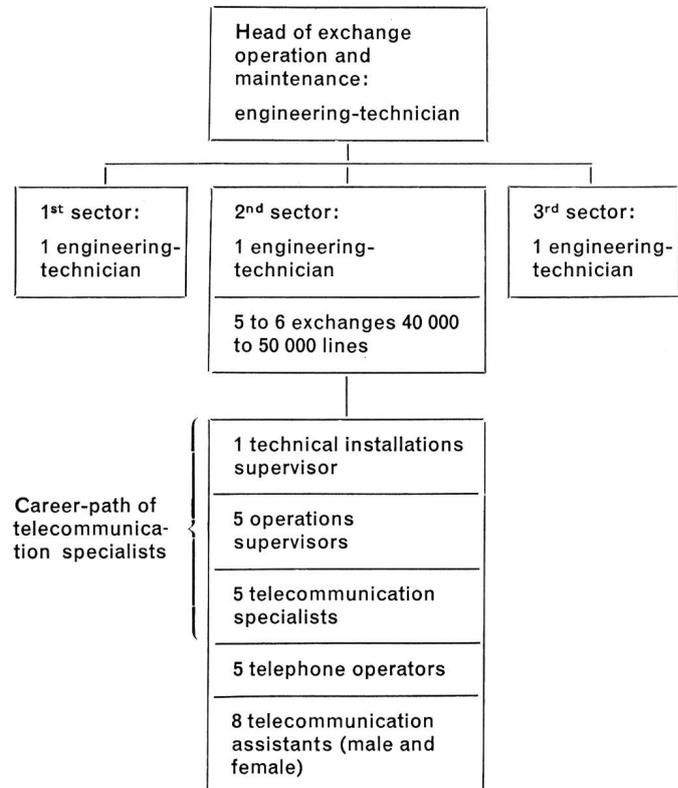
- Only well trained personnel can perform professionally and efficiently. That is why Swiss PTT Telecommunications has been offering extensive training for many years now, and with good results. Its efforts have been appreciated and actively supported by the staff associations.
- Thanks largely to the high level of training, combined with a rational work-assignment, there were only 4.3 employees for 1000 telephones, or 6.7 employees for 1000 main stations, in 1974.

The training objective is to obtain the best possible results with a minimum of investment. This explains why there is no central school of the PTT in Switzerland. Experience has shown that it is more advantageous for the 17 Telephone Regions to train their personnel locally. Central courses are arranged only when the number of candidates is too small to form a class locally. Other basic requirements are that the course must be tailored to the participants' duties, and that staff must be assigned jobs corresponding to their standards of training. It would be wasteful to train a man in electronics and employ him where there are no electronic equipments.

3 Personnel employed in a technical sector

As an example, the personnel structure of a sector in telephone exchange operation and maintenance is given.

Organization of telephone exchange operation and maintenance in the Regions.



The following staff are required for operation, fault-clearance and maintenance of 5 to 6 exchanges with 40 000 to 50 000 lines:

- 1 engineering-technician (head of sector) and some 11 telecommunication specialists (maintenance and repairs)
- 8 assistants (connections, maintenance, and repairs of simple faults)
- 5 telephone operators (test calls, telephone service)

4 Educational and training background requirements for telecommunication staff

The designation of schools and the number of years of study correspond to the conditions existing in the different Swiss cantons.

5 Categories of personnel employed by PTT Telecommunications

Technical personnel:

- C. Engineers
- Engineering-Technicians
- Telecommunication specialists
- Assistants

Operating personnel:

- Telephone operators
- Telegraph operators (male and female)

¹ Deutsche Originalfassung, erschienen in den Techn. Mitt. PTT Nr. 2/1976

Version française, parue dans le Bull. techn. PTT No. 2/1976

C. Engineer

PTT Telecommunications	Engineering-Technician					
1-year initiation period	PTT Telecommunications	Telecommunication specialist				Higher-level administrative officers
1 to 5 years in industry	1-year initiation period	PTT Telecommunications	Telecommunication assistants		Lower-level administrative officers	PTT Telecommunications
4 years institute of technology or university	1 to 5 years in industry	2 to 3-year initiation period	PTT Telecommunications	Telephone or telegraph operator	PTT Telecommunications	1-year initiation period
7 years gymnasium (preparing for university)	3 years technical high school	1 to 5 years in industry	2-year initiation period	PTT Telecommunications	1-year apprenticeship	1 to 5 years in private company or administration
2 years secondary school	4 years apprenticeship	4 years apprenticeship	1 to 5 years in industry	1-year apprenticeship	1 to 5 years practical experience	3 years apprenticeship in business
4 years primary school	5 years secondary school	5 years secondary school	9 years primary school	1 year foreign-language training	1 to 5 years practical experience	5 years secondary school
	4 years primary school	4 years primary school		5 years secondary school		4 years primary school
				4 years primary school	9 years primary school	

Administrative personnel:

- Higher-level administrative officers (male and female)
- Lower-level administrative officers (male and female)

7 Organization of training

Training is in accordance with regulations issued by the PTT General Directorate for

- Training, exams, and continued education of PTT personnel (C4), and
- Employment, recruiting, and training of apprentices (PTT trades) (C2)

The technical and operational departments of Telecommunications are responsible for the planning and organization of specialized training in their respective fields. Coordination is ensured by *Specialized Training Group. Personnel Division* is responsible for general and management training.

In the majority of cases, staff are trained locally by officers from the Regional Directorates' various departments. Teaching is a part-time duty, with only one officer employed full time on the coordination of training.

8 Types of training

As an example, the training of telecommunication specialists will be illustrated. This career is open to applicants with training and experience in electromechanics, electronics, etc., and employment is conditional upon their passing a psychological aptitude test.

The new recruit is immediately assigned to a predetermined area for practical training which is to include as much productive work as possible. Basic training lasts for two to three years and is followed by an examination. The specialist is then ready for duty, for example in a telephone exchange, where he performs the following work:

- Routine maintenance of relays, line finders, selectors, etc.
- Fault detection and location
- Fault repairs
- Testing

6 Breakdown according to staff categories and duties

Percentage	Category	Duties
0.5%	C. Engineers	Research and Development, management (General Directorate)
6.5%	Engineering-Technicians	Planning, construction and operation of telecommunication systems (General Directorate and Regions)
29%	Telecommunication specialists	Construction, operation, maintenance, fault-clearing of tele-communication equipment (difficult technical work)
10%	Telecommunication assistants	Construction, operation, maintenance, fault-clearing of telecommunication equipment (tasks of low to medium difficulty)
20%	Telephone operators (female)	Manual switching, enquiries, fault reports
4%	Telegraph operators (male or female)	Telegraph office
7%	Higher-level administrative officers (male and female)	Administration (HQ and Regions)
13%	Lower-level administrative officers (male and female)	Administration (HQ and Regions)
10%	Other personnel (drawing offices, warehouses, garages, maintenance of buildings, etc.)	Various duties

During the practical training period, the candidate receives one day's (8 hours') theoretical instruction a week in algebra, electrotechnics, electronics, switching, subscriber's sets, transmission technique, and line networks. With only one day's instruction weekly, the candidate has sufficient time to absorb the material and to do homework. *Principle: Theoretical training goes hand in hand with practical training, but the former is only given in instalments.*

At each Regional Directorate the candidates are taught in classes by officers from the respective departments. Thus, an engineering-technician from the Exchange Operation and Maintenance will teach switching systems and techniques. Even plant and line supervisors will be called upon to instruct. *Principle: Teaching is by technical experts from the various departments. They are familiar with the installations in their charge and know what knowledge must be imparted to prepare the candidates for their respective duties.*

Basic training is followed by detailed specialist training which includes recent technical advances.

Central courses of 1...2 weeks are arranged on new apparatus, equipment and systems, the suppliers' representatives often acting as instructors. These courses are attended by those responsible for on-the-job training in the Regions.

9 Methods of instruction

Ten years ago, teaching in class followed the pattern below:

- Presentation of subject by an engineering-technician.
- Aids:
 - Blackboard and demonstrations.
- Dictation of subject taught - fair copy to be made as homework
- Maths homework
- Written work

Today's pattern:

- Less lecturing, more group work, active participation
- Textbooks available to each course member. No dictation
- Aids: Blackboard; view-graph projector; transparencies of all the figures used in the course (less drawing on blackboard); transparency overlays to illustrate steps and evolution of processes; slides with legend to assist the instructor; 16-mm and super-8 films
- Homework and continuous monitoring of progress

Principle: The course members shall participate actively.

10 Advantages of programmed instruction

At present, four groups of programmers are engaged in preparing training programs for telecommunication staff. There are no commercially available programs that would fit the requirements of specialist training for this service.

Programmed instruction is at present based on textbooks. The main advantages of programmed instruction are:

- The subject is taught in small, well thought-out instalments
- The student is intrigued by the program (if it is well conceived)
 - He is constantly being challenged to play an active part and cannot digress
- Instant check and confirmation of progress by comparing answer with correct solution
- Individual study pace. Students with prior knowledge can skip familiar items
- In case of difficulty, the student can repeat the program after hours
- Lessons missed due to illness, vacation, etc. can easily be taken later on
- The instructor is freed from lecturing and has more time for the individual student
- Uniform instruction in all classes; level of teaching fixed by the program
- Progress checks by uniform test papers

So far the experience with programmed education has been good. In the first place it is important that the participants should become actively involved.

11 The advantages of language laboratories

The development of modern means of communications puts ever increasing foreign-language requirements on the telecommunication personnel. New teaching aids and methods have been sought to improve foreign language teaching. Language laboratories, which promised the best results, have been set up in large Regions since 1970. Today, there are 8 laboratories accommodating 12 to 14 students each.

The language laboratory has the following advantages over traditional teaching methods:

- Teaching aims are attained sooner
- The students are encouraged to participate more actively in the course
- Each student determines his own study pace
- Lessons missed due to illness, vacation, military service, etc. can easily be taken later on, since the tape cassettes are very well suited for self-study (private lessons are not necessary)
- With language laboratories, personal contact between teacher and student is maintained
- Uniform programs simplify teachers' preparatory work
- The main advantage of language laboratory instruction is, however, that the student has sufficient opportunity to speak the foreign language. In a traditional language class there is very little room for individual oral practice: the student either listens, reads, or writes. As a consequence, fluency will suffer and a certain hesitation to use the language will result. The use of language laboratories promotes conversation. Instead of only answering two or three questions during a lesson, the student speaks more than a hundred sentences. He can check his pronunciation by listening to the recording of his voice.



A language laboratory

An enquiry with the Telephone Regions has shown that language laboratories are popular and results excellent. After a very short time the telephone and telegraph opera-

tors are able to use effectively their newly acquired knowledge since the main emphasis in laboratory training is on fluency.

12 Conclusions

Experience by Telecommunications over the past two decades shows that the investment in training and continued education of personnel is repaid with interest. Only well-trained personnel can ensure efficient operation of services at low cost.

Highly qualified staff are needed for the operation and maintenance of new telecommunication equipment. While in the past manual skills were very important, today more and more emphasis is placed on intellectual abilities.

To keep up with new developments, special emphasis is placed on continued training. Courses on electronics, new switching and transmission systems, etc. have become permanent features of the training program.