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1 Introduction

The brochure *'Learning Station Analysis I – an instrument to connect Typical Professional Tasks and the operational training'* is a collaborative product of the pilot project 'Move Pro Europe' in the aeronautic sector implemented by EADS. This was a further collaborative development of the instrument BAG-analysis, that was developed and successfully implemented in other contexts (for the automobile industry, see Bernd HAASLER, ITB research report 10). In particular, the form of documentation of the analytical results was changed considerably by the trainers of participating EADS-plants who are now enabled to work on their own with this instrument. In addition to this first part, serving essentially for the analytical reproduction and systematization of the knowledge of those participating in operational training, there will soon be a second part that is concerned with the optimization of learning stations and the checks to see if the potential of a learning station is really achieved.

The procedure 'LSA' (Learning Station Analysis) was developed to help arrange the training at the learning places in an effective way in accordance with the business needs and operating processes. Essentially, it helps users figure out the work places that are important both in terms of the significance of their operating processes *and* for the learning opportunities they provide. This approach emphasizes the value of training taking place at work stations where really important operations are being carried out: the relevance of training to prepare trainees for the requirements of modern skilled work is multiplied if this training takes place where key operational processes are being carried out.

As well as the LSA being used to examine the quality of individual work stations, the tool can highlight the value of *these being accessed in a certain order*. A simple example would be of an operational work place that offers insight into and experience of a technology and a quality procedure that are characteristic for a certain industry. However, in order to be able to 'enter' such a workplace, young people already have to possess understanding of certain production procedures. Without such prior experience, for example if a trainee was to arrive quite early in their training at that learning station and furthermore remain there for only fourteen days, one could not teach them to handle fully the actual functioning at that work station. In such a case good learning opportunities are missed as the flow through different learning stations has consequences in terms of the organisation of training. An additional important aspect of this method is that the skilled work is to be regarded from an angle of an intermediate learner: that is, elements that are self-evident for experienced colleagues but might pose considerable, if not insuperable, problems for an apprentice have to be pointed out. A LSA can uncover the potential that learning at that work station can make to achievement of the overall qualification as well as contributing to the analysis of other work stations so as to give information on the optimal sequencing of movement through the work stations which can be represented on a flow chart. A LSA should also always examine not only the learning potential at work stations already used in training, but also the potential of other work stations that have not yet been used for training purposes.

In general an outcome of a LSA should not only focus upon the *working process of the training* in general, it should also encourage the *development process of the trainees*.

2 Procedure - milestones

The name 'Learning Station Analysis' itself clarifies the aim of the analysis. 'Learning stations' are places where learning to perform work central to the occupation takes place. LSA analyses workplaces, which cover typical professional tasks (BAG, TPT). These TPTs describe skilled work tasks in terms of characteristic operations and work contexts that are needed in order to make sense of learning and development in an occupation. They are typical for the profession and together comprise a complete specification of the learning required in order to become fully skilled. With this definition vocational work tasks can be specified as follows:

No individual activities or performances are analyzed, for example drilling or swaging according to reference documentation. Instead tasks, in the sense of complete actions, following a holistic process structure, are analyzed. The aim is a general process structure of typical professional tasks; containing specifications of concrete tasks, including their planning and accomplishment as well as the inspection and assessment of work outcomes. The LSA construct uses the following criteria:

- it has to reflect the super-ordinate coherence of the vocational working process and refer to a self-contained career profile;
- it always describes a work context and a complete work action, which highlights the context for planning, implementing and evaluating;
- the formulation of the documentation also emphasizes the content and shape of the skilled work;
- it reflects the sense, function and meaning in the context of the super-ordinate operational business processes;
- special regard is given to the development potential that is provided by skilled work.

The analysis of the work places for trainees assigned to typical professional tasks is divided into the following three phases:

- preparation of the investigation,
- accomplishment of the investigation,
- evaluation and documentation of the investigation (for use of the results in constructing a schedule for progression through the learning stations).

3 Analysis of the Learning station – the approach

3.1 Preparation of the analysis of typical professional tasks as learning stations

Although each work analysis corresponds to an identified typical professional task (BAG- or TPT- tables), the following practical advice is recommended. It is necessary to distinguish a typical professional task from activities and performance. So it has to be controlled on the basis of the terms named before if a chosen task is to conform and be valid to the requirements. The project is to plan an apprenticeship at a location in accordance with a complete development and working process. This requires numerous individual analyses, which should be matched in the technical and production areas, in order that suitable development will be realised.

Select workstations

After a typical professional task which can be analyzed has been designated, it is necessary to select operational work places as (possible) learning stations in the enterprise and/or a department, at which qualified specialists master requirements, which are representative for the typical professional task. Operational representatives of the investigation team are responsible for the selection of the workstations, since they have detailed insight into the business and working processes and can assure the organizational conditions of the investigation.

Usually typical professional tasks are not found in isolation from each other in practice. At many work places, and thereby also at learning stations or work fields, several closely linked professional tasks are mastered together. *For the analysis it is advisable to select work places or rather fields with the 'core specification' of a typical professional task. Although, in principle, only an individual professional task is tested with the analysis, of course also the interfaces with other typical professional tasks have to be observed.* A simultaneous investigation of several work tasks can cloud the view of the substantive processes involved in different tasks. When several TPTs are involved in a work process due to the organization of work, it might be necessary to perform several learning station analyses from different angles, for example, in the case of function checks, disassembling and malfunction analysis.

An influential factor not to be neglected in the selection of work places in departments and operations is the participation of specialists in an analysis of their work. Here it is important to make particularly clear that the analysis does not concern the preparation of rationalization measures or personnel restructuring. The location of specialists with substantive professional experience is crucial to devising vocational education and training programmes in practice. This central request should be clarified with the production manager who has given agreement for the planned analyses to take place.

Investigation team

The selection of the participants for the investigation also belongs to the preparation phase. For reasons of an efficient, purposeful execution of a LSA it is recommended to choose a group of two to four persons, containing an expert skilled worker and a trainer. A vocational school teacher or a vocational researcher can join the investigation team. The common point of reference of the team is the profession, for which the analysis has to offer a base later on. Vocational school teachers and training supervisors should be involved in training for this profession. It is obvious that

the expert skilled worker is practicing the profession. The following four functions are to be performed in preparation for the group investigation:

- Discussion schedule (interview);
- Preparation of a record (references);
- Preparation of photos and sketches;
- Taking along / organization of working material (e.g. designs).

Although, as the analysis is a task for all, as a basic principle there should be no hierarchy in the investigation team, but at the start of the analysis someone has to be nominated with responsibility for the documentation. For the analysis it is advisable to use already existing connections (e.g. teacher work circuits, examination boards, local learning cooperation). Nevertheless, the instrument can also be successfully performed by teams who have had no contacts to each other before the common investigation.

3.2 Manual for the Analysis

Both for investigation teams already well-rehearsed as well as for those groups of people who are specially selected for an analysis, it is important to look to the manual as to how the analysis leads through the investigation before starting by focusing on the following questions:

- In which *business and working processes* is the professional task integrated?
- At which *workplace* is the professional task executed?
- Which *items* are treated at the concrete professional task?
- Which *tools, methods and organization forms* are used?
- Which skilled work *requirements* have to be fulfilled thereby?
- Which *interfaces* to other typical professional tasks exist?
- Which experiences exist as regards the *training* on this workplace?

After completion of these basic questions the analysis categories are developed, which can then be opened up in more detail by a leading question catalogue.

Analysis category: business and working process

The analysis of skilled work cannot refer to the workplace without considering the context. Without consideration of the integration in business and working processes, skilled work in its full complexity is not compiled appropriately. For this analysis category material and information flow charts as well as schematic diagrams of the order flow are helpful demonstrations, which facilitate the analysts' work. These materials can often already be examined by the investigation team in the preparatory phase of the analysis, before the 'on-site-analysis' starts.

Analysis category: workplace

Besides the location (department, production area and section) it is of special interest, when describing the chosen work place, to identify the type of working conditions to which the specialists are exposed when managing their everyday work life. Site conditions such as lighting conditions, noise exposure, ambient temperatures but also aspects of ergonomics at the workplace (e.g. seating positions, work benches) are of note here.

Analysis category: components of skilled work

Describing the components of skilled work, the work context and the work process are considered here. Thus, for example, the technical realization of a machine tool is based on the idea that for its use there should be only a few skill and knowledge prerequisites necessary for the operation of the tool. According to this, the work process of the operator differs substantially from that of the maintenance worker, although both work processes include the same machine tool. The operator of the machine tool feeds parts to it, establishes the tool and accomplishes simple maintenance tasks. The work is geared to the trouble-free functioning of the system, and in general the operator does not know very much about the internal design and details of how the tool functions. In contrast, the maintenance worker has to determine the cause for a defect of the system and is therefore dependent on detailed knowledge of the correct function sequence, in order to determine hints for possible causes of malfunctioning.

Especially in methods of skilled work diverse design potentials are possible. Even if, for example, two maintenance workers can proceed completely differently during their search of a fault they aim at the same goal: the identification of the defect. To detect the fault underpins the methodical approach of skilled workers in performing such professional tasks. Differences appear not exclusively in the concrete execution of their work but also in how it is planned, whereby different strategies can be used.

Analysis category: tools and supplies for the skilled work

Concerning the description of the tools and supplies used in the skilled work, the context of the work process is crucial. Beside the tools used, the workshop facilities that are used in the work process at the work place are also of interest.

Analysis category: organization of the skilled work

The form of the organization of work is a key feature for the arrangement of skilled work that cannot be neglected. Here aspects of the operational structure and sequence organisation are the centre of attention (e.g. group organisation, division of labour, hierarchy levels, co-operation with other occupational groups). Co-operation with other professional groups (e.g. in skilled maintenance work; decentralized versus central maintenance) is an important aspect of the investigation. Varying organizational forms lead to substantial differences for the occupational responsibility, the task connection and co-operation and communication requirements allied to the working process. Also work time models (e.g. shift work, work break times, part-time jobs) may affect the nature of skilled work considerably.

Analysis category: demands on skilled work and its components

Here the varying demands towards the work process and the work components which are made by different interest groups are identified. For example, the company sets specific quality standards, which relate to search for competitiveness, that have to be respected when performing skilled work. This may require, as an example, the adherence to time and cost targets. Legislative requirements and how these are enacted in regulations, e.g. in the form of technical standards and rules for the prevention of accidents, must be respected. The possibilities and the requirements of arranging technology and skilled work become clear only in the comparison of these varying, and partially contradictory, demands.

Table 1: guiding questions for the Learning Station Analysis

| Category of Analysis | Constituent questions |
|---|--|
| <i>Business and working process</i> | <ul style="list-style-type: none"> - The professional task belongs to which business and working processes? - Which products are produced? - Which services are furnished? - Where do preliminary products come from? - How are orders accepted? - Where are the products used in the further process? - How are processed orders handed over? - Who is the contracting authority/customer for the service? |
| <i>Workplace</i> | <ul style="list-style-type: none"> - Where is the analyzed workplace located? - What conditions of light are present? - What climatic conditions affect the specialists (e.g. warmth, coldness, radiation, ventilation, gases, vapours, fog, types of dust)? - In what circumstances do the specialists master their tasks? |
| <i>Subjects and methods of the skilled work</i> | <ul style="list-style-type: none"> - What is worked on in performing the professional task (e.g. technical products and processes, services, documentations, control programs)? - What is the role of the object in the working process (e.g. system guide or system repair)? - What processes are used when working on the professional task (e.g. error tracing, quality assurance procedure, manufacture, assembly)? |
| <i>Tools/media of the skilled work</i> | <ul style="list-style-type: none"> - Which tools and media are used to perform this professional task (e.g. circuit analyzer, torque wrench, PC with user software)? - How is the tool/medium handled? |
| <i>Organization of the skilled work</i> | <ul style="list-style-type: none"> - Organization of the skilled work (e.g. individual work or group work, division of labour)? - Which hierarchies affect the skilled work? - Which co-operation and borders to other occupational groups and departments exist? - Which aspects of colleagues' cooperation have a unifying effect? |
| <i>Requirements of the skilled work</i> | <ul style="list-style-type: none"> - Which operational requirements have to be fulfilled during the accomplishment of the task? - Which demands are posed by the customer? - Which social requirements play a role? - Which standards, laws and quality standards are considered? - Which rules and 'standards' does the community of practice require? |
| <i>Interfaces</i> | <ul style="list-style-type: none"> - Which relations exist towards other typical professional tasks? - Which comparisons can be drawn to other analyses of this typical professional task that were already accomplished? - Which things in common/differences exist to other workplaces in the operation where the same typical professional task is mastered? - Which relationships are there to occupational theory (vocational school) and/or for 'vocational basics' and/or to 'core competencies'? |
| <i>Experiences with the training</i> | <ul style="list-style-type: none"> - Do training components take place at the analyzed workplace? - If not, why? - In which year of apprenticeship are the trainees at this station? - How long are they at the station and where were they before/afterwards? - Which preliminary conditions should the apprentices meet? - What should they learn in the view of the skilled workers at that place? - Which special characteristics could be learnt here by the apprentices? - Which impressions from apprentices/young skilled workers do the skilled workers have? - In what way are the apprentices supported? - Do the apprentices work 'normally' or do they work under separate instruction? - Which experiences are there with the BFE/FES system? |

Analysis category: interfaces

Furthermore the investigation has to be set into a broader context, especially interfaces and overlaps with other professional tasks deserve special attention. As previously mentioned professional tasks are rarely found isolated in practice, they are often linked closely to others, which are managed by the specialists together with the one under consideration. Results of analyses concerning professional tasks, which derive from other workplaces, can also be the subject of critical reflection here.

Analysis category: experience with training

The described analysis is focused on the development of recommendations as to the order, duration and shape training could have at the analyzed work stations. The experiences of skilled workers in their interactions with apprentices and/or young skilled workers are accordingly of particular importance.

The presented classification scheme with guiding questions for the LSA is merged in table 1 and designed as a master to guide the investigation. Experience shows that each team member should carry this guide as a 'memory hook' for the investigation. The developed guiding questions offer suggestions for the investigation. It is not intended that they should be strictly followed question by question in each investigation, as if they comprised a checklist. The purpose of the guiding questions is rather to provide suggestions in order to be able to elaborate test results more purposefully.

3.3. Execution of the analysis and documentation

The specialists, who are working on the selected workplaces and whose work should be analysed, should be informed of the topic and aim of the analysis. It has to be made clear to them that they should follow as close as possible their everyday work: the analysis is not concerned with 'performance', but with the accomplishment of everyday requirements of the skilled worker. If on the day the analysis is carried out there are no 'highlights' in the work observed, but rather just unspectacular 'standard work', this is not problematic for the analysis. It just reflects normality. The workplaces are visited and tested following the list. On that the skilled workers are asked, in order to make the "invisible" visible. With the agreement the discussions should be noted, in order to handle the information abundance. The required time for the analysis depends strongly on the complexity of the tasks on the concrete workplace. The experience shows that a time framework between some hours and three half days should be expected.

After performing and documenting several analyses for the professional tasks, the main objective - which is the new training organization - can be started.

4. Evaluation

By using the LSA tool we pursue two targets. First, we try to compare the organisation of work in the learning stations with the tasks to be completed in training according to the TPT table. Secondly, we make an effort to document the learning potential of these stations. Through using the manual described above, data will be available from the results of the interviews with skilled workers on their workplaces that means the learning potential of each workplace should be easily identified and presented with the necessary clarity. However, one should initially consider as well what can be expected of the 'learning potential' in relation to individual development in accordance with vocational training requirements.

For sure 'potential' is not a guarantee of 'learning', rather it highlights that a situation or context offers (good) possibilities for substantive learning. In qualification research and professional education 'learning potential' not only has connotations of positive influences at a personal level, it also highlights in this context the increase of competences in the special subject or task - in the sense that someone is enabled during the learning process to do something that he or she was not able to do before. That is, someone who is not able to do something that he will need to do later in her or his career is not behaving wrongly, he or she is *not yet able* to perform the required tasks. That means that the individual should be expected to reach the required level of performance, in relation to actions and behaviours, not through threats or exhortation, but by learning to do something in the correct manner. For this purpose the individual is in need of appropriate learning opportunities and has to take advantage of those opportunities in order to build up their experience and expertise. Vocational training helps individuals achieve these goals, but in order to realise this supporting role, those planning vocational training have to know where all the relevant learning possibilities are located inside the working process. That is what we mean by 'learning potential'.

An emerging question is what is the relation between a BAG / TPT (typical professional task) and the learning potential for the apprenticeship? This question is very simple to answer: if the definition of the TPT and the selection of the learning stations belonging to the TPT have been done in a sensible high quality manner, then each learning station will have learning potential associated with the TPT. The knowledge and ability of the workers active at workplaces which are important and characteristic for the operation set the norm for the training and competence development of apprentices in the process of three and a half years apprenticeship in order to become skilled workers. This process orientation should enable the apprentices to achieve the ability to do *skilled work* at the end of their training. If firm-specific TPTs are suitably described (first condition) and the learning stations are correctly selected (second condition), then the substantive information is available for an arrangement of the learning stations that is logical for the purpose of competence development.

Here we touch a topic that frequently leads to a misunderstanding. If we say that a process orientated training that involves a different organisation of training results in the possibility of apprentices reaching the standard of skilled workers, then one could doubt the results of a LSA. One could object that a correctly described TPT (first condition) and a learning station selected corresponding to this TPT (second condition) only apparently gives, at first glance, a fitting picture of the learning

potential. The reason why a picture could emerge that is only apparently correct would then be a fault of the investigation-method of the vocational requirements. One could suppress by the TPT-definitions and the LSA oriented to these definitions the fact that the observed skilled work is actually based on experience and routine of many years in order to reach the level of a TPT. Thus, in this sense one could not say that the best TPT and the best suitable learning station are enough in order to reach the level of the skilled work actually exercised, at least in the context of a temporally limited training!

One cannot easily reject this argument. It is true that already from the educational view something is not correct: the advantage of routine and experience skilled workers have gained after 5 to 15 years of professional experience can never be caught up in an apprenticeship – even if it is organised in the most effective way one can imagine. But this is exactly the pedagogic argument as to why beginners should get in contact with skilled workers, with ‘masters of their profession’, and learn together with them from the beginning of their training. Thus, even if it is not possible to become almost as professional as the experts who are working at this working place following a stay of several weeks at the learning station, the contents that are important for the profession one can most effectively learn from the people who are adept in doing important things. A gap between the skills, knowledge and experience of the expert in what is to be learned and those of even the most capable beginner will still remain. It will shrink over time as the former apprentice becomes more expert at performing skilled work. However, one can start the learning process of the apprentice at the side of an ‘expert’.

Therefore the actual argument is, therefore, that it is not the primary task of a process orientated training to change beginners as quickly as possible into ‘experts’. The LSA acts rather to identify the cores of competent skilled work that are present at the relevant learning stations according to the TPT. Furthermore, it is the aim of the LSA to bring them into an appropriate order for learning purposes. For this purpose it is necessary to know the learning potential of all the learning stations. For example, consider the core work associated with the pinning of plugs. Concerning this example, one can look how this competence or skill is learned in an effective way. Also one can detect what kind of prior skills, knowledge and attitudes the apprentice has to have in order to learn effectively in that workplace, for example having a cooperative manner may greatly aid the learning process, as would already having learned how prepared wiring harnesses are shortened and how one sets, and in some cases also connects, pins. If an apprentice already has these skills he or she will be able to do to cooperate in a test stand where all the cables already laid are tested for function, insulation and dielectric. An apprentice can learn all this from involvement in the work process. Afterwards the apprentice could, for example, move on to maintenance work and learn about fault diagnosis. In order to be able to do that independently, although someone else may still be taking ultimate *responsibility*, the apprentice must understand the holistic way systems of fault-finding, the ordering and order-processing of replacement parts operate as well as being able technically to complete the task. These systemic and holistic components, which are compiled for the purposes of individual learning during a LSA according to the TPTs, concern the learning potential of all the working places that are present or can be developed for the apprenticeship.

In order to organize an effective progression (or flow) through the different learning stations, the evaluation of the LSA for this purpose must be led by two relevant questions:

- *What* spectrum of skills does one learn at the particular learning station and *what* content of that spectrum is necessary for *which* upcoming stations?
- *What abilities* does one have to possess already in order to increase the chances of effective cooperation here in order to achieve a substantive learning gain?

These two questions have to be answered for each case in a series of learning station analyses. The initial entry level condition of being able to cooperate at a learning station has to be known as well as the expected final level of the knowledge and skills that one should achieve after performing at a particular learning station. This exit level of skills and knowledge itself can then be the entry level, and a necessary condition, for working at the next learning station. As a result at each learning station one needs data on the initial conditions for learning as well as the learning outcomes that can contribute to the learning conditions for successful completion of subsequent learning stations.

A comprehensively accomplished LSA in a plant will result in a logical organisation of the necessary learning steps that can be achieved by a particular progression through different organisational work processes. The evaluation should therefore take account “of the internal linkage of all working processes”. Thus it can be examined whether the actual organisation of the labour process guarantees an orientation close to the TPT. Regarding the result of this evaluation step, it has to be tested if the requirements inherent in the single TPTs are found to be present in the analysed learning stations and can be acquired in the process as a whole. This is because the requirements for the flow of development-steps of competencies have to align with how apprentices can move through the organisational work processes. With regard to the result of this step of analysis one has to check then, if the single requirements that are inherent in the BAGs and are present in the analysed learning stations, can also be achieved in the process.

Usually the answer to these questions will also depend on the time apprentices are able to stay at the operational workplaces. Clearly one who rushes through a process very quickly will learn little about the process itself. Later on he or she will only be able to tell about the things that he has heard and seen rather than an understanding based upon substantive experience, a rapid progression through work processes is likely to lead to only a superficial knowledge of ways of working that exist in the company. On the contrary, it is important for the control of the overall learning process to have learned in the single steps what is necessary for the upcoming missions in a technical sense and to gain a developing understanding of the work process as a whole.

The flow through learning stations is guided by a pedagogic rationale, since, for example, ‘pinning’ as an ability is needed not just in simple operations but also in very complex work situations. Thus one will rarely find a learning station inside the company where ‘pinning’ can be learned at a glance. We should thus regard be aware that the core competences may require hierarchical structuring because of rising levels of difficulty and increasing amounts of time to learn. Therefore it makes sense if those less complex component elements of a major task are learned at an earlier stage. This means that it will make sense to order progression through the learning stations so that, for example, pinning is mastered before an apprentice arrives at a learning station involving pinning as part of more complex tasks.

5. Example: documentation

The documentation is orientated towards the table of analysis categories as shown in table 1 above. The template in Table 2 below is half open, that means in contexts like tools some tools are identified while others can be added, while in other cases and subcategories entries are pre-structured. In any case, however, there is at any time the possibility to offer additional entries appropriate to the particular case under investigation.

Blueprint Template Electronics Engineer

| description | workstation | device manufacture |
|--------------------|------------------------------------|---|
| location | profession | HH / Electronics Engineer |
| allocation | to TPT | TPT 2: device manufacture or vary |
| process | type of aircraft | all |
| | screens / scopes / sections | device of all scopes – single-part production or small series-production (< 10 exemplars) |
| | (internal) supplier | material collocation through factor |
| | order- / material acceptance | request and special material in cases, which gross is from shoe cases up to packing cases – consumption material in freestock / cable on rolls |
| | direct purchaser | Final Assembly Line HH |
| | „end“purchaser | Final Assembly Line HH |
| | production steps already performed | - |
| | production steps | <p>After the selection of a box, the enclosed order (including the draft of manufacturing) has to be checked. On the basis of the list which is included in the order, it has to be checked if the provided materials are complete, as well as somebody has to fetch the expendable items and the standard materials out of the stock.</p> <p>The first actual production step is the printing of the conductions with the aid of a laser. After that, the shrink tubes will be cut into the right length. By means of a “nailboard”, which is a self-built aid, the cables will get the right form and the right order. The cables that are laid on the board can now be trimmed to the intended length, with the aid of the markings. In the next steps, the shrink tubes will be wound up and the cable shoes will be crimped at the end of the cables.</p> <p>Then the tubes are going to be heated up with a heat gun, so that they wind themselves tightly along the cables, which have to be isolated. At the end the cable lace will be fastened at the places, which are supposed for that and are marked on the board. If it is necessary, a label will be attached.</p> <p>Before the despatch of the bunch to the “Final Assembly Line”, an extensive quality control through the own examiner will take place. A computer-aided inspection sheet does not only check the desired stage, but also possible faulty operations, residual electric currents, the comportment with stress peaks as well as the isolation.</p> |

| | | | | |
|--|--|--|---|-------------------------------|
| | specifics | In principle free choice of the order – hast orders in red portfolios have to be put in hand in favoured. Ongoing card, on which all specifics of the construction have to be enlist. | | |
| | | 1. rejections | 2. reworking | 3. deviation from description |
| | | 4. material availability | 5. operation changeover | 6. splitting of operation |
| workplace | hall | medium-sized hall with approx. 40 work tables | | |
| | illumination/ environment | very good conditions | | |
| | posture | sessile on work tables | | |
| | specifics | individual work | | |
| objects & methods | objects / systems | amongst others toilet illumination, switching unit, lamps, heating conductor or single special cable looms | | |
| | methods / activities | compensation reference documentation and material, crimps, to mark with laser, mech. Manufacture, to brand, self inspection | | |
| | specifics | - | | |
| tools/ standard material (to tick): | | | | |
| half automatic crimp automates | crimp pincers | trimming pincers | torsion key (for mechanical operations) | cable cutter |
| tyrap-pincers (to tighten and abscission the binder) | heat guns (to heat up the shrinktubes) | | | |
| shrink tubes | tube shoes | spouts | diode-suppressor | base discs |
| incandecent lamps | nut | bolts | motor switch protection | bus bars |
| saving wires | grips | liner cuffs | relays | rocker switch |
| plates | warn markers | | | |
| building apparatus: | | | | |
| nailboard | miscellaneious: | | | |
| | | | | |
| organisation | employees on place per shift | 1 | | |
| | employees at range | 40 | | |
| | hierarchy | master – semi-autonomous group speaker/substitute – machine operator | | |
| | cycle | 1 | | |
| | shifts | 2 | | |
| | similar building places | 40 | | |
| | cooperation | supplier/ factor, FAL, Programmer of the diagnostic program, quality assurance | | |
| | specifics | in general individual work / sole responsibility for the request | | |

| | | |
|----------------------------|--|---|
| requirements | General | adherence to delivery dates, flexibility, quality |
| | special | A new quality control by installation into the FAL |
| interfaces | to TPT? | Nr. 1: cable loom manufacture |
| | to other places? | |
| | to workshop/ professional theory? | law of ohm / conductor features of different materials and connections / comportment by strain |
| | miscellaneous | |
| vocational training | vocational year / duration | 1. learning year / 4 weeks |
| | premises / previous stations | 1. work station / basic electric theory knowledge / first practical exercises in the garage / English (50% of the documents) / dexterity |
| | What should they learn? | pertinence of the quality / transparency of the working processes through frequent manageable duration (from 30 minutes) / dexterity |
| | specifics | individual work: trainees may exceed the time-frame of the work order |
| | experience with trainees & young skilled workers | good, in particular in comparison with workers on temporary loan |
| | assistance / working tasks | the trainees take an interest in the appreciate work – there is the possibility, to increase requirements (at first cable looms, than complex switchboards) |
| | TPT / FES | - |
| | Is the existing potential used? | Yes. |
| | improvement possibilities | own places for the trainees |
| | number of the trainees per building place | 1, 4 in the department |
| | miscellaneous | |
| | | |