RCP
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Platform

Occupational Competence Needs Analysis as Basis for TVET Teacher Curriculum Development

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Practice and Working Paper

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List of Abbreviations

CSIL	Centre for Industrial Studies
DCCD	Developing a Curriculum on Curriculum Design
EWW	Expert Worker Workshop
FPTK	Faculty of Technology and Vocational Education
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
IBB	Institut für Berufsbildung, Tongji Universität
MSDS	Material Safety Data Sheets
NUTE	Namdinh University of Technology Education
OSA	Occupational Sector Analysis
PIKA	Pusat Industri Kayu
PLN	Perusahaan Listrik Negara
RCP	Regional Cooperation Platform
RMCS	Regional Model Competence Standards
SMK	Sekolah Menengah Kejuruan
TNB	Tenaga Nasional Berhad
TVET	Technical and Vocational Education and Training
UPI	Universitas Pendidikan Indonesia
WPA	Work Process Analysis
YSU	Yogyakarta State University

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Executive Summary

In the framework of regional cooperation platform (RCP) of GIZ this study report attempts to give a deep and detailed insight about the findings and results of the so called P9-research Project entitled "Occupational Competence Need Analysis". The project, which led by Indonesia University of Education (UPI) in cooperation with another four partner universities in Asia (Tongji University China; University of Namdinh Vietnam, UTHM Malaysia and UNY Indonesia) was planned and carried out to respond the fact of a wide gap existing between technical and vocational education and training (TVET) process with the world of work.

Among the factors leading to the gap is the lack of methodological competence of TVET teachers in working on curriculum development, specifically in analyzing the needs of industrial sector towards occupational competences to be included in the curriculum and accordingly imparted during the learning process in their vocational education institutions. Based on this fact the study project aimed firstly at exploring some different prominent methods used to analyze occupational competence need of the world of work; and then selecting the methods to be applied in analyzing some occupations selected by involved researchers. From the methods application it was expected that researchers obtained empirical experiences which they can convey in vocational teachers education process along with learning materials developed during and at the end of the project work.

Overall there were three methods applied in sequence during the research project: (1) occupational sector analysis, (2) expert worker workshop and (3) work process analysis. The three methods were applied in different country and cultural settings attributed to the origin of the researchers. For the execution of projects plan a guiding instrument was developed and discussed in advance. This was intended to build common basis and understanding among the researchers.

Comparison analysis applied to the research results has found out that the organizational preparedness und proper understanding of the researchers towards the methodology and the provided guidelines became the key factor determining the success of the research. Shortage in this aspect has led to some deviations of expected research output. Thus, it is among others very recommended for researchers to firstly devote their effort to get a clear insight about the methods prior to its application.

1 Introduction

1.1 Rationale and Background

Some people say: "change is something constant". This notion can be applied to every sector of human life including that of education and the world of work. In the context of world of work the changes of technology and work organization have been rapidly occurring from time to time. The changes have apparently brought an implication to education sectors, in particular to that of Technical Vocational education and training (TVET). The implication reflects the coherent interrelation between technology, work and education.

For the TVET sector the change requires adjustments of learning and teaching contents to be conducted. Those adjustments are intended to synchronize what to be taught in vocational education institutions and what to be performed in work places. Obviously, the organization of TVET cannot be separated from world of work, since the main goal of TVET is to develop occupational competencies and enable its outcome to meet the requirements of their future working places. The fulfillment of these goals is very depending among others on the availability of proper TVET curricula. The properness of curricula means that it stands in compliance with the competence needs of the world of work as the user of the vocational education outcome.

In TVET systems of many developing countries the effort to synchronize the training competencies and the occupational competencies in industries has often been become a long term agenda and in some extend does not obtain priority. In many of these countries the endeavor to updating the TVET curricula is often undertaken in a way, whereby it barely takes the quality of its output into consideration; it rather seems to be an agenda accomplished by demands of both internal and external decision makers without or with less orientation on the real needs of employers and industries.

It is indeed not simple to match curricula and real occupational needs of industries and its changes. Even most TVET stakeholders like employers, auditors and industry representatives all acknowledged the difficulties associated with keeping up with constantly-emerging changes in technological innovations, regulation and also the shifts in client demand (Clayton, 2012). However, keeping TVET curricula up-to-date shall be a continuing effort. Once TVET actors stop their effort to do it, the gap between the two sectors will get swiftly bigger, whereby the curricula lags behind. Upon the actors who are engaged and responsible for developing the TVET curriculum, TVET teachers are those who are standing at the cutting edge. They have the closest relation with given curricula and are directly dealing with it in their work. They are the forefront stakeholder of TVET which are responsible for the functionality of a curriculum. They are appointed to operationalize the curricula as a frame instrument to produce occupational competences of their students.

The central function attached to TVET teachers in dealing with the curricula has positioned teachers to be the key actors in the development of curriculum and in the measure to keep it up-to-date. They are supposed to be the first to know what is best for the learners in order to get them prepared to enter the world of work. They should be the first to know what occupational competences are needed by employer and industries. They can grab informations of such needs in relevant work places.

Consequently, to keep vocational curriculum current and relevant with industrial needs it is necessary for vocational teachers and instructors to be -at least- well informed about the methodology of how to analyze the occupational competence needs directly in the world of work. In fact, numerous, if not the most of vocational teachers, particularly in developing countries do not have the methodological competencies for undertaking such analysis. Furthermore, according to Dittrich (2012) TVET teacher educators often know little about the workplaces and the competence requirements of graduates of technical and vocational education and training (TVET). In addition they do not have methodologies at hand, how such workplaces and competence requirements can be analyzed. The same is actually true at national level for the purpose of TVET curriculum development (Dittrich, 2013).

However, it is mandatory, that teacher educators have such methodologies at hand and master them in order:

1) to include the respective knowledge about requirements at work places in TVET teacher education;
2) to include the teaching of the methodologies in TVET teacher education, so that teachers in their future job are able to analyze workplaces and competence requirements;
3) to be able to run research on TVET curriculum development with the purpose to inform national TVET curriculum development.
4) to be able to analyze work places or work processes, respectively, in order to compare competence requirements in TVET at the regional and international level, also with reference to upcoming regional qualification frameworks.

1.2 Urgency of the Competence Need Analysis

The industrialization in almost all economic sectors has brought many changes in the world of work and lead to new occupational competences, which have never been existent before. Not only new competences are come up, on the contrary many old and traditional competences are not performed anymore in work processes.

For TVET system the changes mean new challenges, which it inevitably confronted with. TVET institutions as producers of qualified labor are forced to accommodate new needs of various occupational competences. Qualifications obtained from vocational learning process should be aligned with the real needs of workplaces with the purpose that its outcome can be successfully employed by the industries. For this to happen, analysis of current working competences needs to be conducted. Through the analysis detailed information about items of task performed for a certain job, its descriptions and its sequence to be performed in work process can be obtained. Furthermore, the analysis is according to Spöttl (2002) aiming at revealing various aspects of occupational tasks encompassing:

- Object of the work
- Tools, methods and organizing of work; and
- Requirements posed on work

Actual findings collected from the competence need analysis are going to be the very basic instruments for vocational teacher and instructor to keep their curricula up to date.

1.3 Goals and Outcomes

Generally the improvement of TVET curriculum at least at that at vocational schools in the partner countries involved in this P9 Project underlies the research on occupational competence need analysis. In detail there are some goals to be pursued in this project, which are:

1) To collect and select instruments for workplace analysis and occupational competence needs analysis and prepare the respective learning material for TVET teacher education. In order to be able to prepare relevant learning materials, the members of the project team will apply the selected instruments in real-world situations to conduct work place analysis as well as competence needs analysis. The experiences made in the application of the instruments are expected to contribute to the quality of the learning material and will help the project members (all are teacher educators) to impart the respective knowledge to their student teachers.
2) To check, whether the selected instruments work satisfactorily in the different cultural and "production cultural" environments of the partners. In case a need for adaptation is detected, the instruments will be amended accordingly so as to provide adaptations.
3) The third, but that is a subordinate one, is to compare the results of the instruments' application generated in the different regional and national environments, respectively, in order to demonstrate one of the possible applications of the instruments.

1.4 Purpose and Objectives of the report

The purpose of this report is to provide the reader a theoretical and practical insight about the methods of competence need analysis. Furthermore the application of the methods, which has taken place in respective partner countries, is presented, so that readers can discover the implementation accentuation of the method within different country settings.

Furthermore the report has the following objectives:

- To meet the requisite of the RCP-P9 research project of GIZ
- To document experiences and knowledge acquired by researcher during the research project.
- To provide comparative study results about the application of competence need analysis in different contexts of respective partner countries
- To provide a reference for the teaching entitled methodological competence of TVET education

2 Literature Review

2.1 Relevancy Of Occupational Works Process For The TVET Curriculum

Work Process as a Basis for TVET Curriculum Development

The relation between TVET sector and the sector of world of work represented by the industry constitutes -in ideal circumstance- a mutual interdependence. The one sector should correspond to and be linked to the other. The mutual relation of both sectors is articulated among other in the development of TVET curricula. According to Tippelt (1987) it is the task of vocational training curricula to establish the link between the structures (the qualifications arising at the workplace) and qualifications structures (the qualifications of the employed) created in the training institutions. Every vocational training curriculum should be designed to enable the trainee:

- to fulfill the current requirements of a particular job;
- to adapt to future requirements (which entails access to further training courses);
- to contribute to the progressive development of a decent and efficient job structure.

Technical innovations and changes in the organization of work are immediately absorbed into existing occupations. Because of the resulting processes of change, it is essential to ensure that the content of vocational training courses is continuously updated.

The effort to accommodate and integrate the innovations and changes coming up in world of work into vocational curriculum design calls for an investigation of qualification requirement. Such investigation does not stop only in design stage, it has to be a continuing effort to further develop occupational profiles, training curricula, curricular frameworks and the related syllabuses for in-company and school-based vocational education and training (cf. Rauner, 2008, p.364).

The investigation of qualification requirements can be executed through empirical work process analysis, in which different aspects of an occupation and its current changes are to be revealed. These aspects according to Spöttl (2002) comprise three important categories of occupational tasks that can be seen in the following figure: since 2008 I am talking from core work processes only – the reason is the complexity of the world of work

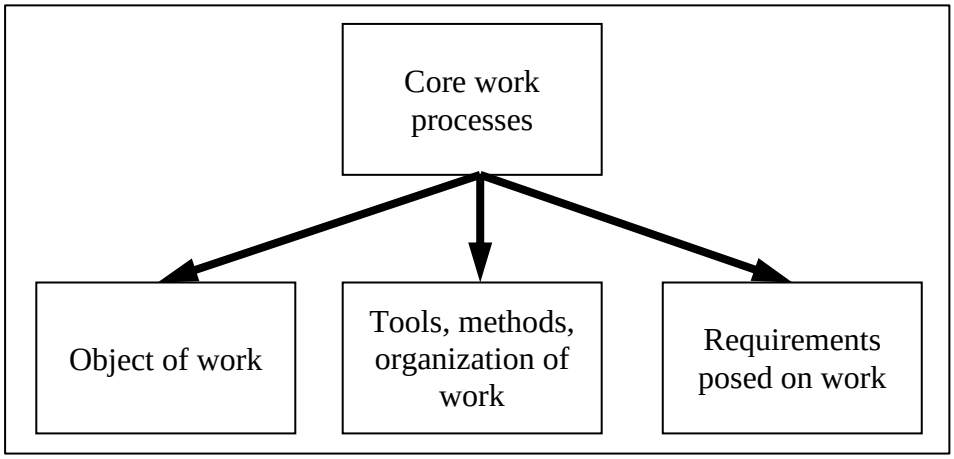


Figure 1: Important categories of occupational tasks

Actual and accurate information of those three components categories of occupational task is the underlying modalities for the work on keeping TVET curriculum current and up-to-date, on which the development of working competences based. Instead, before deciding whether or not to revise existing – or design new – curricula, existing conditions; plus current and/or possible future problems, need to be well defined. This calls for the staging of meetings or conferences, with the participation of recognized experts, in order to compile and assess all available technical, economic and social evolution data related to specific areas of vocational training. As a part of this process, the state of existing curricula and vocational training conditions should be weighed against rapidly changing labor market conditions (Tippelt & Amorós, 2003, p. 14).

The work process analysis is to be considered an underlying principle in designing and developing and modifying and revising TVET curriculum. However in many developing countries this principle often becomes a theory perspective which is barely put into practice. Good practice of the application of the principle can be found in German vocational education system. In German literature we can find the term of "*Situationsorientierung als curriculares Prinzip*" as soon as the "lernfeld" (learning areas) approach is under discussion. By this principle business and work process is an underlying category, to which the process of curriculum development orientate and which the graduate of vocational education in their future career life will be confronted with. Therefore the relevance of work process determines what and how to be imparted in learning process. (Clement, 2006, pp. 263ff, own translation)

The application of work process analysis as a method is not only beneficial for curriculum development itself, but also for the professionalism of TVET teachers and educators. Due to their key function in developing the occupational competences of their learner their capability to analyze the work process in their relevant field constitutes an important part of their professionalism. Hence, the acquisition of methodological capability looms very large.

The enforcement of curriculum improvement by the implementation of e.g. work process analysis, which leads to the quality improvement of vocational education in general, depends also a great deal on the ability of institutions to adjust the content of training to meet changing skill needs. Sustainable capacity for curriculum development and revision is a characteristic of flexible and high quality training. It provides the mechanism through which new technologies and techniques can enter the training process. Indeed, this characteristic is often cited to justify formal pre-employment training.

Many countries have been unable to establish this capacity at national levels, and more have been unable to do so at the level of the school or training center. This problem is particularly acute in small countries, where the size of the system makes the overhead costs of such capacity very high in relation to operational costs. Where central curriculum development capacity does exist, the resources for ongoing occupational analysis, curriculum research, and materials development are often lacking. The curricula of schools and centers become obsolete, basic learning materials become unavailable, and staff lacks the capacity to effect improvements locally. In many centralized systems, curriculum change at the institutional level requires central approval, which can take months or even years to obtain, further discouraging adjustment. These rigidities also restrict institutions from attempting more

innovative and flexible approaches to vocational instruction (Middleton, Ziderman, & Adams, 1993, p. 200)

Indeed, because key economic, social, legal and historical factors vary from country to country, the outcome of the curriculum development process will also vary. It is therefore unfeasible to think in terms of standardizing training matter on a worldwide basis. Nevertheless, there are various search strategies, analytical procedures and forms of presentation which, taking into account specific national factors, can contribute to the process of curriculum development and help to improve vocational training (Tippelt, 1987)

2.2 Methods Of Work Related Curriculum Development

During the RCP Capacity Building Measure No. 8 which was conducted on 5.-8.2.2013 at Universitas Pendidikan Indonesia in Bandung, Indonesia, a number of candidate instruments were discussed. These instruments were collected from methods which are used for vocational curriculum development all over the world, and included DACUM (Norton, 1997), Functional Analysis (Mansfield & Schmidt, 2001), and the instruments developed in the DCCD project (Dittrich, 2008). The ILO tool for developing Regional Model Competence Standards (RMCS) (Lewis, 2006) was not separately discussed, since it is relatively similar to the Functional Analysis approach.

The discussions produced essentially the following findings:

- Functional analysis is just a method to formulate occupational tasks in a specific form, so that these formulations can be used as verifiable standards. The approach does not provide a method for how to identify the respective occupational tasks, nor for getting a deeper insight into the associated competence requirements. The same applies to RMCS (Regional Model Competence Standards), a guide recommended by the ILO for developing competence standards.
- DACUM, as well as one of the DCCD tools named Expert Workers Workshops are suitable tools to identify the scope of occupational tasks associated with an occupation. While both, the original DACUM approach as well as the DCCD tool, concentrate on collecting the required information from experts of the field in question by means of formalized face-to-face group meetings, the more recent online-DACUM version pays less attention to this discursive element of quality and verification. The difference of DACUM and the DCCD tool lies in the underlying philosophy, how an occupation should be described, and what information is necessary for that.
- The only tool collection discussed which gives real insight into the work processes by conducting observations at and analysis of workplaces is the DCCD tool of work place analysis.

I far as I see it DACUM and DCCD are different approaches

As a consequence, 3 instruments were selected for application in the project, namely

- occupational sector analysis for getting an overview, what the labor market and business environment of the selected occupation looks like, including its current and future developments, and the existing education and training landscape,

- a combination of DACUM and the DCCD tool of Expert Workers Workshops, primarily for identifying the occupational tasks which make up an occupation, and
- the DCCD tool for Workplace Analysis for getting a deeper insight in the occupational task, i.e. in the related work processes.
  All three tools are described in detail further down in this paper.

3 Methodology Of Curriculum Development

3.1 Methodology Of Research

The qualitative approach was applied to collect data of research. The logic of a pilot project, whereby researcher attempted to explore valid data as much as possible, underlies the selection of the qualitative approach. Overall three methods for competence the need analyses, which all researchers agreed on, were selected to be piloted in the research. They are Occupational sector analysis, expert workers workshop and work process analysis.

For the application of the three methods a guiding instrument was developed by RCP P9 Research advisor at the UPI. By mean of the instrument five team of research partner in four Asian countries working on the project (UPI and UNY (Indonesia), NUTE (Vietnam), IBB Tongji (China) and UTHM (Malaysia)) should have clear orientation in collecting both primary and secondary empirical data. The instrument provides them detail instruction and tools to be used in the research work.

Since the instrument developed by Dittrich (2013) is an integral part of the research, the following descriptions of the selected methods are originated from the instrument. The complete guidelines of the methods implementation can found in the instrument.

3.2 Expert Worker Workshop

3.2.1 Introduction And Background

This instrument for occupational profile analysis is taken mainly from the results of the DCCD project Dittrich (2008: 18-34). Partly, the text has just been copied; partly it has been modified in order to accommodate the specific purpose of the current project.

The instrument has some history. It first was developed in the first half of the 1990ies in the framework of a European project which analyzed the discrepancies between work reality and occupational structures in the car service sector of a number of European countries (Spöttl, 2009). The next prominent application of the instrument, which led to some modifications, was in the framework of the restructuring of the corporate education and training concept at all German manufacturing sites of Volkswagen, the German car maker. In the course of this project, a first manual was published in German language (Kleiner, Rauner, & Reinhold, 2002). The instrument in addition was used for developing occupational profiles in various south-east European countries after the dissolution of the Republic of Yugoslavia, as well as in the European-Asian university-cooperation project "Developing a Curriculum on Curriculum Design" (DCCD). It has further been applied during the development of the Malaysian National Dual Training System and most recently during the development of the vocational education and training system in the sultanate of Oman.

The instrument shares some communalities in terms of procedures and actors with the original DACUM instrument (Norton, 1997), but is founded on a pretty different TVET philosophy. The current "Online-DACUM", which is provided as a web-tool on the DACUM website (www.dacum.org) deviates from the instrument given here and the original DACUM instrument, in

that it tends to virtualize the DACUM process. Experts do not meet any more face-to-face but are largely restricted to written-text-based discussions. The author of this paper fears, that this way a lot of opportunities for controversial interaction, in-depth clarification, discovery of innovative tendencies, etc., are given away, and that this lack of discursive verification will compromise the quality of the outcomes. Furthermore, considering the experience, that it is already hard in a face-to-face session to create an appropriate understanding of the underlying philosophical concept (which is quite different to the DACUM – early "competency-based training" philosophy, but which is needed in the framework of the project), it is very likely, that in a virtual discussion experts will give their contributions based on very different perceptions of the concept.

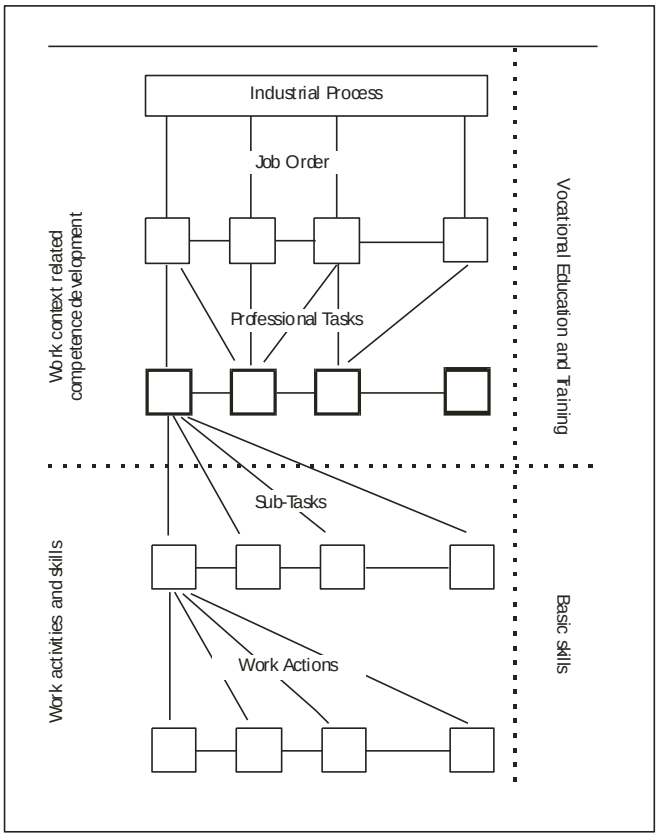
The common assumptions of both instruments are:

- A worker who is an expert in his or her field can describe his or her work or métier better than any external observer.
- An occupation can accurately be described by defining the particular work-related actions the expert worker is performing.
- All kinds of work-related actions require a certain level of knowledge, skills, method and attitude in order to be performed correctly.

The major differences between the DCCD instrument of expert workers workshops and the non-online DACUM instrument are the following:

- The DCCD instrument pays a lot of attention to who the expert workers are, who are invited to the workshop
- The DCCD instrument provides a formalized procedure on how to run the workshop. It also provides some working aids.
- The format, how the results are recorded is quite different. DACUM uses its relatively detailed DACUM Charts, which feature a high number of small, separated tasks as an output – which might later be difficult to recombine in order to produce a comprehensive picture of an occupation. The DCCD instrument identifies core occupational tasks of a much larger coverage and tries to describe these 8 to 12 tasks in a more comprehensive way, in order to illustrate the complexity of the respective core occupational task.

Core work-related or occupational tasks describe a particular job to be performed in terms of the expected results. Those tasks are always specific to the particular work setting. The structure and organization of work along a limited number of core occupational tasks is crucial in order to understand the purposeful and sense-giving dimension of work.



Source: Dittrich (2008)

Figure 2: The hierarchical relationship between the mastering of occupational tasks and simple work actions

Core occupational tasks can be divided into sub-tasks which again can be divided into basic work actions. Such an approach is used when drawing up DACUM Charts. The problem with this approach is, that it implies (often unintended, at least that is to hope!) that mastering basic work actions and sub-task makes up the competences needed in an occupation. The fact, that the awareness on how these small pieces of work are interrelated, what has to be considered for efficiently and successfully handling the complete core occupational tasks, easily gets out of view, while the ability of holistically considering the contribution of each work action to the overall goal makes up a decisive part of occupational competence.

Very likely it is not possible to describe these interrelations between work actions or even sub-tasks comprehensively in the framework of a timely restricted workshop for the identification of occupational tasks, at least not for a medium complex occupation. And even if it would be done afterwards, the result would fill hundreds of pages, and thus for the current purpose would not be of much use. Therefore, the instrument presented here is restricted to identifying core occupational tasks and describing them comprehensively by using the format described below (see table 1)

3.2.2 Objectives Of The 'Expert Workers Workshops'

The 'expert workers workshops' have the following two main objectives:

- To describe modern skilled labour in terms of core occupational tasks that can be classified according to occupational fields or a specific metier;
- To differentiate between different tasks according to the level of skills they involve.

If a metier / an occupation can be described by means of core occupational tasks, then the competences it involves are automatically defined. This implies that workers are able to independently perform the described occupational task.

The investigation of skilled labour and its description along occupational tasks need to fulfil the following criteria:

- The occupational tasks need to represent the broader, higher-level work process.
- It must be possible to relate the occupational tasks to a specific occupational profile or metier.
- An occupational task needs to describe a complete work process that involves and connects planning, implementation and evaluation phases (complete action).
- Occupational tasks also make reference to the contents and methods of the respective area of skilled labour.
- When an occupational task is being performed, its purpose, function and meaning need to be recognizable in terms of the broader, higher-level work context.

3.2.3 Documentation Of Results

The documentation of the expert workers workshop is made up of 4 elements, namely a description of the organisational framework of the expert workers workshop, an ordered list of occupational tasks, a more detailed documentation for each occupational task according to the scheme given in table 1and a documentation of important aspects which have occurred during the workshop.

The description of the organisational framework should include some information about the framework conditions, under which the expert workers workshop was organised, i.e. what the reason for organising the workshop was, who the researchers were, how the expert workers were selected, what the educational and practice backgrounds of the expert workers was, etc.

The ordered list of identified occupational tasks should display just the titles of the tasks. The tasks should be ordered according to the results of the "analysis of occupational tasks" (see the respective section below), starting with the tasks which provide a good overview over the metier and can be given to novices, up to the tasks which need the most specialised knowledge.

The detailed description of each occupational task uses the template given in table 1. In the heading it displays the number of the occupational task (according to the ordered list) and its title.

Next comes a description of the occupational field of activity, which this task covers. The text should describe in a few sentences, what the task is about, what the framework conditions are under which it must be handled, and how the task is embedded in the whole occupation.

Under the heading “objects of work”, the objects, which are worked on and produced are listed. Objects can be physical objects like an entire car in the case of standard service, the motor of a car in the case of machine tuning, or a list of technical accessories in case of installing additional appliances in a car like, Radio, GPS, air conditioning, etc. In case of services provided to a costumer it can be a holiday travel plan, a contract for renting a house, or a consultation on how to keep one’s body physically fit.

In the next column the tools are listed, which are used to accomplish the task, e.g. chainsaw when cutting wood plates, air brush for painting, iron for ironing etc. Next come the methods to be applied when accomplishing the task, for example strictly following the maintenance plan when doing standard service for a car, discussing with the client the design of a dress and taking her measures. Under the sub-heading organisation, information is given on the organisational specifics, like with whom the activity has to be coordinated, whether it is teamwork, whether it is necessary to follow certain procedures, etc.

Table 1: **Template for documentation of an occupational task**

<table>
<tr><td>Number</td><td colspan="2">Title of the occupational task</td></tr>
<tr><td colspan="3">Description of the occupational field of activity (5 to 15 lines)</td></tr>
<tr><td>Objects of work
•
•
•</td><td>Tools
•
•
•
•
Methods
•
•
•
Organisation
•
•
• An example is necessary – empty tables do not help</td><td>Demands
•
•
•
•</td></tr>
</table>

The column about demands in most cases is a really important one. Here is listed, what the demands are, which certain actors around the worker have the work accomplished. Just a few pretty generic examples: employers could want that the work is done in the shortest time possible and with least possible material used. Clients want to have a cheap solution or a luxurious one, but always with a good quality to cost ratio, they might want to have a wheelchair-compatible solution or one which does not evaporate toxic gases, etc. Laws, regulation, professional codes, or technical instructions might have to be followed. The solution to the task should be environmentally friendly, e.g. using little energy, not damaging the environment, etc. And finally, the worker himself would like not to be exposed to health risks or would like to do the work according to his professional ethics. The

information given in this column should illustrate the tensions which exist for decision making when looking for an optimum solution.

The documentation of the workshop event, finally, should mention remarkable positive and negative aspects which occurred during the workshop itself. Such events or issues can be for example an extraordinary intensive discussion between the experts on a certain topic, additional information gained with respect to the occupational sector analysis (instrument 1), observations about group dynamics, additional information about the background of the experts, etc.

3.2.4 Preparing Expert Workers Workshops

3.2.4.1 The facilitator

The facilitator is the most crucial factor when implementing 'expert workers workshops'. His or her skills and competencies in terms of technical knowledge and methodological know-how will determine whether the workshop will be successful or not.

The facilitator needs to assume a neutral role that ensures her/his commitment towards the agreed aims. She/he is challenged to establish a trustworthy relationship so that participants are sure that the statements they make during the workshop will not be used for some kind of evaluation purposes. The anonymity of participants is crucial for how the workshop develops. There are some advantages of using an external facilitator. External facilitators have a greater distance towards the company where the participants work. In addition, a competitive relationship between the facilitator and the participants is unlikely to evolve.

In order to lead the discussion with skilled workers about the occupational tasks they perform it is indispensable that the facilitator has some basic technical knowledge of the respective occupational field. Ideally, the facilitator has been trained in the field and has worked as a skilled worker in various related areas. Alternatively, the facilitator may have acquired some experience as a trainer or instructor in the respective occupational field. Having some basic technical knowledge also extends to the capability of understanding opinions about trends and possible future developments of the occupation. This means that the facilitator also needs to be familiar with some theoretical background material or should have participated in events that give the opportunity to discuss those issues.

Apart from the technical knowledge the facilitator needs to have well developed communication skills and some practical experience of how to organize and implement seminars and workshops. Since the 'expert workers workshops' are developed on the basis of a moderation method it is important that the facilitator is familiar with this method and knows how to apply it. At this point only some basic principles of the moderation method can be introduced:

- The facilitator is not leading the workshop or sessions. His or her role is to provide a framework that supports the participant's active engagement.
- The participants are responsible for the results of the workshop. The facilitator is required to take on a neutral position.

- The objectives and the method of the workshop need to be made transparent to the participants. This is important in order to underline the participant's independence, responsibility and self-reliance.
- Switching between different modes of working such as individual and group work ensures that all participants engage in contributing towards the results.
- Visual aids such as clip boards support a more structured and systematic way of working, particularly in the context of group discussions.
- The principle of consensus is geared towards giving each participant the opportunity to contribute his or her skills and knowledge towards achieving common results.

In a broader sense the moderation method also extends to directing group dynamics, visualizing and presenting results as well as generating a positive atmosphere for exchange and discussion.

It will probably be the exception rather than the rule that a facilitator combines the required technical knowledge and the methodological know-how. Therefore, and also because certain duties like documentation can be shared, it is recommended to have 2 facilitators for one workshop. In that case one facilitator may take up the role of a technical expert, whereas the second facilitator assumes responsibility for organizing and implementing the workshop. While the first facilitator may structure the content of the discussions that require a certain level of technical expertise and should ask back where clarifications are needed, the second facilitator can direct the overall development of the workshop and ensure that the principles of moderation are followed. For the latter task a certain distance to the investigated metier may even be an advantage, as such a distance makes it less likely that the facilitator will influence the direction the workshop may take by bringing in or even imposing his or her own opinion.

3.2.4.2 How To Select And Invite Participants

The selection of participants should follow the criteria of representing the respective area of skilled labour. This makes the occupational task which the potential participant is currently performing, and his or her actual operational area and work profile, the most important selection criteria. This means that the expert workers who are invited to participate in 'expert workers workshops' must actually perform the core occupational tasks of the occupational field of investigation. That the participant has also been trained in the respective occupational field is not required, but in most cases this would prove to be an advantage. However, somebody who has only acquired some general knowledge of the metier by means of initial training, for example, without having relevant practical work experience would not be a suitable candidate. Also supervisors are not the most suitable participants, at least if they are not any more directly involved in practical work. In addition, direct supervisors of other participants should not be invited as this would generate some kind of dependency relationship between participants. Higher level supervisors or HR-people should not be included at all, because in addition to the aforementioned reason, they usually will not have the required practical, related work experience at the level of skilled labour. Their view on the things very likely will be inappropriate because of their often academic socialisation.

In addition to the above described criteria the following principles should be taken into account when identifying suitable expert workers:

- The expert worker must have acquired significant work experience in the respective occupational field.
- He or she has regularly followed some kind of formal or informal continuing vocational training in order to enhance work-related skills and competencies.
- The current work profile involves technologically advanced work processes – in case this is relevant for the occupational profile in question.
- The expert worker forms part of advanced flexible work structures and a flexible work organisation.
- His or her occupational tasks are complex and driven by innovation.
- The expert worker has some degree of autonomy in performing the work he or she is doing and can bring in his or her own ideas.

The above list of selection criteria for potential participants does not imply that each participant must fulfil all the criteria. The decision as to whether someone may be a suitable candidate is ultimately left to the organizers of the workshop. Even a participant who does not meet all of the expected criteria may still be considered an expert worker who can significantly contribute towards the success of the workshop.

Participants also need to be open to share their work-related knowledge, for example about machines, tools, methods, and work organisation. They must also be able to reflect upon their technical knowledge and have some communication skills in order to be able to describe and explain work processes and tasks. Of course, they must be willing to participate in the workshop without being pressed against their will.

For sure, there will always be a compromise necessary between the appropriateness of participants and whether it is possible to get such people involved. A crucial point always is, whether it is possible to convince employers of the importance of the project so that they let their employees participate, or convince workers to participate in their free time – this might also include the availability of financial means. In any case it will be necessary to record, where the participants are working, and what their experiences are, in order to be able to make a judgement on the validity of the workshop results.

A good selection of participants will significantly contribute towards the success of the ‘expert workers workshops’. The technical knowledge and work experience of the invited participants will determine how well and to what level of detail the occupational field can be assessed during the workshop. It is important to keep in mind that the statements participants make about their technical knowledge and work experience are rooted in their personal occupational history. Participants who cannot be considered ‘experts’ in the metier of investigation usually are not able to contribute productively towards the results of the workshop. In the worst case, they may even mislead or distort the results. A tool mechanic, for example, will not be able to make detailed statements about the occupational tasks of an industrial mechanic who works in the maintenance unit of a big production plant.

It is difficult to give a definite recommendation concerning the minimum number of participants a workshop should have. 10 participants may be appropriate, the upper limit might be 12. Less than 6 is unfavourable, since the breadth of experiences and the possibility of group work will be restricted.

Everything in between will depend on the area to be covered, e.g. a single company, large or small, various companies, various application areas, etc. For representative coverage of an occupational profile a bigger number of workshops will be necessary. Then additional criteria will have to be set-up so as to have a meaningful composition of workers in the different workshops.

Tool: Check-list for selecting participants

- ➢ The work-related tasks performed relate to the metier of investigation ❑
- ➢ The current operational area represents the metier of investigation ❑
- ➢ The worker has done his or her initial training in the occupational field ❑
- ➢ He or she has acquired significant work experience ❑
- ➢ He or she has regularly followed some kind of formal or informal continuing vocational training in the relevant occupational field ❑
- ➢ The current work profile involves technologically advanced work processes ❑
- ➢ The worker is involved in flexible work structures and work organisation ❑
- ➢ His or her occupational tasks are complex ❑
- ➢ He or she has some degree of autonomy in performing and planning work tasks ❑
- ➢ No dependency relationship with other participants ❑
- ➢ The worker is willing to participate in the workshop ❑

Figure 4: Tool: Check-list for selecting participants

For the pilot applications we don't want to define the selection criteria too strictly. First it might be difficult, to get a sufficiently large number of workers involved, considering the limited available budget. Second, if in some of the expert workers workshops the composition of the group of experts is not ideal, the researchers can learn by experience, how important it is to select expert workers carefully.

3.2.4.3 The Equipment Needed

First of all a room is needed, where the workshop can take place. The room should provide an appropriate atmosphere, so that the participants and the facilitators can feel well. Tables and chairs should be arranged for collaborative work und should provide the possibility for group work at tables. A typical classroom-style setup should be avoided.

Since it will be necessary to show, what participants have written, it is recommended to have an overhead projector available. Thus participants can write on transparencies (transparencies and appropriate pencils have to be supplied) and use the transparency to present their persona occupational history (see below). As an alternative, a document camera (attached to a computer with digital projector) or a dedicated document projector can be used. This allows the participants to write on ordinary paper, but usually has the disadvantage, that the display of the written text is not very clear.

A sufficient number of moderation boards (pinboard with stand) is needed for easily displaying, arranging and re-arranging cards with text written on them. During group work, participants will use cards to write occupational tasks on them, during the discussions these cards will be arranged, re-arranged, and new ones created, and have to be displayed. A sufficient number of pins, cards, and markers have to be provided.

A flipchart might prove useful, with the rundown of the workshop and other necessary information written on it. That way such central information can be accessed and displayed whenever necessary without using overhead slides or a computer. A flipchart might also prove useful to write a preliminary documentation of workshop results on it, e.g. the core occupational tasks and their numbering.

One or more whiteboards would be good to have in case the need comes up to draw a sketch to clarify an issue or to support discussion. Be aware: Board markers and permanent markers should be kept separate from each other.

An audio recording device with sufficient quality and capacity should be available. At least the participant's presentation of their personal professional history, as well as the plenum discussions should be recorded. This helps to re-check discussions at a later time when a detailed documentation of the workshop and its results is drawn up. Participants have to be asked for their agreement to being audio recorded.

A camera (digital) is needed for documentation of interim results of what is written on whiteboards, how cards on pinboards are arranged, and of activities during the workshop, not to forget the group photo of all participants and facilitators.

Last but not least it will be necessary to provide some catering in terms of drinks and snacks, including lunch as well as coffee, tea, and snacks for the breaks.

3.3 Work Process Analysis

With the tool of expert workers workshops we get valuable information on core occupational tasks, which make up an occupation. This, however, is information which is passed verbally, off the real work processes.

Vocational teachers and lecturers, when they teach, should be able to refer to own experiences, not solely on things they read or they were told. For sure, the best would be own working experience in the occupational field in question, but that cannot always be realised. In addition, sometimes, or for certain purposes, a more objective view on work processes is needed. Also teachers and lecturers who have extensive own working experience in the field will need to update themselves about innovations that have taken place since they became educators, about what the current state of occupational, skilled work is.

Occupational task analysis presents an easily approachable means of analyzing work for those in the field of technical and vocational education and training. It enables the better understanding of occupational tasks in work and business processes through analysis. Curriculum developers, teachers, lecturers can get an impression of the characteristics and requirements in skilled work.

The results of an occupational task analysis help to define and further differentiate the description of the occupational field of activity, the learning and qualification goals, as well as the subject matters for work and study in each occupational task.

The analysis of occupational tasks often also is termed "work process analysis", and occurs in the following three phases:

- Preparing for the research
- Carrying out the research
- Evaluating and documenting the research (so that the results may be used in the framework of a research project, for teaching or even for curriculum development).

3.3.1 Preparing For The Analysis Of Occupational Tasks

The occupational tasks identified in expert worker workshops provide the picture of a complete occupational profile. Depending on what the goal of the research is, further, in-depth knowledge about the occupational tasks is necessary. In case teaching or curriculum development is the final goal, occupational tasks need to be shaped from an educational perspective. As a basic principle, each occupational task represents one curricular learning field. Thus, it is necessary to analyze each occupational task with respect to content, challenges faced by the worker, and learning possibilities. Taking into consideration that a curriculum should not be based on the results of a single analysis, each occupational task should ideally be analyzed three times at different work places.

Curriculum developers can only manage the resulting amount of work through a clear division of labour, but also for other purposes it is advisable to do the investigations in a group, so that maximum benefit can be drawn from the activity. In any case, the research activity should be well prepared in advance, so as to maximize outcome and minimize effort.

3.3.2 Choosing A Workplace

After identifying an occupational task for analysis, positions in a company or business are chosen where skilled workers have to meet demands that are representative of the occupational task in question. Professional/occupational representatives in the work team are important when choosing the positions/jobs, since they have a detailed insight into the business- and work processes, and they can ensure that the organizational prerequisites for the analysis have been met at the location where the analysis will take place.

The most relevant criteria for choosing a workplace or a task area are virtually the same criteria that are also used to come up with the formulation of the occupational task (see above on expert workers workshops). Isolated activities like turning a driveshaft or dismantling a bearing, are not to be analyzed, rather tasks in the sense of comprehensive work processes. In this regard the progressive structure of an occupational task contains the precise identification of the tasks, the planning and execution of the tasks, as well as controlling and evaluation of the work results (see the model of complete action further above).

Therefore, the criteria for choosing occupational positions are derived from the criteria for the formulation of the occupational task.

In practice, occupational tasks are not usually found selectively isolated from one another. In many occupational positions/task areas multiple occupational tasks are accomplished, which are often closely associated with one another. It is advisable to choose the occupational positions/task areas for analysis that will exhibit the "core characteristic" of an occupational task. Although only one individual occupational task is analyzed in the analysis, it is necessary to note the interfaces with other occupational tasks. However, concentration should remain centred on one occupational task. A simultaneous analysis of multiple occupational tasks can lead away from the main point, so that, in the end, "the wood cannot be seen for the trees".

Occupational task analyses are not limited to a one-time usage. Multiple analyses of the same occupational task, in different parts of a company, in different companies, the task carried out by different workers, contribute to broadening and deepening the insight in the task.

Measurement noise is smoothed out when using an approach that evaluates the characteristics of an occupational task in companies in different industrial sectors, with varying size and in different geographical regions. That way, the danger is minimized that outdated technology and tasks will be taken as the state of the art instead of seminal task areas that are the focus of innovation in the respective sector.

An influential factor that shouldn't be neglected when choosing the occupational positions in a company is the readiness of the expert workers who work there to participate in an analysis of their work. It is important to make clear that the purpose of the analysis is not to impose measures of efficiency or restructure the personnel. Of major interest are the work practices of the expert workers, which should be integrated into vocational education and training much more than it has been in the past. This central concern should also be made clear to the management of the company/business in question, whose approval is required. A report back to the company/business regarding the results of the analysis should be restricted to the findings on competence requirements. In no case there should be a judgement on the performance of the individual worker, since this would compromise her or his willingness to provide a deep insight in her/his work.

Due to the fact that it is difficult to comprehensively portray the whole spectrum of work content and demands that are related to an occupational task in merely one position, other positions should be analyzed that also represent the occupational task. As a matter of principle it is advisable to use different research teams to analyze an occupational task. The more comprehensive the mix of industrial sectors, ranges of products, and sizes of companies in the analysis being undertaken is, the more valid and comprehensive the results will be.

3.3.3 Analysis Team

Another part of the preparation is selecting those who will carry out the analysis. In order to conduct an efficient, goal-oriented realization of an occupational task analysis, it is best to set up groups of 3 to 4 persons that, if possible, include an expert worker, a vocational school teacher and/or a training instructor, and a researcher. The collective point of reference for the team is the occupation for which

a curriculum will be developed. The educators should be from the relevant occupational field, and of course the expert worker should be a practitioner of the occupation in question. The following 5 duties are to be accomplished by the group during the analysis:

- Observation
- Interviews
- Taking minutes or notes (using keywords)
- Taking pictures and making sketches
- Having the necessary working material present (e.g. drawings)

Although an analysis team doesn't usually contain any form of hierarchy, since the task of analyzing is something that everyone participates in, it is advisable to designate a member of the analysis team to be responsible for the documentation. It is best to use existing connections (among the persons) for the analysis, for example training instructor/teacher working groups or examination boards. Nevertheless, it is also possible for teams who didn't have any contact with one another before to successfully carry out the analysis.

3.3.4 Guide for Analysis

It is important for established teams, as well as teams meeting for the first time, to delve into the guide of analysis in the run-up of the investigation. It must be clear to each member of the analysis team what the categories of analysis and the procedures are. Each team member assumes equal responsibility for the results of the analysis.

In order to achieve rewarding analysis results, it is advisable to consider the following central questions during the analysis.

- Into which business or work process is the occupational task integrated?
- At which workplace is the task carried out?
- Which objects/items will be worked on for this specific task?
- Which tools, methods, and organizational forms will be put to use?
- What demands on skilled work from which sides have to be met?
- What interfaces with other occupational tasks exist?

Categories for analysis have been developed on account of these basic questions, which can be made more accessible with a catalogue of guiding questions. This leading analysis pattern has proved successful in practice, producing usable and particularly comparable analysis results, especially for use in curriculum development.

- **Analysis Category: Business and Work Processes**

Analyzing skilled work cannot be undertaken without regard to the context of the workplace. Skilled work in all its demanding complexity will not be appropriately understood without considering how it is integrated into the business and work processes. Material and informational flow charts as well as schematic descriptions of the procedures of executing an order are helpful resources for the analysis, which make the work of the analyzers easier. These materials can often be examined by the research team during the preparatory phase of the analysis, before the on-site analysis starts to take place.

- Into which business or work processes is the occupational task integrated?
- Which products are produced?
- Which services are provided?
- Where do the pre-products come from?
- How are orders taken/processed?
- Where will the finished products be further worked on?
- How will completed orders be handed over?
- Who is making an order/taking an order for services?

- **Analysis Category: Workplace**

Apart from the location (department, production area/section), it is interesting to note, when describing the chosen workplace, under which working conditions the skilled workers cope with their daily work routine. Conditions of the work environment like lighting, noise level, and room temperature as well as aspects of working positions (e.g. posture while sitting, workbenches) are of interest in this case.

- Where is the workplace located that is being analyzed?
- What are the lighting conditions?
- What climatic conditions affect the expert workers? (e.g. heat, cold, radiation, ventilation, gases, steam, fog, dust)?
- In which position do the expert workers carry out their tasks?

- **Analysis Category: Objects of Skilled Work**

In describing the objects of skilled work, the work context and the work process should be taken into consideration. Thus, it's all about the object of work in the work process.

- What will be worked on in the task? (e.g. technical products and processes, services, documentation, control/assessment).
- What role does the subject (the worker) play in the work process? (e.g. operation of or repair of a system/plant)

- **Analysis Category: Tools and Means of Skilled Work**

The context of the work process is crucial when describing the tools and means of skilled work. Especially universal tools such as personal computers require being described as special tools for a specific work process.

- By what means and with which tools will the task be accomplished (e.g. millimetre, torque wrench, PC with specific software applications)? Are there tools with different quality for working on the task?
- How will the tool/means be used?

- **Analysis Category: Methods of Skilled Work**

There is a lot of design potential associated with the methods of skilled work. Although, for example, two servicemen might go about searching for a specific problem in a production facility in very different ways, in the end they both achieve the same goal: the identification of the problem/point of breakdown.

- How are occupational tasks approached? (e.g. identification of failures/problems, quality assurance procedures, production, fitting/installation).

- **Analysis Category: Organization of Skilled Work**

A formative and not to be neglected point in the design of skilled work is the form of organization. First of all there are the aspects of work arrangement and workflow management (e.g. group organization, division of labour, levels of hierarchy, cooperation with other occupational groups). Cooperation with other occupational groups (for example decentralized vs. centralized maintenance) is an important aspect of the analysis. Models of work-time arrangements (e.g. shifts, breaks, and part-time work) play a decisive role in skilled work (ibid.).

- How is the work organized? (E.g. individual or group work, division of labour)?
- Which hierarchies influence the skilled work?
- What types of cooperation or barriers with other occupational groups and departments exist?
- Which competences of the workers interact and complement one another?

- **Analysis Category: Demands on skilled work and its objects**

There are various parties, each with their own perspective, who make demands on the work process and the object being worked on, thereby on the skilled workers as well. It is therefore possible that contradictory demands exist, due to conflicting interests. On the other hand there are those demands that are partially or completely identical to others. One should differentiate between business, societal (institutional) and individual demands.

- What are the company/business's demands that must be met concerning the accomplishment of the task?
- What demands does the customer make?
- Which societal demands play a role?
- Which norms, laws, and standards of quality are to be considered?
- What rules and "standards" are imposed by the community of practice?
- What demand does the skilled worker make on his/her own work?

- **Analysis Category: Interfaces**

Last of all it is necessary to see this selective analysis in a larger context. Interfaces and overlaps with other occupational tasks are especially worth noting. As was mentioned before, occupational tasks are seldom found independent from other tasks in practice. They are more often than not closely tied to other tasks that the skilled workers accomplish. Here it is also possible to critically reflect on analysis results of an occupational task that was analyzed at another workplace.

- What relationship is there to other occupational tasks?
- What comparison can be made to other completed analyses of this same occupational task?
- What similarities/differences are there with other workplaces in the company/business where the same task is accomplished?
- Is there any emerging potential for vocational training to take place at the workplace or in the department?
- The whole text is without sources but a lot of sources are available – please mention some

Apart from the goal of developing a curriculum, the analysis might also result in direct stimuli for vocational education and training. One or the other of the analyzed workplaces might provide opportunities for practical training in entry-level positions. In the framework of the analysis, corresponding contacts might be established.

- This outline of guiding questions for the occupational task analysis is summarized at the end of this text in photocopy-friendly format. It has proved helpful for each member of the team to have this guide with him/her during the analysis, to use as a memory aide. These guiding questions have been developed as a suggestion for approaching the analysis. They are certainly not intended to serve as a checklist, nor are they to be used as an interview guideline. Note: the research method applied is accompanying observation / contextual inquiry, not structured interview! The guiding questions are rather to be considered as an aid, in order to be able to successfully sort out the results of the analysis.
- Carrying Out the Analysis of Occupational Tasks
- The initial contact for a planned analysis is usually made by the company representatives in the analysis team. After informing the business/company/heads of departments regarding their request, suitable workplaces will be chosen to conduct the analysis. The skilled workers, whose work will be analyzed, need to be likewise informed as to what the analysis will entail. It should be made clear to them that their day-to-day work will continue as usual, as far as this is possible. A "performance" is not called for, rather the accomplishment of everyday activities by the skilled workers.

If there is not a "highlighted work task" on the day of analysis, but rather unspectacular "standard work", it is not a disadvantage for the analysis. It is just a reflection of the everyday work.

- However, "business as usual" cannot completely be realized during observation interviews. The skilled workers should openly provide information about their work when questioned by a member of the analysis team. Basically the case remains that the analysis will only slightly influence the usual flow of work.
- Observation Interviews – contextual inquiry
- On the day of analysis the team finds itself "in the work process", working on answering the guiding questions for the analysis. This is accomplished through observation interviews (or contextual inquiry – this term originates from participative software development). Impressions, whose function isn't only revealed through observation, are complemented by questions addressed to the skilled workers when using this method. A skilled worker might, for example, be asked to verbalize/comment on what he/she is doing while repairing a machine. Short pointed questions usually result in a much more detailed insight into skilled work than observation alone might. The catalogue of guiding questions for the analysis should not be systematically worked through, point by point, but it should always be present in the background of an analysis so that no aspects are neglected. Apart from the observation interviews, taking photographs can also substantiate the analysis. Regarding the documentation of the analysis, pictures often say more than complex written descriptions, especially for those who were not present at the analysis.

There will always be situations that the analyzers won't be able to fully understand. Even when the skilled workers are willing to provide complete information on their professional work and detailed photographs have been taken, there is still a lot concerning workers' activities, which is not open to the analyzers. The intervening question of an analyzer, such as "What are you doing? Why are you doing it that way, and not this way?" is often answered in a way that isn't satisfying. To express especially their practical knowledge in words often is difficult for skilled workers. An external analyzer stays just outside a border, which should be evident to him/her, and he/she should know that this barrier is not a result of a lack of willingness to cooperate on the part of the worker.

- As there is not a hierarchy in the analysis team, there is also not a designated member to lead the interviews. Depending on the case and the situation, questioning will be undertaken without significant prior consultation amongst the team members. In principle, additional skilled workers might be invited in during the analysis for the whole team to observe. It is the whole team's responsibility to comprehend the situation, so that during the documentation phase statements like "I thought that you observed/asked that" can be avoided.
- Findings from the observation and interviews can be written down in the form of key words during the analysis, so that it is easier to relate back to the situation during the documentation phase. However, the analysis team must be conscious of the danger that always having a note pad around gives the skilled workers the impression that the analysis is too controlling. For this reason it is better to have interviews in situations similar to the daily routine. With a bit of practice the results of the analysis can be recapitulated without documented notes. In addition to observation interviews and photographs, technical drawings, sketches, listings of computer programs, etc. have proven to be valuable items to take, if such an opportunity presents itself.
- The usage of the guiding framework leads to comparability of analysis results for different workplaces. An occupational task analysis usually takes about two hours, based on experience to date. This amount of time might increase significantly if, for example, a fault diagnosis is given in the analysis followed by the operational start up of the manufacturing plant.

A typical mistake that is made in an occupational task analysis is giving undifferentiated descriptions of the analyzed skilled work. It is possible to avoid mistakes of this type when the guiding framework for analyses is used, since the guiding questions focus the analysis on individual aspects, e.g. tools used, forms of organization of skilled work. In conclusion it should be particularly clear to the analysis team what demands are made on the skilled workers by their colleagues in daily practice, and how they manage this.

- Documenting the Analysis of Occupational Tasks
- For being able to use the analysis results later on, documentation is needed. The first phase in preparing the documentation should take place immediately after the execution of the analysis, which all the members of the analysis team take part in.
- This phase safeguards the results of the analysis by going through the guiding framework point by point. The team member, who, prior to the analysis, was designated as being responsible for preparing the documentation, calls out the analysis categories one after the other (e.g. "Tools of Skilled Work"). Each team member shares her/his perceptions, which are

then summarized and noted by the person responsible for the documentation. The group should arrive at a consensus that accounts for the individual assessments of each team member, but simultaneously establishes a collective result of the analysis. The length of this group meeting is usually an hour, based on experience to date. The actual writing up of the detailed documentation is then carried out by the person designated as being responsible for that. The breadth and level of detail in the documentation may vary significantly depending on the purpose. Most importantly the person writing down the documentation should keep in mind that people who will be reading it and were not present at the analysis need to clearly understand the results of the analysis. It is advisable to have a continuous text that comprehensively describes the results of the analysis. A list of key words might not suffice for an external reader to get an impression of the analysis. The occasional but targeted use of photographs, sketches and illustrations in the documentation has proved to be exceptionally helpful in presenting the facts comprehensively.

- Usually an ex post approval of the documentation by the group is not required due to collective analysis in the team, followed by prearrangements for the documentation made consensually.
- After multiple documented analyses of an occupational task are available, the individual results need to be merged, pointing at the differences observed between individual workers, workplaces, and companies.
- Sources necessary

3.4 Occupational Sector Analysis

An occupational sector analysis always should be conducted as a first step of occupational research since it is meant to provide the necessary background information. Depending on the overall goal of the research, it will have to be more or less detailed or comprehensive.

Kleiner et al. (2002) give hints on what has to be considered in occupational sector analysis for the purpose of occupational profile design. Since we do not target curriculum development, the instrument presented here is quite different, even though we use some of their considerations.

For the term “occupational sector” there are quite a number of diverging definitions possible depending on the context in which the term is used.

In the context of this paper, which focuses on the analysis of existing occupations, an occupational sector is that part of the labor market and of the economy, in which the “occupational profile” we want to investigate is embedded, i.e. it is the environment in terms of economy and in terms of the labor market, in which the respective “occupational profile” (profession, occupation) is relevant. Latest literature has to be mentioned – the approach is more advanced nowadays

3.4.1 Objectives Of An Occupational Sector Analysis

Whenever an occupational profile in terms of work processes and related competence requirements shall be researched, information must be available on the relevance of the respective occupation, in what type of economic activities the respective skilled workers are involved, what type of companies they are working in, what “neighboring” occupations there are, what regulations exist with respect to

the occupation as such and with respect to the related economic activity, what education and training pathways exist and what the structure and volume of the education and training market looks like. Such information greatly helps to set the research scope and to select companies and workplaces to be researched.

The purpose of an occupational sector analysis in our context is

- to get an overview of the occupational sector with its structures and developments, including the types and volume of the business, the number and type of companies, employees, own account workers, the significance of the occupational profile in question, remuneration structures, regulations, major actors like professional, employers, employees associations, etc.,
- to find out, which additional occupational profiles exist in the sector and what their relation to the occupational profile in question is,
- to acquire knowledge on
  - the "state of the art" of work in the sector
  - recent and future development trends
  - organization of work and business processes
  - technical developments
  - socio-economic developments
  - legal framework settings
  - Major actors (companies, associations, unions, ...)
  - ...

This implies that the sectoral and geographical coverage has to be defined according to purpose of the study. If we just want to look at a certain economic sector, it will not be of much use to give very detailed information on other sectors, where the occupational profile in question might also be used. Some information on these neighbouring sectors however should be given, since they might affect the developments in the sector to be researched. The same applies to geographical coverage. If we deal with only a province or a city, detailed data should be given related to this geographical unit, information on the national situation does not need to be too detailed, especially when there are regions with pronounced different economic structures.

3.4.2 Categories Of Occupational Sector Analysis

In the following list, categories are given for which information should be collected and documented in order to create a picture of the occupational sector. The list given is by no means comprehensive, but should be adapted to the purpose of the sector analysis. The information should be arranged in an easily readable continuous text in order to provide an easily accessible overview.

- Structure of employment
- Structure of companies and business
- Work organization in the companies
- Existing qualifications, initial and further education and training and their boundaries
- Employers, employees and professional organizations and their influence
- Labor market
- Technological trends

- Contribution to and velocity of innovation
- Contribution to social modernization
- ….

The last item "contribution to social modernization" might need some explanation. It refers to the social dimension of work and production, i.e. to what extent workers are involved in shaping work processes and work environments, how comprehensively competences and qualifications are used, whether the sector contributes to changing societal structures, or whether the sector contributes to enhancing service quality at large to a considerable extent.

As already mentioned, this list of items will have to be elaborated depending on the purpose of occupational sector analysis. Therefore there is no rigid structure proposed. The researchers will have to develop a meaningful structure by themselves.

3.4.3 Data Sources For Occupational Sector Analysis

Data for an occupational sector analysis can be retrieved from various sources, but availability of data will be different between countries and/or regions, especially with respect to official statistical data, existing research reports or policy planning documents. Researchers should make optimum use of already existing data in order to reduce costs and efforts, but in case available data is not sufficient, they might have to embark on some original research activities. Possible data sources might include the following:

- Employment statistics
- Manufacturing statistics
- Education and training statistics
- Economic planning documents
- Existing sector reports of any kind
- Relevant scientific articles
- Other publications, newspapers, journals
- Interviews and/or focus group discussions with industry associations, professional associations, labor unions, ministries, innovative companies, researchers, workers, …
- …

3.4.4 Additional Remarks

In the current context, occupational sector analysis is meant just to collect information about the occupational sector. Certain elements, however, can also be used to get in contact with the relevant actors in the sector, like e.g. companies. Such contacts might be essential to get access to expert workers and workplaces.

In other settings, e.g. when work on the vocational education and training system is intended, the occupational sector analysis will be a means to initiate or develop a vocational education dialog between all the stakeholders involved. In this case, the interaction between the actors deserves much more attention in order to develop mutual trust and mutual understanding.

4 Pilot Application Repot Of Methodology Of Competence Need Analysis

4.1 Description Of UPI Experience*

Regional Cooperation Platform
for Vocational Teacher Training and Education in Asia (RCP)
Project P9:
Research on Occupational Competence Needs Analysis
In the sector of wood furniture construction
Country report of Indonesia

Prof. MS. Barliana; Ilhamdaniah, MSc; Dr. Phil. Dadang Kurnia; Dr. Sudjani
Faculty of Technology and Vocational Education, Indonesia University of Education

Contribution to Chapter 4: Project Implementation in Each Respective Countries

4.1.1 Project Application

4.1.1.1 Introduction

The paper of Indonesia country report consists of five parts:

1) Introduction, which offers an overview and structure of the research. This introduction serves as a background of the entire research and helps the reader understand the research of the implementation of three methodologies in occupational competence need analysis;
2) Occupational sector analysis, which summarizes some basic facts and development trends of the (wood) furniture industry in Indonesia;
3) Occupational profile analysis, which resulted from an expert worker workshop. This outlines the occupational profile and elaborates working tasks of a wood furniture worker.
4) Occupational task analysis, which clarify the result from the expert worker workshop. It analyzes and describes the work process and some other major characteristics of the working tasks outlined above. It gives the reader a detailed description about the actual working processes of a wood furniture worker, their basic requirements, tools requirements, working environment, etc.;
5) Methodological reflection and suggestion, which is a summary of the lessons learned in the implementation of three methodologies in research process. Some shortages of this research project implementation are reflected to give input for further methodological revision.

This Indonesia Country Report is the result of an implementation of the methodology to study the occupational profile and task of wood furniture workers (carpenters) in Bandung, Indonesia.

4.1.1.2 Occupational Sector Analysis (OSA)

Ideally the occupational sector analysis (OSA)gather the data from existing sources of data and information (e.g. labour market information, job descriptions), surveys of employers and key

stakeholders, interviews with a representative sample of employers and key stakeholders, workshops or focus groups with employers and key stakeholders. The occupational sector analysis here is mainly based on the secondary data analysis (content analysis) from literature and statistics on the furniture industry, and information regarding to workers in furniture-making industry in Indonesia. The description is regarding to the general information about the wood furniture industry, the developmental trends and the vocational training that support the sector.

a) General information about wood furniture industry

Based on the data from Centre for Industrial Studies (CSIL), the world furniture trade had reachedUSD122billion. China is quite dominating the world market at approximately USD 45 billion, Vietnam has earned U.S. $ 4billion, while Indonesia furniture export is USD1, 7billion, or less than2% of total world global furniture trade. The furniture industry is one of the 'big four' Indonesian pillars for export (along with rubber, palm oil, and footwear). The industry relies heavily on timber as its raw material, with an annual requirement of up to 7.5 million cubic meters. Wood species used as raw material for furniture (mainly teak and mahogany) come from natural forest and plantation/community forests. Indonesia Ministry of Industry and Trade said that the furniture and handicraft industry has a very important contribution to the economy. Based on data from the Ministry of Trade, the results of the industrial exports reached U.S.$ 1.9billionin 2012. Thevalueincreased10.2percentfrom the previous year, which was U.S.$ 1.7billion.

Table 2: **Data of wooden furniture export from Ministry of Industry and Trade, Indonesia**

Type of Furniture	2007	2008	2009	2010	2011	trend
Wooden furniture (except seats) of a kind used in offices	34.990,6	30.150,3	17.748,7	19.080,9	14.936,7	-19,43%
Wooden furniture (except seats) of a kind used in the kitchen	16.493,0	21.623,3	22.232,2	23.419,0	30.338,0	13,87%
Wooden furniture (except seats) of a kind used in the bedroom	183.777,3	194.933,1	160.350,4	154.700,8	129.576,2	-8,88%
Wooden furniture	865.649,8	869.850,4	738.562,4	908.706,1	650.116,0	-5,15%

Source: Ministry of Trade Report (Kemenperindag), 2013

In the national market, the local furniture industry still holds 70% of domestic furniture market1. However, market share is threatened by imported furniture from China whose growthreached200% per year in the past year. The increase in imported furniture from China that occur each year primarily for lower middle market.

Key developmental trends and their influences on the workers

The local furniture business mainly meets the local needs. This business also absorbs the skilled labor and semi-skilled labor in the field of wood construction. For the export market, the need of skilled

[1] BI Report on PolaPembiayaan Usaha Kecil: Furniture Kayu (2008).

labor in the business of furniture making is crucial. Therefore the demand of skilled worker in this business is increasing. For meeting the demand of local market, the skilled worker also needed.

The big scale industries (national-wide and international wide scale) in the furniture-making industry are 6 companies (data from the Ministry of Industry and commerce). Based on the data registered in the ministry, there are 635 medium scale companies involve in this business, administered with the legal administrative documents. This statistics has not include the small scale industries which are not administered in the ministry or industry and commerce provincial offices, since those SMEs do not equipped with the legal documents of practicing in this field of industry. The data of formal workers in this industry is not available, it is also difficult to estimate the overall number of informal workers in this industry, in the city level, provincial level and country level. In general, the number of workers in the small scale industries is bigger compared to the number of workers who work in formal furniture industries.

The employment in this home-based furniture industry mostly classified as informal worker. They work based on order from clients. They earn their salary based on the furniture projects that are being made.

The vocational training program that support the sector

Formal vocational training program that support the labor force for furniture-making industry is vocational secondary high school in building construction expertise, majoring in furniture skill (*SMK bidang keahlian Teknik Bangunan, sub bidang keahlian Teknik Furnitur*).

Table 3: **Vocational High School Expertise, Building Construction Major, Specialization in Furniture Making**

No	Field of Study	Major (Study Program)	Specification	Specification Code
1	Technology and Engineering (*TeknologidanRekayasa)*	1.1 Building Construction (*TeknikBangunan)*	Steel Construction (*TeknikKonstruksi Baja*)	001
			Wood Construction (*TeknikKonstruksiKayu*)	002
			Concrete and Stone Construction (*TeknikKonstruksiBatudanBeton*)	003
			Construction Drawing Techniques (TeknikGambarBangunan)	004
			Furniture-making Techniques (*TeknikFurnitur*)	005

Source: KeputusanDirekturJenderalManajemenPendidikanDasardanMenengahDepartemenPendidikanNasional No. 251/C/Kep/MN/2008

There was changes and development in the SMK spectrum of expertise in the year of 2013. Initially in 2008 the Furniture-making specialization was part of Building Construction major. In 2013, the Furniture-making Techniques was one of the majors in the technology and engineering field of study

Table 4: **Specialization of Furniture-Making among Technology and Engineering Field of Study**

No	Field of Study	Major (Study Program)	Specification	Specification Code
1	Technology and Engineering *(TeknologidanRekayasa)*	1.1 Building Construction (*TeknikBangunan)*	Steel Construction (*TeknikKonstruksi Baja*)	001
			Wood Construction (*TeknikKonstruksiKayu*)	002
			Concrete and Stone Construction (*TeknikKonstruksiBatudanBeton*)	003
			Construction Drawing Techniques (TeknikGambarBangunan)	004
		1.2 Furniture (*TeknikFurnitur)*	Furniture-making Techniques (*TeknikFurnitur*)	005

Source: Curricula of 2013 for SMK

Furniture making expertise fall within the building construction expertise in SMK. However, not all of SMK which has building construction major also possess the specialization in wood-furniture making. There are only 26 SMKs which has the specialization of wood furniture making in Indonesia. 23 of them are state-owned SMKs and 3 of them are private SMK. They are not evenly distributed across Indonesia, 2 in Jakarta, 3 in West Java, 5 in East Java, 3 in East Java, 5 in Northern Sumatera, 4 in Southern Sumatera, 3 in Kalimantan and 1 in Papua. In West Java, the SMKs which have the furniture-making expertise are located in Ciamis District (southeastern part of West Java). One interesting fact is that there is no SMK in Bandung (capital city of West Java) have this specialization in their SMKs.

Related to preparing skilled labor for furniture-making industry, some description about SMK Curricula in furniture making are depicted in the table of SMK curricula. In the curricula, the expertise of furniture making was given starting from the second year of SMK study. While in the first year, the students are mandatorily have to take courses on general subjects. The table illustrates the structure of curricula of SMK specialization in furniture-making.

Table 5: **Structure of SMK Curricula specialization in Furniture-making**

Field of expertise : Technology and Engineering (*Teknologi dan Rekayasa*)

Major : Furniture Making (*Teknik Furnitur*)

Courses		Grade					
		X		XI		XII	
		Sem1	Sem2	Sem1	Sem2	Sem1	Sem2
Courses Group A (Mandatory)		Credits per Semester					
1	Religion and Ethics *(Pendidikan Agama dan Budi Pekerti)*	3	3	3	3	3	3
2	*Pancasila* National Ideology and Civics (*Pendidikan Pancasiladan Kewarganegaraan*)	2	2	2	2	2	2
3	Indonesia Language (*Bahasa Indonesia*)	4	4	4	4	4	4
4	Math (*Matematika*)	4	4	4	4	4	4
5	History of Indonesia (*Sejarah Indonesia*)	2	2	2	2	2	2
6	English (*Bahasa Inggris*)	2	2	2	2	2	2
Courses Group B Mandatory)							
7	Art and Culture (*Seni Budaya*)	2	2	2	2	2	2
8	Art Creativity and Entrepreneurship (*Prakarya dan Kewirausahaan*)	2	2	2	2	2	2
9	Sports (*Pendidikan Jasmani, Olah Raga & Kesehatan*)	3	3	3	3	3	3
Courses Group C (Vocational/*Kejuruan*)							
C1. Fundamental (*Dasar Bidang Keahlian*)							
10	Physics (*Fisika*)	2	2	2	2	-	-
11	Chemistry (*Kimia*)	2	2	2	2	-	-
12	Technical Drawing (*Gambar Teknik*)	2	2	2	2	-	-
C2. Basic Expertise Program (*Dasar Program Keahlian*)							
13	*Materials* (*Teknologi Bahan*)	8	8	-	-	-	-
14	Furniture Technics and Modelling (*Rekayasa dan Pemodelan Furnitur*)	10	10	-	-	-	-
C3. Expertise Program (*Paket Keahlian*)							
15	Furniture-making technics (*Teknik Furnitur*)	-	-	18	18	24	24
TOTAL		48	48	48	48	48	48

The training in the sector is also offered by short-term training programs in various training organizations or on the job. The training organization can be government-owned or private-owned training centers. Nationwide, there are some vocational school specializing in training wood workers, such as in PIKA (*Pusat Industri Kayu*) Semarang. PIKA has secondary vocational high school, the polytechnic for diploma program in wood industry, and the production unit for commercial furniture making[2]. The information on short-term training program and on-the-job training in a city, province and country scale is not available while the research data gathering was conducted.

4.1.1.3 Occupational Profile Analysis

The occupation selected by UPI and IBB Tongji was carpenter in building construction, specifically in the furniture making industry. Carpentry is a skilled trade in which the primary work performed is the use of wood to construct items as large as buildings and as small as desk drawers. The word "carpenter" is the English rendering of the Old French word *carpentier* (become *charpentier*) which is derived from the Latin *carpentrius [artifex]*, "(maker) of a carriage[3]. A finish carpenter (North America) also called a joiner, is one who does finish carpentry; that is, cabinetry, furniture making, fine woodworking, model building, instrument making, parquetry, joinery, or other carpentry where exact joints and minimal margins of error are important. Some large-scale construction may be of an exactitude and artistry that it is classed as finish carpentry. A cabinetmaker is a carpenter who does fine and detailed work specializing in the making of cabinets (wardrobes, dressers, storage chests, and other furniture designed for storage) made from wood. In Indonesia, the terminology of carpenter in furniture-making is called "*tukang meubel".Tukang*is the terminology often used for skilled/semi skilled people working in building construction industry. *Meubel*is the terminology often used as an alternative of furniture.

The occupation chosen for this study was carpenters (cabinet-maker) who are working on the furniture making industry. This occupational profile analysis was conducted through "Expert Workers Workshops". The expert carpenters are invited to attend one day workshop, and the researchers tried to tap their description of occupational expertise trough the steps of expert worker workshop.

4.1.2 Expert Worker Workshop

4.1.2.1 Preparation Of Expert Workers Workshops

The preparation started with effort to understand the method of EWW. All the researchers need to learn the method which already been agreed in the RCP CB-8 workshop. The research instruments are studied by all the researchers, especially the ones who are assigned to be the moderator/facilitator of the EWW.

The facilitator is one the most crucial factors when implementing 'expert workers workshops'. The skills and competencies of the facilitator in terms of technical knowledge and methodological know-

[2] See www.pika-semarang.com
[3] See http://en.wikipedia.org/wiki/Carpentry

how determine the success of the workshop. The facilitators also need to do the preparation of all the worksheets that are needed in the EWW.

Initially the researchers identify the workshops which make furniture and furniture shops in Bandung area. The information was gathered from newspaper, ads, websites, and field visit. We visited the furniture shops and furniture workshops to gather initial information. The information gained in the furniture shops sometimes lead to other workshops which produce furniture. The furniture workshops are mostly the small to medium scale business. The researcher gave initial informal invitation to the workshop owners and the skilled carpenters to participate in expert worker's workshops. Some were giving enthusiasm to participate, but some are reluctant to participate due to some reasons (mostly time does not allow them to participate due to working orders or working time). The experts to participate in the EWW are selected based on their response to our initial invitation to the wood workshops. The experts who gave positive response and voluntarily willing to contribute to the EWW then formally invited to attend the workshop in UPI.

4.1.2.2 Professional Background Of The Researchers And Expert Workers

The Professional backgrounds of the researchers as well as the workers have substantial influence on the investigation process and results.

The UPI research team consists of four members, they are four university teachers in the field of vocational education, architecture engineering, and civil engineering. The leader is Prof. M.S. Barliana (vocational education and architecture engineering), Dr. Phil Dadang Kurnia (vocational education) and Ilhamdaniah, MSc (architecture engineering) are the facilitators, and Dr. Sudjani (civil engineering & vocational education) did the presentation on the purpose of the EWW to all of the audience to open the workshop.

The attending carpenters are the ones that possess experience in the wood furniture-making industry. FPTK UPI invited eight expert carpenters to the workshop. Those carpenters are specializing in the making of furniture, with various materials from wood. They were coming from 4 different companies, all of them are in the scale of home industry (small to medium scale industry). Three of the experts were coming from the Punakawan wood workshop, specializing in the making of furniture for kitchen cabinet, food booth, etc with the basic material from wood, multiplex and other modern finishing material. Two other are coming from the home-based furniture making, experienced in various material such as solid wood and multiplex. Two of the carpenters are coming from the solid wood furniture-making, called Amrozy Meubel. One carpenter was involved in the furniture-making industry but focus on basic material from wood with rattan as finishing material.

Among the eight workers invited to the workshop, 1 worker has a work experience of nearly40 years, 1 worker has a work experience of 17 years, 1 workers have worked as wood furniture worker for 10 years, 1 had 8 years of working experience, 2 has approximately5 years' work experience, and 2 has more than 3 years of work experiences as wood furniture worker.

The fact that they come from different companies and differ in the type finishing material would enrich the discussion in the workshop.

4.1.2.3 Organization And Run-Down Of Expert Workers Workshops

Objective of EWW:

- Identify the professional task which constitute an occupation
- Get some insight into the content and the complexity of these professional tasks.
- Get information on which professionals tasks have to be mastered before a learner can proceed to the next professional task.

The workshop was conducted utilizing step by step as stated in the EWW rundown method in RCP P9 research instrument. The descriptions are as follows.

- **Introduction**

Objectives of the Expert Worker Workshop
Basic assumption of the EWW
Justification of the selection of participants

- **Personal Occupation History**

Participants wrote on the workshop sheet 1:

- their stages of professional development, from beginning of their career up until become an expert carpenter
- describe professional tasks carried out during each of these stages.

Participants presented the workshop sheet 1:

Moderator asked questions for clarity

Participants marked particularly challenging and qualifying task that was important in shaping their expertise today

- **Compiling of professional tasks**

Participants formed small groups of 3 people. There were 3 groups formed (A, B, C)

In each group, the participants identify the professional tasks

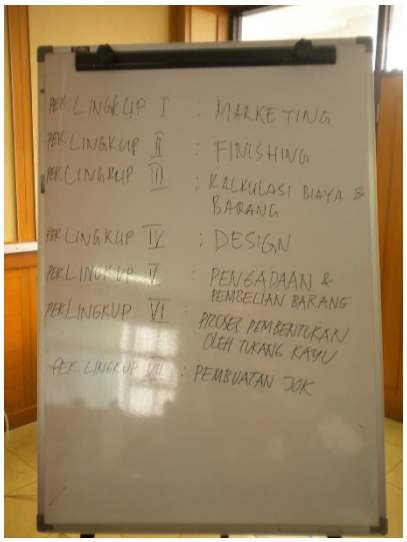
The occupational tasks were written down in the metaplan cards and worksheet 2.

The description in the workshop sheet 2 included the information regarding to tools and methods applied to perform the professional tasks.

- **Presenting and clustering the Professional Tasks**

1) Group A presented one occupational task, the metaplan card of the occupational task is pinned to the board.

2) Moderator asked whether group B and C had similar occupational task, and the similar occupational task were pinned and clustered together
3) Group B presented one occupational task, the metaplan card of the occupational task is pinned to the board.
4) Moderator asked whether group A and C had similar occupational task, and the similar occupational task were pinned and clustered together
5) Group C presented one occupational task, the metaplan card of the occupational task is pinned to the board.
6) Moderator asked whether group A and B had similar occupational task, and the similar occupational task were pinned and clustered together.



The cycle (1-6) repeated until all the cards of each group were presented.

- **The formulation of agreed occupational tasks among group**

- **The discussion of the clustered occupational tasks**

  Discussion to agree upon the common occupational task performed by the experts in their daily work. The participants agreed on their core occupational tasks.

- **The documentation of occupational tasks**

  The discussed and agreed occupational tasks was being documented by the facilitator. There were seven core occupational tasks, but the last occupational task of cushioning was only conducted by two carpenters belong to the same factory/workshop which work on chairs. Since most cabinet-makers work on cabinet, kitchenette, desk, bed, and not all of them working on tables and chairs, so the process of cushioning the chairs can be omitted.

After the documentation process completed, the participants took a small break. Furthermore, the participants was expected to fill in the workshop sheet 3, the worksheet listing eight possibilities to assign occupational tasks to different skill levels. The assigning of occupational task to different skill levels was done individually. Each participants must filled in the worksheet 3. This process was not carried out by discussion within group as the P9 research instrument stated. This is due to the time constraint, since the discussion would took more time.The filled worksheet will be calculated by the researcher later on. The result of worksheet 3 is attached in the appendices of this report.

After the process completed, the facilitator summed and conclude the discussion. The last session was the feedback session, where the carpenters gave feedback of how the workshop had been carried out. This process marks the end of the workshop.

4.1.2.4 Results From Expert Workers Workshops

Based on the discussion and consensus among carpenters in the expert workers workshop and some refinements in terms of language, the core working tasks of a wood furniture worker in Bandung Indonesia are as follows:

1. **Marketing (*Promosidan Pemasaran*)**
2. **Designing (*Perancangan*)**
3. **Cost Calculation and Volume Estimation (*Kalkulasi Biayadan Volume Barang*)**
4. **Purchasing the materials (*Pengadaandan Pembelian Barang*)**
5. **Furniture shaping/parts assembling (*Pembentukan dan perakitan oleh tukang kayu*)**
6. **Finishing (*Penyelesaian akhir)***

Their detailed information is available as follows:

Table 6: **Detailed information about core working tasks of a wood furniture worker in Bandung Indonesia**

<table>
<tr><td>Core Working Task1</td><td>Title of the professional task
Marketing</td><td>Duration :
Depending on the client
Workplace:
in the workshop, in exhibition, meeting directly the clients in various places</td></tr>
<tr><td colspan="3">Description of the occupational field of the activity
Marketing was done by traditional way and modern way of marketing incorporating information technology. Marketing done through words by mouth, participating in the exhibition, distributing name cards to potential clients, updating company portfolios, or discuss projects with potential customers. Marketing process also done through online media, by updating company website, campaigning using social media, and communicating through email.</td></tr>
<tr><td colspan="3">Contents of work and learning</td></tr>
<tr><td>Objects of work:
Understanding the demand of specific client and recent market trend/style of furniture</td><td>Tools:
Website, flyer, name card, email account, portfolio of previous works.

Methods:
Promoting through website, promoting through participating in the furniture exhibition, through word by mouth of previous clients,

Organization:
In small/medium size companies, often conducted by the boss with the assistance of other designer/carpenters.</td><td>Demands/requirements:
The clients requires the carpenter to be communicative (abundant communication skill), assertive, utilize various promotion and marketing media, knowledge in information technology. The carpenter need to be able to give design ideas to enrich the ideas from the client.</td></tr>
</table>

Table 6: **Detailed information about core working tasks of a wood furniture worker in Bandung Indonesia (Cont.)**

<table>
<tr><td>Core Working Task2</td><td>Title of the professional task
Designing</td><td>Duration :
Depending on the client
Workplace:
In the clients‘ place, finished in the workshop</td></tr>
<tr><td colspan="3">Description of the occupational field of the activity
Prior to designing phase, the designer needs to pay attention to what the clients demand for their customized furniture, helping them describe accurately what they want using sketches or illustration, providing the client with the previous products that the carpenters had already work on, and capture the idea of the client through sketches. Discuss projects with customers, and draw up detailed specifications. Discuss projects with customers, and draw up detailed specification.The design will be finalized in the workshop, by utilizing the computerized drawing or refined technical drawing.Finally draw up detailed specifications.</td></tr>
<tr><td colspan="3">Contents of work and learning</td></tr>
<tr><td>Objects:
Understanding requirements of the client, determining the materials and structure of the furniture.</td><td>Tools:
Pencil, pen and paper, computer.

Methods:
• Dialogue/discuss with client, guiding clients with words, understanding the implicit wishes.
• Interact with other carpenters to allocate work tasks and share ideas.
• Basic measuring.
• Design furniture, using computer-aided drawing programs.
• Draw up detailed specifications.

Organization:
in small companies, often conducted by the boss or the carpenter that had already have some experiences in designing the furniture.</td><td>Demands:
Discussion phase:
Communicative, sketching skills, technical knowledge, knowledge on materials and furniture trends.

Designing phase:
The clients demand that the carpenter can illustrate the design in quick sketch, therefore the sketching skills are needed. The technical knowledge of wood, computer aided drawing skill, knowledge on materials and furniture trends are also demanded.</td></tr>
</table>

Table 6: **Detailed information about core working tasks of a wood furniture worker in Bandung Indonesia (Cont.)**

<table>
<tr><td>Core Working Task3</td><td>Title of the professional task
Cost Calculation and Volume Estimation</td><td>Duration :

Workplace:
The furniture workshop/office</td></tr>
<tr><td colspan="3">Description of the occupational field of the activity
- To estimate the volume of materials necessary for the specific furniture construction the following steps are followed: listing necessary components, listing all the materials and their specifications; taking into considerations the size of materials, the size of the furniture.
- At the same time the prices of all materials from the supplier shall be updated, the survey of the prices need to be undertaken, multiplying the estimated volume of material and times that by the price. The costs are therefore taken into account while preparing the list of materials. Calculating the labor cost. The last step in cost calculation is add with the margin of profit. After some years of experience, the cost of furniture making can be roughly estimated by price per square meters of furniture.
- The carpenter also have to estimate the volume of materials needed to produce particular furniture. This result will be needed as an input for the next core task.
- Read job schedules to plan work tasks and co-ordinate with sub-trades or other parties.</td></tr>
<tr><td colspan="3">Contents of work and learning</td></tr>
<tr><td>Objects:
Estimate the amounts, types, and costs of needed materials.Estimate the amounts, types, and costs of needed materials</td><td>Tools:
Calculator, computer excel sheet, pen & paper

Methods:
• Read the technical drawing and interpret specifications,
• Estimate the amounts and types of materials
• Calculate costs of needed materials.

Organization:
Sometimes this is done by the experienced carpenter, with the input from the carpenter which has updated information on materials and the price.</td><td>Demands:
Need precision in estimating the volume of material and calculating the cost of material, and the cost of work labor.</td></tr>
</table>

Table 6: **Detailed information about core working tasks of a wood furniture worker in Bandung Indonesia (Cont.)**

Core Working Task4	**Title of the professional task** Purchasing the materials (*Pengadaandan Pembelian Barang*)	**Duration** : - **Workplace:** Distributor store
Description of the occupational field of the activity surveying the materials available in the market, comparing the price, updating new materials from brochures/distributors information, purchasing the materials.		
Contents of work and learning		
Objects:	**Tools:** No specific tool is needed. Need support of vehicle to carry the purchased materials. Need telephone to communicate. **Methods:** interact with suppliers to order materials or compare prices. **Organization:** This work is usually conducted by the owner accompanied by the carpenter. If the materials ordered regularly, the carpenter only order material to the workshop owner, and call the distributor to deliver the materials.	**Demands**: Efficient, precision in estimating and purchasing.

Table 6: **Detailed information about core working tasks of a wood furniture worker in Bandung Indonesia (Cont.)**

<table>
<tr><td>Core Working Task5</td><td>Title of the professional task
Furniture shaping/parts assembling
(Pembentukan dan perakitan oleh tukang kayu)</td><td>Duration:
Depending on how complicated is the design
Workplace:
Workshop which are equipped with the tools.</td></tr>
<tr><td colspan="3">Description of the occupational field of the activity
- Make decisions about assessing the efficient use of materials
- Produce and assemble components of articles of customized furniture, such as store fixtures, office equipment, cabinets, kitchen set, food-booth, tables, and chairs.
- Establish the specifications of articles to be constructed, and plan the methods and operations for shaping and assembling parts, based on blueprints, drawings, diagrams, or oral or written instructions.
- Interpret electrical, mechanical and other peripherals to co-ordinate work with other parties beside the carpenters.</td></tr>
<tr><td colspan="3">Contents of work and learning</td></tr>
<tr><td>Objects:</td><td>Tools:
- For dimensioning:
- For cutting: hand tools such as planes, chisels, or wood files.
- For assembling: glue, dowels, nails, screws, and/or clamps.

Methods:
- Measure and mark dimensions of parts on paper or lumber stock prior to cutting, following blueprints, to ensure a tight fit and quality product.
- Cut timber to the right size and shape and trim parts of joints to ensure a snug fit.
- Verify dimensions, and check the quality and fit of pieces in order to ensure adherence to specifications.
- Framing furniture shaping
- Attach parts and subassemblies together to form completed units, using glue, dowels, nails, screws, and/or clamps.
- Reinforce joints with nails or other fasteners to prepare articles for finishing
- Trim, sand, and scrape surfaces and joints to prepare articles for finishing.

Organization:</td><td>Demands:
Precision, accordance of the measurement to the blueprint drawing (design), accordance of the technical specification.
The is the need for simple mathematical/numerical understanding, Read and write, count, round off, add or subtract, multiply or divide whole numbers. For example, reading measuring tapes, ordering lumber, etc.
The final wood product required must not shrink, therefore it needs to be dry.</td></tr>
</table>

	- Carpenters work in pairs most of the time as this promotes efficiency and productivity. They also work with apprentices most of the time to direct and monitor their work. Occasionally, carpenters may work alone when the task at hand may be performed single-handedly. - Coordinate among the carpenters that are working on the same furniture order but different parts of furniture. - Co-ordinate work with other parties beside the carpenters, in terms of electrical or other materials beside wood.	

Table 6: **Detailed information about core working tasks of a wood furniture worker in Bandung Indonesia (Cont.)**

<table>
<tr><td>Core Working Task6</td><td>Title of the professional task
Finishing (Penyelesaian akhir)</td><td>Duration :
Workplace:
Performed in the workshop, with natural air ventilation, and natural lighting in the mid day.</td></tr>
<tr><td colspan="3">Description of the occupational field of the activity
- Sanding and scraping surfaces and joints to prepare articles for finishing
- Finishing of Wood Surface (There are two types of finishing, namely finishing of solid wood surface and finishing of laminating the wood surface by surfacing materials).
- Parts assembling
- Install hardware such as hinges, handles, catches, and drawer pulls, using hand tools.
- Final touch of finishing.</td></tr>
<tr><td colspan="3">Contents of work and learning</td></tr>
<tr><td>Objects:</td><td>1. Finishing of Wood Surface:
Tools:
Rags, Brushes , Rubbing Pads, Spray Guns and Equipment

Methods:
Dip, brush, or spray assembled articles with protective or decorative finishes such as varnish, paint, or lacquer.

Parts assembling
Install hardware such as hinges, handles, catches, and drawer pulls, using hand tools.

Final touch of finishing
Quality control while finishing

Organization:
The sanding, filling the pore of wood surface can be assisted by the assistant. The spray painting must be conducted by carpenters which have experience in spray paint finishing.</td><td>Demands:
Precision</td></tr>
<tr><td></td><td>2. Finishing of laminating wood material:
Tools:
Glue, cutter,

Methods:
- Cutting the laminating materials.
- Gluing the laminating materials to the wood surface.
- Apply masonite, formica, and vinyl</td><td>Demands:
Precision. The glue spread evenly so that the surfacing materials laminated the wood neatly. Pay attention to the details at the edge.</td></tr>
</table>

	surfacing materials. **Parts assembling** Install hardware such as hinges, handles, catches, and drawer pulls, using hand tools. **Final touch of finishing** Quality control while finishing **Organization:** The process must be conducted by carpenters which have experience in laminated finishing to assure the precision and the surface/edges are neat.	

The process of planning job schedules to plan work tasks and co-ordinate with sub-trades or other parties are not specifically mentioned in this result of EWW. This is mainly done by the owners of the furniture workshops. The carpenters mostly have to meet the certain time-frame to finish one specific furniture order in order to be paid by the owner. The sooner they finish, they will be paid. However, the longer time they need to finish, the later they will be paid, and the amounts of money paid will still the same.

The process of quality control was done in almost all core occupational tasks, but mostly in the finishing phase. The experts do not mentioned the quality control as a specific core occupational task. There are not yet written quality standard that has to be met. Mostly it depends on the client and the price of the furniture ordered. There are range of quality of products or materials and it affect the cost of the furniture.

The carpenter still need to do the final assembling while setting the customized furniture in the client's place. The final quality control was done in the client's place, incorporating the demand of the client.

4.1.3 Occupational Task Analysis – Work Process Analysis

The work process analysis was conducted in three wood furniture workshops. The WPA was conducted to verify the process that had been described in the EWW. The interview was conducted with the carpenters while they are performing their daily work in the workshop. Among the workshops visited are Punakawan workshop, Megah Jaya Workshop and Amrozy Meubel Workshop. The difference in work process analysis among the workshops sometimes due to the difference in the finishing materials, the tools that are used, and the working environment of the workshop.

4.1.3.1 Work Process Analysis In Punakawan Workshop

Company Description and Working Environment

Punakawan Workshop located in Jalan Gedebage Selatan no 171, Bandung. This is a small furniture workshop, which occupy the workshop area of approximately 30 square meters with naturally ventilated workshop terrace. The working process of core occupational tasks (marketing, designing, cost calculation/volume estimation, purchasing/procurement, producing furniture/assembling, finishing) are performed mainly in this workshop.

Clarification of Occupational Task as Described in the Expert Worker Workshop

Table 7: **Clarification of Occupational Task in Punakawan Workshop**

Occupational task 1: Marketing	
Item	**Description**
Workplace:	In the workshop and outside the workshop. In the client's place, exhibition, etc.
Business and Work Process:	Marketing was done by traditional way and modern way of marketing incorporating information technology. Marketing done through words by mouth, participating in the exhibition, distributing name cards to potential clients, updating company portfolios, or discuss projects with potential customers. Marketing process also done through online media, by updating company website, campaigning using social media, and communicating through email. Marketing was done by traditional way and modern way of marketing incorporating information technology. Marketing done through words by mouth, participating in the exhibition, distributing name cards to potential clients, updating company portfolios, or discuss projects with potential customers. Marketing process also done through online media, by updating company website, campaigning using social media, and communicating through email.
Objects of the work task:	Marketing, discussing with potential clients.
Tools, methods:	Company portfolios, through online media, company website, campaigning using social media, and communication through email.
Organization of work:	This work is performed by the owner of the workshop, and carpenter himself need to be able to promote the workshop to the client by doing their work well. Since the client(s) will also be the means of marketing if they are satisfied by promoting the product to the relatives/colleagues.
Demands made on skilled work & technology:	The clients requires the carpenter to be communicative (abundant communication skill), assertive, utilize various promotion and marketing media, knowledge in information technology. The carpenter need to be able to give design ideas to enrich the ideas from the client.

Table 7: **Clarification of Occupational Task in Punakawan Workshop (Cont.)**

Occupational task 2: Designing	
Item	**Description**
Workplace:	Usually the refined designing and drawing work takes place in the office/workshop. Using rough sketches as discussed with client, commonly that designing and drawing process is finished with the assistance of computer software.
Business and Work Process:	Prior to designing phase, the designer/carpenter/workshop owner have to discuss projects with customers. The designer needs to pay attention to what the clients demand for their customized furniture, helping them describe accurately what they want using sketches or illustration, providing the client with the previous products that the carpenters had already work on, and capture the idea of the client through sketches. Browsing the ideas through literatures, magazines, flyer, brochure, and online literatures also become part of this process. Visit the client's place to measure (if it is a built-in kitchenette or cabinet). The design will be finalized in the workshop, by utilizing the computerized drawing or refined technical drawing. Finally draw up detailed specifications.
Objects of the work task:	This is done as the service to the customer. The workshop do not charge the fee for the design process.
Tools, methods:	Paper, sketching pencil, pen, computer aided drawing.
Organization of work:	Performed individually by the carpenter who has the duty to design and had discussed with the client. Interact with owner to discuss new ideas and potential changes.
Demands made on skilled work & technology:	The clients requires design that up-to-date with the trend, meet their needs and reasonable/affordable price.

Table 7: **Clarification of Occupational Task in Punakawan Workshop (Cont.)**

Occupational task 3: Cost Calculation and Volume Estimation	
Item	**Description**
Workplace:	The office or in the workshop.
Business and Work Process:	To estimate the volume of materials necessary for the specific furniture construction the following steps are followed: listing necessary components, listing all the materials and their specifications; taking into considerations the size of materials, the size of the furniture. At the same time the prices of all materials from the supplier shall be updated, the survey of the prices need to be undertaken, multiplying the estimated volume of material and times that by the price. The costs are therefore taken into account while preparing the list of materials. Calculating the labor cost. The last step in cost calculation is add with the margin of profit. After some years of experience, the cost of furniture making can be roughly estimated by price per square meters of furniture. The carpenter also have to estimate the volume of materials needed to produce particular furniture. This result will be needed as an input for the next core task. The task also requires the calculation of time and making job schedule. Read job schedules to plan work tasks and co-ordinate with sub-trades or other parties.
Objects of the work task:	The worksheet, bill of quantity, cost calculation.
Tools, methods:	Calculator, excel worksheet, pen, paper, schedule, flyer/brochure of materials, price-list of materials from distributors. After the drawing specification is set, the material needed are listed including the calculation of the volume. The price of materials among different distributors shall be compared.
Organization of work:	This is done by the experienced carpenter or the owner of the workshop, with the input from the carpenter which has updated information on materials and the price.
Demands made on skilled work & technology:	Need precision in estimating the volume of material and calculating the cost of material, and the cost of work labor. The client sometimes bargaining regarding to the cost, they may discuss to lower the price by utilizing lower quality of materials with lower price. The carpenter need to give the input to the clients regarding to the best material or the optimal quality finishing material with the optimum price agreed by the customer.

Table 7: **Clarification of Occupational Task in Punakawan Workshop (Cont.)**

Occupational task 4: Purchasing the materials	
Item	**Description**
Workplace:	The distributor's shop.
Business and Work Process:	surveying the materials available in the market, comparing the price, updating new materials from brochures/distributors information, purchasing the materials.
Objects of the work task:	Materials available in the workshop, materials to be purchase in the market.
Tools, methods:	**Tools:** No specific tool is needed. Need support of vehicle to carry the purchased materials. Need telephone to communicate. **Methods:** interact with suppliers to order materials or compare prices.
Organization of work:	**Organization:** This work is usually conducted by the owner accompanied by the carpenter. If the materials ordered regularly, the carpenter only order material to the workshop owner, and call the distributor to deliver the materials.
Demands made on skilled work & technology:	The volume of materials to be purchased are adequate, similar to the volume estimated in the previous process, leaving less left over after the overall furniture making.

Table 7: **Clarification of Occupational Task in Punakawan Workshop (Cont.)**

Occupational task 5: Furniture shaping/parts assembling	
Item	**Description**
Workplace:	The distributor's shop.
Business and Work Process:	Interpret blueprints or furniture drawing, with a certain degree of accuracy, to verify measurements, determine the integrity of the plans and report mistakes or omissions.
Objects of the work task:	Furniture product
Tools, methods:	Sometimes the frame of the furniture is not entirely made of wood (for food-booth, the frame material is from hollow steel or aluminum). The carpenters sometimes continue the work of other workers.
Organization of work:	interact with other carpenters Interact with apprentices to provide direction and monitor their work.
Demands made on skilled work & technology:	Precision and adherence to the specification details.

Table 7: **Clarification of Occupational Task in Punakawan Workshop (Cont.)**

Occupational task 6: Finishing	
Item	**Description**
Workplace:	The workshop
Business and Work Process:	Laminating the finished wood surface Detailing of edges Installing the furniture peripherals Quality control while finishing Setting the finished furniture in the client's place. Final quality inspection while finishing
Objects of the work task:	Finished product
Tools, methods:	**Tools:** Glue, cutter, **Methods:** Cutting the laminating materials. Gluing the laminating materials to the wood surface. Apply masonite, formica, and vinyl surfacing materials. **Parts assembling** Install hardware such as hinges, handles, catches, and drawer pulls, using hand tools. **Final touch of finishing**
Organization of work:	Skilled worker is leading in assembling the material and finishing the overall furniture. Semi-skilled worker can be in charge of particular finishing matters under supervision of skilled worker.
Demands made on skilled work & technology:	Precision. The glue spread evenly so that the surfacing materials laminated the wood neatly. Pay attention to the details at the edge.

Below are some of the illustrations of working process during the work process analysis in the workshop.


The materials and finishing materials





The working process















The tools utilized in the process:

Tools used:

For cabinet-making and assembling: Glue, dowels, nails, screws, and/or clamps, welding machine

For finishing wood surface: Sanding paper, sanding machines,

For painting: Compressor



The examples of products from this wood-furniture workshop

4.1.3.2 Work Process Analysis At Megah Jaya Workshop

Company Description and Working Environment

Megah Jaya Workshop located in Jl. Cisirung 67, Muhammad Toha, Bandung Jawa Barat. This is a small furniture workshop, which occupy the workshop area of approximately 30 square meters with naturally ventilated workshop terrace. The working process of core occupational tasks (marketing, designing, cost calculation/volume estimation, purchasing/procurement, producing furniture/assembling, finishing) are performed mainly in this workshop.

Below are some of the illustration of working environment and working process during the work process analysis in the workshop.


The working environment



The materials and finishing materials






The working procedures



The tools

Clarification of Occupational Task as Described in the Expert Worker Workshop

Table 8: **Clarification of Occupational Task at Megah Jaya Workshop**

Occupational task 1: Marketing	
Item	**Description**
Workplace:	In the workshop and outside the workshop. In the client's place, exhibition, etc.
Business and Work Process:	Marketing was done by traditional way and modern way of marketing incorporating printed flyers, ads in the local newspaper, and ads in the local promotion brochures, and website. Marketing done through words by mouth, participating in the exhibition, distributing name cards to potential clients, updating company portfolios, advertising through yellow pages website. Marketing process also done through online media, by updating company website and communicating through email or telephone.
Objects of the work task:	Marketing service, discussing with potential clients.
Tools, methods:	Company portfolios, through online media, company website, campaigning using social media, and communication through email. www.meubelmodern.com http://panpages.co.id/listings/id336201-megah-jayahttp://www.yellowpages.co.id/directory/megah-jaya-46
Organization of work:	This work is performed by the owner of the workshop to promote the workshop to the client by doing their work well. Since the client(s) will also be the means of marketing if they are satisfied by promoting the product to the relatives/colleagues.
Demands made on skilled work & technology:	The clients attracted by the interesting ads in the flyer, local advertising pages. This requires the marketing process by utilizing various promotion and marketing media, knowledge in information technology. The carpenter need to be able to give design ideas to enrich the ideas from the client.

Table 8: **Clarification of Occupational Task at Megah Jaya Workshop (Cont.)**

Occupational task 2: Designing	
Item	**Description**
Workplace:	Usually the refined designing and drawing work takes place in the office/workshop. Using rough sketches as discussed with client, commonly that designing and drawing process is finished with the assistance of computer software.
Business and Work Process:	Prior to designing phase, the designer/carpenter/workshop owner have to discuss projects with customers. The designer needs to pay attention to what the clients demand for their customized furniture, helping them describe accurately what they want using sketches or illustration, providing the client with the previous products that the carpenters had already work on, and capture the idea of the client through sketches. Browsing the ideas through literatures, magazines, flyer, brochure, and online literatures also become part of this process. Visit the client's place to measure (if it is a built-in kitchenette or cabinet). The design will be finalized in the workshop, by utilizing the computerized drawing or refined technical drawing. Finally draw up detailed specifications.
Objects of the work task:	This is done as the service to the customer. The workshop do not charge the fee for the design process.
Tools, methods:	computer aided drawing, illustration with 3-d modeling and Photoshop touch up.
Organization of work:	Performed by the designer who has the duty to design and had discussed with the client. Interact with owner to discuss new ideas and potential changes.
Demands made on skilled work & technology:	The clients requires design that up-to-date with the trend, meet their needs and reasonable/affordable price.

Table 8: **Clarification of Occupational Task at Megah Jaya Workshop (Cont.)**

Occupational task 3: Cost Calculation and Volume Estimation	
Item	**Description**
Workplace:	The office of marketing and display workshop
Business and Work Process:	To estimate the volume of materials necessary for the specific furniture construction the following steps are followed: listing necessary components, listing all the materials and their specifications; taking into considerations the size of materials, the size of the furniture. At the same time the prices of all materials from the supplier shall be updated, the survey of the prices needs to be undertaken, multiplying the estimated volume of material and times that by the price. The costs are therefore taken into account while preparing the list of materials. Calculating the labor cost. The last step in cost calculation is add with the margin of profit. After some years of experience, the cost of furniture making can be roughly estimated by price per square meters of furniture. The carpenters also have to estimate the volume of materials needed to produce particular furniture. This result will be needed as an input for the next core task. The task also requires the calculation of time and making job schedule. Read job schedules to plan work tasks and co-ordinate with sub-trades or other parties.
Objects of the work task:	Calculation and estimation
Tools, methods:	Calculator, excel worksheet, pen, paper, schedule, flyer/brochure of materials, price-list of materials from distributors. After the drawing specification is set, the materials needed are listed including the calculation of the volume. The price of materials among different distributors shall be compared.
Organization of work:	This is done by the experienced carpenter or the owner of the workshop, with the input from the carpenter which has updated information on materials and the price.
Demands made on skilled work & technology:	Need precision in estimating the volume of material and calculating the cost of material, and the cost of work labor. The carpenter need to give the input to the clients regarding to the the optimal quality finishing material with the optimum price, agreed by the customer.

Table 8: **Clarification of Occupational Task at Megah Jaya Workshop (Cont.)**

Occupational task 4: Purchasing the materials	
Item	**Description**
Workplace:	Materials available in the workshop, materials to be purchase in the market.
Business and Work Process:	Purchasing the materials by directly go to the market. Some regular material purchasing can be done through telephone and being delivered by the suppliers.
Objects of the work task:	**Organization:** This work is usually conducted by the owner accompanied by the carpenter. If the materials ordered regularly, the carpenter only order material to the workshop owner, and call the distributor to deliver the materials.
Tools, methods:	**Tools:** No specific tool is needed. Need support of vehicle to carry the purchased materials. Need telephone to communicate. **Methods:** interact with suppliers to order materials or compare prices.
Organization of work:	Materials available in the workshop, materials to be purchase in the market.
Demands made on skilled work & technology:	The volume of materials to be purchased are adequate, similar to the volume estimated in the previous process, leaving less left over after the overall furniture making.

Table 8: **Clarification of Occupational Task at Megah Jaya Workshop (Cont.)**

Occupational task 5: Furniture shaping/parts assembling	
Item	**Description**
Workplace:	The distributor's shop.
Business and Work Process:	Interpret blueprints or furniture drawing, with a certain degree of accuracy, to verify measurements, determine the integrity of the plans and report mistakes or omissions.
Objects of the work task:	Furniture product
Tools, methods:	Sometimes the frame of the furniture is not entirely made of wood (for food-booth, the frame material is from hollow steel or aluminum). The carpenters sometimes continue the work of other workers.
Organization of work:	interact with other carpenters interact with apprentices to provide direction and monitor their work.
Demands made on skilled work & technology:	Precision and adherence to the specification details.

Table 8: **Clarification of Occupational Task at Megah Jaya Workshop (Cont.)**

Occupational task 6: Finishing	
Item	**Description**
Workplace:	The workshop
Business and Work Process:	Laminating the finished wood surface Detailing of edges Installing the furniture peripherals Quality control while finishing Setting the finished furniture in the client's place. Final quality inspection while finishing
Objects of the work task:	Finished product
Tools, methods:	**Tools:** Glue, cutter, **Methods:** Cutting the laminating materials. Gluing the laminating materials to the wood surface. Apply masonite, formica, and vinyl surfacing materials. **Parts assembling** Install hardware such as hinges, handles, catches, and drawer pulls, using hand tools. **Final touch of finishing**
Organization of work:	The process must be conducted by carpenters which have experience in laminated finishing to assure the precision and the surface/edges are neat.
Demands made on skilled work & technology:	Precision. The glue spread evenly so that the surfacing materials laminated the wood neatly. Pay attention to the details at the edge.

4.1.3.3 Work Process Analysis At Amrozy Meubel Workshop

Company Description and Working Environment

Amrozy Meubel Workshop is located in Jalan Gedebage Selatan Number 16, in the eastern side of Bandung. The workshop is located in the second floor, while the first floor is used as showcase or exhibition space. The showcase is filled with the unfinished teakwood furniture, ordered from Jepara Central Java. The finishing process is done in the workshop at the second floor.

The working environment

The raw products

The tools

	
The methods of work	

Clarification of Occupational Task as Described in the Expert Worker Workshop

Below are the clarification of each of the core occupational task that was carried out in the workshop.

Table 9: **Clarification of Occupational Task at Amrozy Meubel Workshop**

Occupational task 1: Marketing	
Item	**Description**
Workplace:	The process do not take place in this workshop. The marketing process is carried out in the office in the first floor, which have the same floor as the display store. The display store is also becoming a marketing tool, since people will take a look at the displayed products before deciding to order or purchase the furniture. The display and office area is approximately 12x9 meter.
Business and Work Process:	Marketing was done by traditional way of marketing. Marketing done through words by mouth, participating in the exhibition, distributing name cards to potential clients, and promoting in various social gathering group. The potential client can purchase in cash to the workshop, but sell it in credits to other clients through social gathering group (*arisan*).
Objects of the work task:	Marketing the furniture and customer services
Tools, methods:	exhibition, distributing name cards to potential clients, and promoting in various social gathering group
Organization of work:	The marketing work was conducted by the owner of the workshop. It can be assisted by other parties that market the products in the household level in the community gathering.
Demands made on skilled work & technology:	The clients sometimes do not come directly to the workshop, they can get the information from the flyer/brochure of the workshop. Therefore the clients demand the informative pictures in the brochures. More individual approaches of marketing is needed as well.

Table 9: **Clarification of Occupational Task at Amrozy Meubel Workshop (Cont.)**

Occupational task 2: Designing	
Item	**Description**
Workplace:	The refined designing and drawing work takes place in the workshop in Jepara, Central Java. The workshop in Central Java have the coordination with the workshop in Bandung. The workshop in Bandung only purchased the furniture that had been designed and produced half finished.
Business and Work Process:	The process do not take place in this workshop.
Objects of the work task:	The process do not take place in this workshop.
Tools, methods:	The process do not take place in this workshop.
Organization of work:	The process was conducted by carpenters in Jepara workshop. The carpenter in Bandung do not involve in this activity.
Demands made on skilled work & technology:	Different type of clients have different type of demand. The quality-oriented client will demand the very good quality of wood, good finishing detail of wood carving (*pahatan)*, and good quality of finishing. This type of clients willing to pay the expensive teak/mahogany furniture. While there are other type of customer which require mahogany furniture with slightly less expensive, with more modern or simple style of wood carving (*pahatan*).

Table 9: **Clarification of Occupational Task at Amrozy Meubel Workshop (Cont.)**

Occupational task 3: Cost Calculation and Volume Estimation	
Item	**Description**
Workplace:	In the office.
Business and Work Process:	Calculate the price of raw furniture, shipping cost, labor cost, and finishing material cost. The person also need to estimate the amount of time needed to finish a certain type of furniture, since it have the direct relation with the labor cost. Adding that amount of money by the margin of benefit will determine the price of the finished furniture. The person need to be able to estimate the volume of finished materials needed.
Objects of the work task:	The calculation of cost and the estimation of material volume
Tools, methods:	Calculator, excel sheet, pen/paper.
Organization of work:	This process can be performed individually.
Demands made on skilled work & technology:	Precision in estimating the bill of quantity (volume) and estimating the cost for purchasing materials. The labor cost to make the furniture must also estimated. In this stage, estimator (in this case workshop owner) should be able to estimate the margin of profit that the workshop should make, in order to sustainably run the workshop.

Table 9: **Clarification of Occupational Task at Amrozy Meubel Workshop (Cont.)**

Occupational task 4: Purchasing the materials	
Item	**Description**
Workplace:	Purchasing the raw half finshed furniture from Jepara, Central Java. Purchasing the finishing materials (paints, finishing tools, etc in Bandung, West Java) The distributor's shop.
Business and Work Process:	**Business Process:** The workshop in Bandung only purchased the furniture that had been designed and produced half finished from Jepara, Central Java. The purchased furniture are still raw and not finished. The furniture were sent in not-assembled condition (parts by parts). The purchasing process need to be organized together with the sellers/distributors from Jepara, Central Java.
Objects of the work task:	Actions of comparing the price, purchasing the raw furniture and finishing materials, arranging the delivery services.
Tools, methods:	Telephone, survey, shipping/delivery services.
Organization of work:	The work can be done individually by the owner of the workshop which have knowledge on the raw furniture product, have knowledge on market trend/demand, and have connection with the suppliers in Jepara.
Demands made on skilled work & technology:	The company required that the price of raw-furnitures is compared among distributors. The quality of materials should be good. The shipping cost and delivery service is assuring that the furniture will not crack or damage during the transportation process.

Table 9: Clarification of Occupational Task at Amrozy Meubel Workshop (Cont.)

Occupational task 5: Furniture shaping/parts assembling	
Item	**Description**
Workplace:	The part assembling is done in the workshop, after the furniture is received from the purchasing process. The furniture assembled and placed in the showroom. The final parts assembling and tuning is done in the client's place.
Business and Work Process:	Assembling the parts of furniture that were un-assembled during the shipping process. Assembling the furniture in the workshop, and display for marketing purpose. Arranging the furniture for the next process.
Objects of the work task:	The parts of furniture those were un-assembled during the shipping process. The furniture (cabinet, chair, table, bed) was made entirely of solid wood of teak or mahogany.
Tools, methods:	After finishing all the parts, usually the next step is displaying the furniture in the display room or in the storage. The part assembling is done in the workshop, after the furniture is received from the purchasing process. The furniture assembled and placed in the showroom for attracting the potential clients. After the furniture had been ordered by the clients, the finishing of wood surface can be carried out in the workshop.
Organization of work:	The work can be performed individually.
Demands made on skilled work	The parts of furniture must be assembled precisely and resulting in a sturdy and compact furniture.

Table 9: **Clarification of Occupational Task at Amrozy Meubel Workshop (Cont.)**

Occupational task 6: Finishing	
Item	**Description**
Workplace:	In the workshop, located in the terrace of the workshop with natural air ventilation, so that the spraying process can be done.
Business and Work Process:	Wood-pore filling, surface sanding, stain removing, spraying paint, varnish (top-coating the surface for protecting the wood surface)
Objects of the work task:	What will be worked in the process is the parts of furniture/panels that had been dis-assembled.
Tools, methods:	Tools: Stain remover, pore filler, sanding paper, sanding machine, compressor, spraying gun. Methods: In order to carry out this process, the furniture should be dismantled again into parts/pieces of furniture. Surface treatment was done by sanding the wood surface. Filling the pore of wood surface, and re-sanding. After surface treatment the painters paint the first layer of paint and wait for air drying. Quality inspection is carried out to check the products meeting the quality standards can be directly proceed to the next level of spraying. The products that do not meet the quality standards shall be sent to reprocessing, appropriate treatments shall be carried out, until they meet the quality standards. After the painting process, the re-assembling process was conducted in the display room, and ready to be delivered to the client. The final parts assembling and tuning is done in the client's place, to make the quality assurance of the products.
Organization of work:	The work is performed by the expert painter with the assistance of the assistant. The painter work on the spraying and quality assurance of the result, while the assistance work on the preparation before the spraying process.
Demands made on skilled work & technology:	The company and the clients' demands that must be met concerning the accomplishment of the task are that the finished product is neat and in good quality. No pore of the wood surface, no crack between the wood plank that consisting the panel of the furniture. The spread of paint must be equal, the varnished surface is shiny or dove (depending on the finished painting).

4.1.4 Summary And Remarks

4.1.4.1 Remarks On Occupational Sector Analysis

The data is nationwide. Lack of data on provincial level or municipal level. The data is difficult to obtained, since not properly recorded by the municipal level. Especially the small scale industry do not registered their companies, so that the aggregated data in municipal/city/provincial level is difficult to obtain.

4.1.4.2 Remarks On Experts' Expertise

Experts that were invited in our EWW mostly gained their expertise through apprenticeship process which did not involve formal vocational trainings. This case is mostly occur in the small scale business industry in cabinet-making, as well as in other wood construction sector. If the experts were coming from the big scale industries, likely the expertise of the experts came from formal vocational training.

Learning is done as part of regular work activity or from co-workers working the in the projects. This is done through reading or other forms of self-study at work, on worker's own time, using materials available through work.

If the expert carpenters are assigned to train the apprentice in a certain work, there is no record or evaluation reports on apprentices who have been assigned to them on the job.

There is no stated regulations and standards to comply with national, provincial and municipal regulations.

The carpenters in this small scale industry usually not a formal worker, they work based on the order.

There is no working union among the informal workers. There is no monthly industry trade magazines to acquire information on technological advancements such as new construction materials and methods, computerized plan design and energy efficiency.

The construction industry is experiencing rapid changes due to technological advancements and a changing regulatory framework. The furniture industry also experiencing the growth and development of trend/styles. Carpenters must incorporate new skills and knowledge of designing, constructing, assembling, new materials and placing a new emphasis on continuous learning.

4.1.4.3 Remarks On Working Condition In Work Process Analysis

- There is lack of proper working place condition. The workshop of home-based small scale furniture industry is located in a temporary building or in the terrace part of office building. The lighting usually depend on natural daylight and natural ventilation.
- Lack of attention to Occupational Health and Safety Regulations as needed to create safe work practices.

- They do not exactly pay attention and read material safety data sheets (MSDS) carefully to identify the chemical composition of materials, how to use them safely and emergency first-aid procedures.
- There is concern on energy efficiency, mostly regarding to electricity efficiency.
- The carpenters/workers do not use time cards to record work hours and times for payroll. The notes is still done manually, or recorded by the owners.
- It is essential to maintain a job diary to record job information and the relevant details of their day's work such as problems encountered and resolved, hours of work, etc, so that the work can be recorded.
- There are no written reports for informal meetings or project completion, only a record using the photograph of finished furniture.

4.1.4.4 Remarks On Methodological Reflection And Suggestion

The expert worker workshop in this research, despite its fruitful results, has a substantial shortage, namely the workers invited are from the several company.

- Difficulties in implementing the methods.
- Methodological drawbacks in the context of implementing these methods in Indonesia
- Potential adjustment to suit the context of Indonesia

In the case of small (home-based) furniture industry in Bandung Indonesia, the skilled workers are mostly gaining their experience from experience not formal vocational education. Some difficulties in implementing the methods occurred. With some modifications in the research methodologies, the methods can be applied in Indonesia, to suit the real condition in the field. For the curriculum development based on the occupational competence needs analysis, the involvement from the formal industry (big-medium companies are needed). Since that formal industry possess the experts, educated, experienced in doing their occupational tasks. They perform the work more systematically compared to the small industry or home-based industry. The industry also provide with adequate infrastructures, tools to support the work process. P9 research mainly focused on the application of the method to analyze specific job analysis process. Further recommendation to follow up this P9 research is to develop the curriculum based on these P9 methods. Implementing the P9 methods for as an approach to develop a curriculum seems to be a comprehensive task by involving all business scales. It is also need to be conducted in various location in Indonesia (not only Java as center of development), to have a representation of all condition in Indonesia.

4.2 Description Of IBB Experience*

Research on Occupational Competence Needs Analysis
In the sector of wood furniture construction
Country report of China in the framework of RCP P9

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4.2.1 Introduction

This paper is the result of a research on the occupational profile and task of wood furniture workers in China; the researches carried out in the framework of RCP research project 9 led by UPI Indonesia.

The paper consists of five parts:

1) This introduction, which offers an overview and structure of the research;
2) Occupational sector analysis, which summarizes some basic facts and development trends of the (wood) furniture industry in China; it serves as a background of the entire research and helps the reader understand the paper;
3) Occupational profile analysis, which is result of an expert worker workshop and outlines the most important working tasks of a wood furniture worker; it also serves as the basis for the next part of research;
4) Occupational task analysis, which analyzes and describes the business and work process as well as some other major characteristics of the working tasks outlined above; it gives the reader a detailed description about the actual working processes of a wood furniture worker and their basic requirements etc.;
5) Methodological reflection and suggestion, which is a summary of the lessons learned in the research process; some flaws and possible shortages of this research project are reflected; suggestion is given concerning potential future relevant research.

4.2.2 Occupational Sector Analysis

The most recent nationwide sector report on (wood) furniture business in China is not available. The occupational sector analysis here is mainly based on the following two documents:

- The Furniture Industry Analysis Report2011 done by China National Furniture Association;
- Wood furniture Industry Analysis Research Report done by South China Investment Management Co. Ltd. in 2009.

a) General information about wood furniture industry

The Chinese furniture industry has experienced rapid development in the past20 years. From 1988 to2007Chinesefurniture industry output has grown for 130 times, furniture exports grew by294times, reaching an annual increase of 34.9%.

In 2007 the industry output value was nearly 540 billion Yuan, accounting for 25% of the global furniture industry; the export was 22.62 billion U.S. dollars, accounting for 22.6% of the global furniture trade. In 2009 the industry output value reached nearly730 billion Yuan. As for wood furniture industry, in 2007 the Chinese wood furniture companies achieved total industrial output value of about120 billion Yuan, an increase of 19.79% over last year; sales production rate was 95.17%.

In 2007 the total number of exported wood furniture reached over190 million, representing an increase of about 10.61% compared to the previous year; it reached a total value of 6.64 billion U.S. dollars, reaching an increase ofabout15.52%compared to the previous year.

Not only the turnover is huge, it is heavily dependent on the export, which is consistent with the national economy generally.

However, with the Chinese people's income constantly increasing, the expansion of housing construction are accelerating, as well as construction area of the hotel and office buildings expanding, the domestic demand has great growth potential.

Although the overall amount of production has steadily increased over a relatively long time, due to the increasing competition worldwide, the profit rate of the Chinese wood furniture companies has decreased over years.

China's furniture industry has a relatively low concentration of production: China's largest10plantstotalturnover accounts foronly3% of the entire industry turnover.

The Chinese furniture industry as a whole is still facing some fundamental problems. Many furniture companies in China suffer from a lack of rigorous production process and process specifications; there's also lack of rigorous production management, production process is not reasonably and scientifically regulated; the vast majority of the factory does not implement information management such as MRP, ERP, etc., the labor productivity is relatively low; processing equipment mostly mechanized or semi-mechanized, has a low degree of automation, and there's a lack of adequate control and inspection means.

b) Key developmental trends and their influences on the workers

Despite the rather low degree of automation and quality standard compared to developed countries, the wood furniture industry is experiencing some developments and changes. Here we outline only the most important ones as follows:

- The consumption cycle is steadily reducing, and more attention of the consumers has been switched from price to the furniture's cultural meaning and aesthetics.
- Furniture customization and personalization services are becoming more popular.
- There's been a steady increase concerning the environmental aspects of the furniture.
- Intellectual CapitaLand knowledge management is gaining importance for the Chinese furniture companies.
- Production base tends to move to inland China for cheaper labor and raw materials.
- Branding and production operations phases tend to be separated from each other.

Due to the changes above, the requirements this industry poses on its ordinary workers are also changing correspondingly. The wood furniture manufacturing used to be technique/manual skill-intensive and requires high level of craftsmanship; however with machines took over most of the work, the requirements posed on the skills of the workers actually become lower. Thus there's no need to train the majority of the wood workers for three years.

c) Additional information to the sector (concerning the training program in the sector)

The current Chinese Secondary Vocational School Discipline Directory, containing all the majors that can be learnt in the Chinese secondary vocational schools, does not have a specialized major for wood construction. On the other hand, in the Chinese Dictionary of Occupations, the wood construction worker exists as an occupation.

Based on the information provided by Shanghai Education Committee, although the vocational schools in Shanghai used to have degree program for wood workers in the 1980s; most schools no longer train wood workers in the degree programs. The majority of training in the sector is offered by short-term training programs in various training organizations or on the job. Nationwide there are some vocational school specializing in training wood workers in the degree program, but these programs are not available at the moment.

Because the information on short-term training program and on-the-job training in a city scale is not available, it is difficult to estimate the overall number of workers in the city/country. However it is estimated by some workers and wood furniture sellers that the number of workers in wood construction is high (in terms of at least thousands).

The workers we observed and interviewed in this research are mainly trained on their current job position. According to the information they provide, most workers do not possess the knowledge and skills to draw the blueprints accurately (see later sections for more details).This corresponds with the phenomena mentioned above: the requirements on workers in wood furniture business have become lower. The on-the-job training just provides the workers with basic skills to operate the machines.

4.2.3 Occupational Profile Analysis (Through "Expert Workers Workshops")

Methodological explanations:

Before presenting the results of occupational profile analysis, it is necessary to give a brief introduction to the methodological approaches applied by our team in this investigation. On the one hand this could make the research approach more transparent and therefore more comparable with other researches under the same framework, on the other hand it also shows the reasons for the possible advantages and shortages of this research.

a) Getting in touch with expert workers

It has been very difficult finding the expert workers in wood furniture industry. First attempts were unsuccessful. We have tried to get in touch with factories/bosses of some small workshops through the furniture shops near university. However, because the owner of the shop does not know us very well

(despite the fact that I have bought furniture of over 1000 Yuan at the shop), she could not offer me very strong support.

The bosses we contacted via telephone basically refuse to cooperate, because their business can potentially be illegal and they fear that we might be investigators from government agencies checking business order and claiming to be university researchers.

The break came as I contacted a house keeper of a teacher dormitory where I used to live. This house keeper happens to know the owner of a wood furniture factory which produces furniture for the university.

After communicating briefly through the house keeper, the owner of the factory agrees that we can visit the factory and interview the workers.

b) Organization of the workshop

Due to the tight working schedule of the workers, we cannot have a one-day workshop. Instead, we needed to develop a method which works more efficiently while not jeopardizing the quality of the products too much.

We firstly investigate the relevant papers documents on wood furniture workers' competence standards and work procedure, in order to gain a basic understanding of the wood furniture workers.

An interview was then held with the most experienced worker in the factory, who is also the technical supervisor of several other workers. During the interview a preliminary list of most important tasks for wood furniture workers was developed.

Shortly after the first interview (a few days), a workshop was organized where we invited five workers from the same factory to attend. In this workshop, the workers first discuss the preliminary list developed in the last interview and further improved it. Then the workers explain to us again all the tasks outlined in the list: the sequence of the producing a wood furniture, the meaning and purpose of each step of work, the difficulties and complexity of certain task, as well as the organization form they required etc. Additional information is also obtained through this workshop, such as the skill and knowledge required to accomplish certain task, the location where the task is fulfilled, specific tools necessary, and so on. Thus, much of the information needed for the next work step-work process analysis has been directly obtained here.

c) Professional background of the researchers and workers

The Professional backgrounds of the researchers as well as the workers have substantial influence on the investigation process and results.

As researchers, we have a team of three members, consisting of one university teacher in the field of vocational education, two bachelor students studying civil engineering (qualifying for a vocational school teacher) in their third year.

Among the five workers invited to the workshop, 1 worker has a work experience of less than 3 years, 2 workers have worked as wood furniture worker for 10 years, 1 has more than 20 years' work experience, and 1 has more than 30 years of work experiences as wood furniture worker.

Results from Expert Workers Workshops

According to our expert workers workshop, the core working tasks of a wood furniture worker in China are as follows:

1. **Finding out and understanding the requirements of the client**
2. **Drawing and revising blueprint**
3. **Making a list of materials to be processed**
4. **Purchasing the materials**
5. **Cutting the wood planks/boards, making all the components and units**
6. **Edge sealing**
7. **Assembling**
8. **Painting, surface treatment**
9. **Quality control**

Their detailed information is available as follows:

Table 10: **Structure of a learning field of an education and training plan**

<table>
<tr><td>Learning area 1</td><td>Title of the professional task
Finding out and understanding the requirements of the client</td><td>Duration :
Depending on the type of tasks; ranging from 1 hour to 2 days.
Workplace:
by client</td></tr>
<tr><td colspan="3">Description of the occupational field of the activity
Paying attention to what the clients talk about their requirements, helping them describe accurately what they want; understanding their expectations and demands concerning the products</td></tr>
<tr><td colspan="3">Contents of work and learning</td></tr>
<tr><td>Objects:
Understanding requirements of the client, determining the materials and structure of the furniture.</td><td>Tools:
Pen and paper.

Methods:
Dialogue with client, guiding clients with words, understanding the implicit wishes, basic measuring

Organization:
In large companies, normally conducted together by personnel from business department and design department; in small companies, of tern conducted by the boss with the assistance of a technician.</td><td>Demands:
The clients expect the workers to be communicative and professional. Bad impression of the workers can be harmful for the business.
Accurate and professional understanding of the wishes and demands of the client is crucial to the success of entire project.</td></tr>
</table>

Table 10: **Structure of a learning field of an education and training plan (Cont.)**

Learning area 2	**Title of the professional task** Drawing and revising blueprint	**Duration:** depending on the workload Workplace: office, increasingly with the assistance of computer Classroom:
Description of the occupational field of the activity Drawing construction documentations, including rendering. The blueprint is not to be shown to the client.		
Contents of work and learning		
Objects: Drawing construction documentation which offers the overall solution for furniture construction.	**Tools:** Pen, paper, T-square, triangle ruler, protractor, ruler template, scale, computer **Methods:** Workers draw the graphics and communicate constantly, then checked and revised by group leader. **Organization:** Work is normally divided to several workers.	**Demands:** The blueprint shall be professionally correct with all the necessary information for construction is included.

Table 10: **Structure of a learning field of an education and training plan (Cont.)**

Learning area 3	**Title of the professional task** Making a list of materials to be processed	**Duration** : rather fast after the blueprint is made Workplace: office in factory
Description of the occupational field of the activity Marking names and arranging numbers to the components, listing all the materials and their specifications, taking into account the wastes, distinguishing net materials and wastes, taking into considerations of leftover bits and pieces.		
Contents of work and learning		
Objects: Lay the foundation for preparing the materials for construction.	**Tools:** Paper, calculator **Methods:** Taking into account the net size and losses of the materials according to the blueprint. **Organization:** The workers who draw the documents shall also finish this task.	**Demands:** The employer expects the workers carrying out this task to be calculating. The combination of an economic way of thinking and the familiarity with the profession is regarded as optimal.

Table 10: **Structure of a learning field of an education and training plan (Cont.)**

Learning area 4	**Title of the professional task** Purchasing the materials	**Duration** : Workplace: Building materials market
Description of the occupational field of the activity purchasing the materials on the given list		
Contents of work and learning		
Objects : Getting ready for the actual construction and manufacturing	**Tools**: money **Methods:** Locally or via telephone/internet **Organization:** Normally done by shopping team, not by construction workers	**Demands:** Similar to the last step, the workers shall possess both an economic way of thinking and professional know-how.

Table 10: **Structure of a learning field of an education and training plan (Cont.)**

Learning area 5	**Title of the professional task** Cutting the wood planks/boards, making all the components and units	**Duration:** depending on the workload Workplace: workshop
Description of the occupational field of the activity Making all the components and units of the furniture by cutting the standard planks		
Contents of work and learning		
Objects: Producing all the components of the furniture, preparing for the assembling	**Tools:** Guided saws, tape measure, shaped and painted line tools, sand paper machine, sealing machine, drill machine **Methods:** operating the corresponding machines **Organization:** workers can work independently while the amount of work is limited, the tasks are distributed to several workers, each finishing one step/process	**Demands:** Safety is a very important factor in this and the following steps, especially this one. All manufacturing shall be implemented with high safety standard. Injuries caused by work are becoming increasingly harmful for the respective employer. Ecological aspects are also important, because it's directly related to the economic factor: reasonable cutting could avoid wastes and improve utilization ratio and therefore increase potential interests.

Table 10: **Structure of a learning field of an education and training plan (Cont.)**

Learning area 6	**Title of the professional task** Edge sealing	**Duration:** normally very short, easy jobs take just a few minutes Workplace: workshop
Description of the occupational field of the activity seal the edge of the components with machine		
Contents of work and learning		
Objects: Protecting the finished components	**Tools:** Edge Banding Machine **Methods:** straight edge sealing and profiled sealing, with machine **Organization:** Depending on the workload, distributed to several workers, or done by one worker independently	**Demands:** Safety factor is important. The client can easily observe the quality of this work process, thus the quality requirement is affected by the corresponding target market.

Table 10: **Structure of a learning field of an education and training plan (Cont.)**

Learning area 7	**Title of the professional task:** Assembling	**Duration:** Depending on workload Workplace: workshop
Description of the occupational field of the activity Assembling the components into one complete furniture		
Contents of work and learning		
Objects: Assembling the complete furniture	**Tools:** Screwdriver, electro drill, assisted tools in hardware **Methods:** assemble according to the correct order **Organization:** The number of workers depends on the size of the plank as well as the degree of difficulty in assembling	**Demands:** Ecological aspect plays an important role here. Generally speaking the customers are paying increasing attention to the ecological aspect of furniture, especially if it's made of wood. Whether the materials used are harmful to human health could affect its sales.

Table 10: **Structure of a learning field of an education and training plan (Cont.)**

Learning area 8	**Title of the professional task** Painting, surface treatment	**Duration:** depending on workload Workplace: workshop
Description of the occupational field of the activity Carrying out surface treatment for the furniture		
Contents of work and learning		
Objects: Protect the furniture and make it more beautiful	**Tools:** Wool brush, air compressor, airbrush, spray gun, sandpaper **Methods:** Choosing surface treatment methods depending on the colors required etc. **Organization:** Normally done by professional painters	**Demands:** Similar to the last step, the ecological aspect is important.

Table 10: **Structure of a learning field of an education and training plan (Cont.)**

Learning area 9	**Title of the professional task** Quality control	**Duration** : Depending on the workload Workplace: workshop
Description of the occupational field of the activity Double checking and controlling the quality in each steps of work, throughout the entire work process		
Contents of work and learning		
Objects: Inspecting the quality of the products of each steps, prevent problems and flaws, correction of deviation in time	**Tools :** Certain tools listed above, esp. the measuring tools are applied here to check the accuracy of size, etc. **Methods:** Paying attention to the size constantly, double checking regularly Self-inspecting during the work process **Organization:** Done by workers during the production process	**Demands:** The quality control could have enormous influence on the overall quality of the products and therefore on the performance of the factory as a whole. The employer naturally attaches great importance to this aspect.

4.2.4 Occupational Task Analysis – Work Process Analysis

Methodological explanations:

The following occupational task analysis is done mainly based on the results of last step, namely occupational profile analysis; meanwhile, during the expert workshop some information has been obtained on the work process. Our team members analyzed separately the work process based on the information gained; then we gathered the information together and double checked the correctness and accuracy of the description. Appropriate corresponding photos are then selected to be added to the document.

Results of the work process analysis

Analyses of occupational tasks

1.

Occupational task:

Finding out and understanding the requirements of the client

Workplace:

Normally this work takes place at the client's office or home. On the one hand it is more convenient for the client; on the other hand it is also easier for the investigating workers to do some basic measuring.

Business and work process:

Normally the client has a wish to construct some wood furniture and contact the factory/company. After first communication about the general purpose of the client, the company sends some workers from business department and design department to the client's office or home. The workers from business department should get as much information as they can about the concrete wishes of the client. They should help the client formulate clearly their requirements in terms of professional standards if necessary. The workers from design department can contribute to this process by offering professional advice according to the wishes of the client. After collecting all the necessary information needed to draw a blueprint, the workers from design department can measure the space/length etc.

Objects of the work task:

Clearly the purpose of this task is to understand as precise and correct as possible the requirements of the client which forms the basis for the next steps of work. After this task a description of the products should be ready. The clearer, the more detailed this description is, the easier further steps of the work it becomes.

Tools, methods and organization of work:

This task is mainly conducted through conversation between the client and the workers from the wood furniture construction factory.

In big factories, it is normally done jointly by workers from business department and design department. In small factories, the boss/owner of the factory often overtakes the job since it sometimes concerns the business handling process.

Demands:

Workers carrying out this task should not only have a certain level of technical knowledge, but also good communication skill. He/she should possess the verbal abilities to guide the client express his/her wishes clearly.

The clients expect the workers to be communicative and professional. Bad impression of the workers can be harmful for the business. Accurate and professional understanding of the wishes and demands of the client is crucial to the success of entire project.

2.

Occupational task:

Drawing and revising blueprint

Workplace:

Normally this work takes place in the office. It is increasingly common that it is finished with the assistance of computer software.

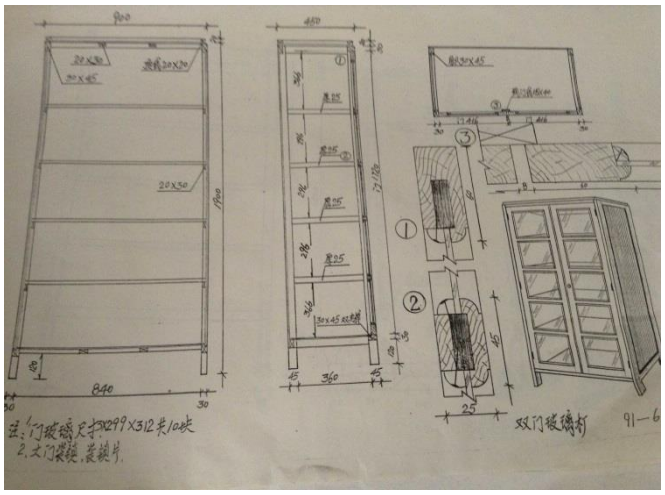
Business and work process:

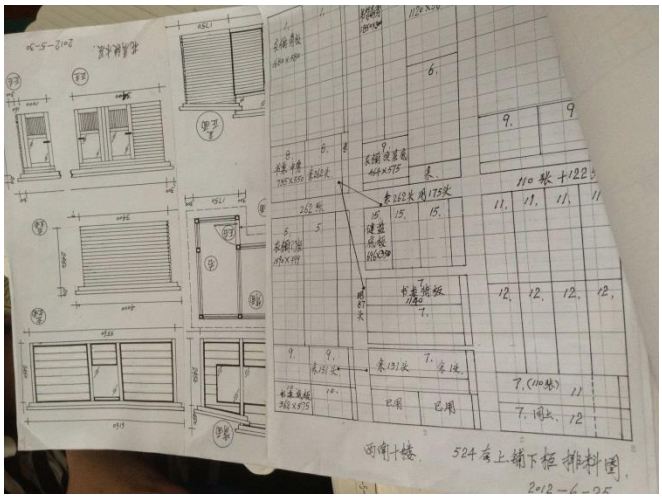
Based on the information obtained in the first step, the workers in the design apartment draw the rendering as well as the blueprints. The workers communicate with each other about the drawing process as well as the preliminary graphics and make necessary revisions based on each other's advice. Both the rendering and the blueprint are then shown to the department/group leader, who makes revision and improvements to it. The rendering is then shown to the client, who gives further suggestions and opinion if necessary. Normally the blueprint is not shown to the client in order to protect the interests of the company.

Objects of the work task:

Drawing construction documentation offers the overall solution for furniture construction. The construction documents, especially the blueprints, are the guideline for all the following construction processes. They are also the standards, according to which the quality control is carried out.

Figure 1&2 Blueprints made by a Chinese wood furniture designer





Tools, methods and organization of work:

The drawings of the rendering and blueprints used to be done with tools such as T-square, triangle ruler, protractor; however it becomes common to use computers nowadays.

Work is normally divided to several workers. They finish the first documents according to technical standards, then the group leader make revisions to the first documents.

Demands:

It is necessary for the workers to understand and draw stereogram. They should possess some basic understanding of certain mathematics, for instance the grid method.

The quality of blueprint is normally set high: it shall be professionally correct with all the necessary information for construction is included.

3.

Occupational task:

Making a list of materials to be processed

Workplace:

This is normally done in the office.

Business and work process:

To make a list of all the materials necessary for the construction include the following steps: listing necessary components; marking names and arranging numbers to the components; listing all the materials and their specifications; taking into considerations account the wastes, distinguishing net materials and wastes, taking into considerations of leftover bits and pieces.

At the same time the prices of all materials shall be calculated and the costs are therefore taken into account while preparing the list of materials.

Objects of the work task:

The list of the materials as well as their prices shall lay the foundation for preparing the materials for construction. Both the economic and the technical aspects shall be taken into considerations. Making the list not only determines the materials to be used, but also has influences on the overall costs of the entire construction and therefore also its profits.

Tools, methods and organization of work:
The basic tools necessary are just paper and calculator.
The workers who draw the documents shall also finish this task; he/she shall take into account the net size and losses of the materials according to the blueprint; they shall keep in mind that different materials have different losses during the construction.

Demands:

The workers carrying out this task should be very familiar with the characteristics of the various materials and the possible losses during the construction process.

The employer expects the workers carrying out this task to be calculating. The combination of an economic way of thinking and the familiarity with the profession is regarded as optimal.

4.

Occupational task:

Purchasing the materials

Workplace:

Building materials market

Business and work process:

The workers go to the building materials market and buy the materials etc. according to the list made on the last step. Sometimes this can be done online or through telephone, namely the workers can make orders via digital media and the company delivers the requested materials.

Objects of the work task:

The purpose of this task is to get ready for the actual construction and manufacturing.

Tools, methods and organization of work:

This job is normally not done by the construction workers, rather by the workers in the business/purchasing department. Construction workers may offer necessary support. Not much technical tools and equipment is needed.

Demands made on skilled work and technology:

The workers carrying out this task shall be well informed about the materials and their up-to-date prices.

Similar to the last step, the workers shall possess both an economic way of thinking and professional know-how.

5.

Occupational task:

Cutting the wood planks/boards, making all the components and units

Workplace:

mostly in workshops/factories, where the workers carry out most of the construction work.

Business and work process:

The workers need to read the blueprints carefully, investigate all the components and units shown on the blueprint closely. They could also discuss with the designer of the blueprints about it in order to get a deeper and better understanding about the blueprints. Under certain circumstances workers can apply a different approach of construction and therefore there might be minor differences between the actual product and the blueprint, however the overall functions and effects shall remain the same.

While cutting the wood planks, workers should calculate the size and mark them on the standard board; this needs to be done in a very concise manner. Then the workers shall consider the approach and way of initiating the cutting and the appropriate tools according to the wood grain. They shall cut the planks first into bigger pieces, then into smaller pieces; and during the cutting process the workers shall save the materials as much as possible.

Objects of the work task:

The purpose of this task is to cut the standard plank into the sizes needed and therefore to prepare for the next construction process.

Tools, methods and organization of work:

This job is normally done by the construction workers; meanwhile they shall communicate with the designer. The distribution of tasks and work organization depends largely on the amount as well as the complexity of the production. If the amount of production is small, this could be done by one single worker; however if the amount is big, it is necessary to distribute to several workers, with each one cutting a different part independently.

Workers need to use pencil, ruler and some shaped and painted line tools to mark size. They shall use guided saws, tape measure, sand paper machine, sealing machine, and drill machine.

Demands:

The workers carrying out this task shall be sensitive to size, be able to test and operate all the machines that are applied to cut the planks.

Safety is a very important factor in this and the following steps, especially this one. All manufacturing shall be implemented with high safety standard. Injuries caused by work are becoming increasingly harmful for the respective employer.

Ecological aspects are also important, because it's directly related to the economic factor: reasonable cutting could avoid wastes and improve utilization ratio and therefore increase potential interests.

6.

Occupational task:

Edge sealing/edge banding

Workplace:

mostly in workshops/factories, where the workers carry out most of the construction work.

Business and work process:

After producing all the components, the workers need to choose different types of edge banding machine according to the type and shape of the semi-finished material/products, test and operate the machine to seal the edge for the components. If the materials are authentic wood, this task needs to be done with hand.

Objects of the work task:

The purpose of this task is to seal the edge of the components, in order to protect them and make them more aesthetic; it could also avoid injury caused by friction.

Tools, methods and organization of work:

This job is normally done by the construction workers and the main tools they use is the edge banding machine, which can be divided into two types: straight edge sealing and profiled sealing. When the material of the component is not wood, this task is almost exclusively done with machines, which is operated by one worker simultaneously. The amount of production determines largely the number of workers and their share of edge sealing work.

Demands:

The workers are able to test and operate various edge banding machines, they shall be able to choose the appropriate machine according to the type and shape of wood/materials. The skills required here is rather simple; it is also among the first jobs that can be carried out by new learners. However the authentic wood components shall be sealed with hand, which requires higher skills.

Safety factor is important. Bad use of machine or operation that do not follow the safety guideline could lead to damage to both products and people.

The client can easily observe the quality of this work process, thus the quality requirement is affected by the corresponding target market.

7.

Occupational task:

Assembling

Workplace:

This task is mostly done in workshops/factories, where both various machines, tools and enough space are available. Meanwhile, since both tasks 5 and task 6 are carried out in factory, the products of the work task, namely the materials for this task, are stored in the factory, thus the task is done in the factory.

Business and work process:

After all the components, accessories, tools are prepared, the workers apply the appropriate tools to assemble the components and accessories into the product according to the blueprints. During the process, the workers carry out quality control to avoid mistakes.

Objects of the work task:

Clearly, the purpose of this task is to assemble the complete furniture according to the blueprint as accurate and concise as possible. Basically after this step one piece of or a series of products that fulfill the customer's requirements are largely produced.

Tools, methods and organization of work:

Screwdriver, electro drill, and assisted tools in hardware are applied to help the workers finish the assemble task. Basically the workers just need to assemble the corresponding parts/components of those on the blueprint with appropriate tools.

The manager decides the number of workers doing this task mainly based on the amount of products as well as the complexity of the assembling. When the sum is big and/or the assembling process requires cooperation of several workers, one or a couple of teams of assembling need to be arranged.

Demands:

This task posts rather simple requirements on the competencies of the workers. They just need to be able to understand the blueprints, and it means that they can correspond the actual components with the drawing/identifier on the blueprints correctly. They shall be able to choose the right tools, and use them to assemble the components in correct order. In this process the workers shall have a clear and

vivid understanding of the information presented by the blueprint, and they shall know the characteristics of the tools and make good use of them based on this knowledge.

Ecological aspect plays an important role here. Generally speaking the customers are paying increasing attention to the ecological aspect of furniture, especially if it's made of wood. Whether the materials used are harmful to human health could affect its sales.

8.

Occupational task:

Painting and surface treatment

Workplace:

This task is mostly done in workshops/factories, where both various machines, tools and enough space are available.

Business and work process:

This task is not necessary for the products that are made from paint free panel. For the products that are not made from paint free panel, painters shall first carry out some surface treatment, including the removal of wood wool, dirt and resin, bleaching, dyeing, filling and embedded complement. After surface treatment the painters paint the varnish and wait for air drying. After this is done, a quality inspection is carried out, the products meeting the quality standards can be directly sent to the client, the products that do not meet the quality standards shall be sent to reprocessing, appropriate treatments shall be carried out, until they meet the quality standards.

Objects of the work task:

Clearly, the purpose of this task is to protect the wood as much as possible and make the products more aesthetic. Painting the surface of the products can to a certain degree prevent Worms, rot fungi

and erosion of other natural forces; meanwhile it could prevent moisture intrusion, slow down the speed of wood moisture, reduce cracking and deformation, so that products become more durable; lastly painting could make the wood shiny, with varied colors, and more artistic sense.

Demands:

Wool brush, air compressor, airbrush, spray gun, and sandpaper are necessary equipment and tools for workers to carry out surface treatment. The function of wool brush is to brush the paint onto the product surface; the effect of air compressors and spray gun is painting; sandpaper can make the product surface smooth.

During surface treatment it is important to choose the correct treatment methods according to the variation of colors.

The number of painters needed depends mainly on the amount of products and the difficulties in surface treatment. When the sum is big and/or the surface treatment process requires cooperation of several workers, one or a couple of teams of assembling need to be arranged.

Demands:

The workers carrying out this task should be familiar with the characteristics of the material as well as the paint. They should have good knowledge about the various treatment methods for different materials and requirements. They need to be skillful in operating the treatment; they can brush or air brush the paint on the product surface evenly.

Similar to the last step, the ecological aspect is important. The materials used can be harmful to person. So the clients are becoming increasingly more sensitive to this.

9.

Occupational task:

Quality control

Workplace:

Workplace is mainly in workshops, because the major construction work is done in the workshop. However, since this task is constantly carried out throughout the work process, from the very beginning the quality shall be constantly checked, therefore all the locations listed above are workplaces for this task.

Business and work process:

Generally speaking, workers shall carry out double checking and controlling of the quality in each steps of work, throughout the entire work process. Once flaws and mistakes are discovered, products-in-progress with those problems are returned to reprocessing.

Objects of the work task:

Clearly, the object of the task is to inspect the quality of the products of each steps, prevent problems and flaws, and correct deviation in time, so that the quality can be guaranteed.

Tools, methods and organization of work:

Generally speaking, all the tools used above might be applied to carry out quality control, esp. the measuring tools to check the accuracy of size, etc.

Major methods are to pay attention to the size constantly, double check regularly, self-inspect during the work process.

Demands:

Besides the relevant technical skills and knowledge, the workers carrying out quality control, namely all workers, should know the blueprints well, be constantly careful, sensitive to size of the components and products.

The quality control could have enormous influence on the overall quality of the products and therefore on the performance of the factory as a whole. The employer naturally attaches great importance to this aspect.

4.2.5 Methodological Reflection And Suggestion

The expert worker workshop in this research, despite itsfruitful results, has a substantial shortage, namely the workers invited are from the same company. It is very common that workers from the same factory have a certain power hierarchyamong them; some workers, due to their experiences and knowledge, may have certain privilege compared to other workers or even power influence on other workers. This could easily lead to a situation during the workshop that only the most powerful, experienced and influential workers will express freely and openly. This would almost undoubtedly damage the effectiveness of the workshop. Thus it is recommended that, **for expert worker workshop, it is necessary to invite expert workers from different factories/companies, instead of the workers from just one firm.**

To extend this logic a bit further, during the workshop the moderator shall try to maintain an equal/balanced power structure among the participants. Attempts shall be made to guarantee that all participants in the workshop hold similar level of expertise and that they understand acknowledge, and accept the rules of open discussion of the workshop.

Selecting expert workers from just one company may also contribute to the overall results by bringing companies of potentially different size and production specialty together. The information gained could be therefore more representative of the entire industry requirements on workers.

4.3 Description of UTHM Experience*

Research on Occupational Competence Needs Analysis
In the sector of Electrician/Electrical Wireman
Country report of Malaysia in the framework of RCP P9

Reported by:

Razali Hassan Ph.D, Badaruddin Ibrahim Ph.D, Ramlan Zainal Abidin & Suhaimi Mohamed

Faculty of Technical and Vocational Education, Universiti Tun Hussein Onn Malaysia

4.3.1 Introduction

This paper explain the result of a research on the occupational profile and task of Electrician workers in Malaysia; the research is carried out in the framework of RCP research project 9 led by Universiti Pendidikan Indonesia (UPI).

The paper consists of five parts:

1) This introduction, which offers an overview and structure of the research;
2) **Occupational sector analysis**, which summarizes some basic facts and development trends of the (Electrical Wireman) electrical industry in Malaysia; it serves as a background of the entire research and helps the reader to understand the content of the whole research paper;
3) **Occupational profile analysis**, which is result of an expert worker workshop (EWW) and outlines the most important working tasks of a Electrical Wireman; it also serves as the basis for the next part of research;
4) **Occupational task analysis**, which analyzes and describes the business and work process as well as some other major characteristics of the working tasks outlined above; it gives the reader a detailed description about the actual working processes of a Electrical Wireman and their basic requirements etc.;
5) Methodological **reflection** and **suggestion**, which is a summary of the lessons learned in the research process; some flaws and possible shortages of this research project are reflected; suggestion is given concerning potential future relevant research.

4.3.2 Occupational Sector Analysis

The process of Sector analysis has been conducted by researcher team members. The research group had selected the electrician sector as a pilot for the curriculum design and development exercise. The sector was determined based on several factors such as the importance of the sector to the domestic and industries for public and social development, local and international demand as a result of housing development growth, increasing public demand and awareness on electrical services.

The researchers also work under the similar sector of electrical wireman and as a vocation that requires competent personnel. Therefore the training of electrician should follow a curriculum which

is derived from the working field. So far, the electrician curriculum in Malaysia is developed as a subject content that closely follows the DACUM approaches. The researchers applied several methods for data collection purposes such as interview key personnel and documents analysis. The majority of the data gathering was collected at government sector at ministry of Education and Ministry of Human Resource. This is included Electrical sector either under the Ministry of Human Resources, Ministry of Education, Ministry of Youth, Ministry of Energy and Telecom and Post.

UTHM responsible to develop their own curriculum referred to others college and universities as part of references in curriculum development. Under the new regulation the curriculum provide by university should be revised every five years and the practicing electrician should be revised refer to the standard. Therefore, the development of curriculum has been

4.3.3 Occupational Profile Analysis (Through "Expert Workers Workshops")

Getting in touch with expert workers

Team members tried to get the right expert workers in electrical industry. List of company has been identified from the selected company given by the research team members. Planning for selection expert workers began by sending letters to companies related to the field of domestic and industrial electrical wiring. Company selection based on related to criteria that have been discussed with the research committee as follows:

1) Type of company based on electrical wiring domestic and industries.
2) Single phase wiring electrician.
3) Workers with working experience not less than 3 years.
4) Malaysian nationality
5) Company we preferred should not involve with training institution.

As others company we contact each of the company owner by the phone before we follow up with an official letter. At the beginning the owner of the business company refuse to give cooperation due to not interested to the non business matter or involved any profit making. Therefore, some of the meeting has been made without any appointment.

The workshop was conducted on the 18th April 2013 at the Faculty of Technical and Vocational Education, Universiti Tun Hussein Onn Malaysia with the assistance of the main coordinator of the project, Dr. Ing. Joachim Dittrich. The workshop was scheduled for one day. The participants were local electrician currently working with electrical company and owner of the small business company. There were 12 pupils and 2 facilitators involved in the workshops. They were also participant from vocational schools which has been selected based on their vast experienced in electrical work. The two facilitators were trained by the researchers on what and how to conduct the expert workers' workshop.

Preparation of the Workshop

Contact to the hospital management was done to explain our project and to ask for permission to select facilitators and participants for the workshop. After the permission granted, we first trained the two facilitators on the aims and philosophy of the methodology. Finally trained them on how to conduct the workshop and explained their role in this exercise. The facilitators are two senior practicing electricians while the participants are all experienced electricians.

Greetings and Introduction

The workshop started with the introduction session by Dr. Razali Hassan. He introduced the members of the project and briefly explained the about the RCP project to the participants and further explained the purpose and objective of the workshop. The organization and plan of the workshop was done by Dr. Razali Hassan. He also conducted the ice breaking session with the participants and ran the whole workshop with the assistance of the facilitators, main coordinator and other researchers. The participants were placed in groups of four.

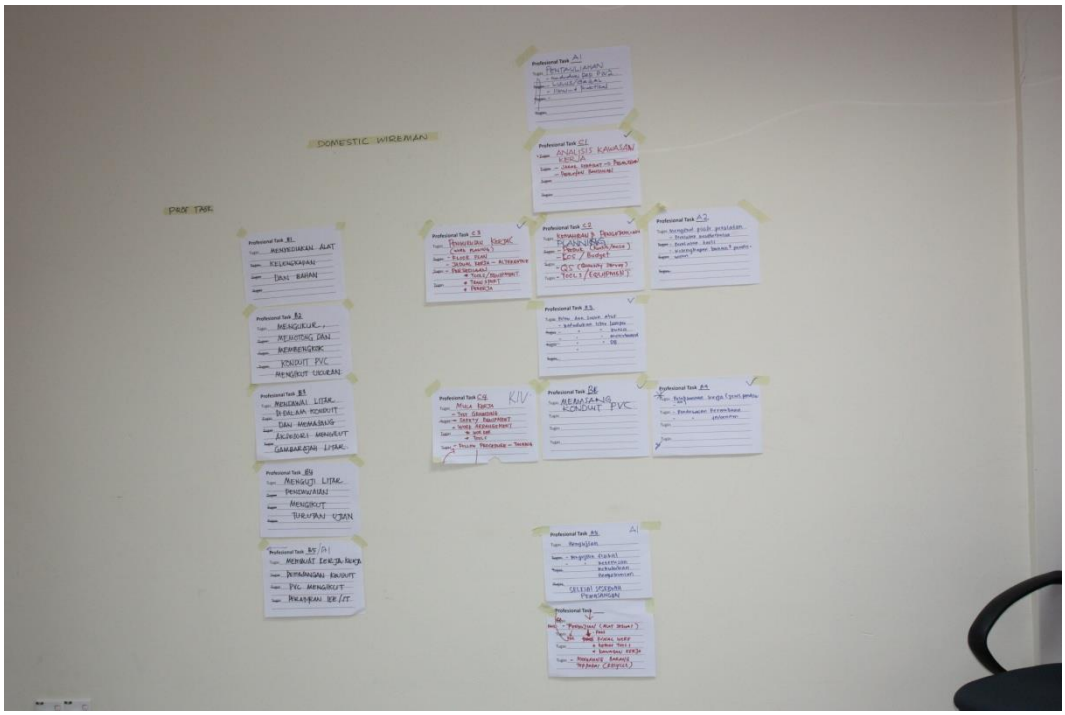
Description and presentation of stages of development

Presentation of concepts such as core professional task, task and sub-task were explained. The first exercise for the participants was to recall and share their occupational history. In this exercise each of them had to fill in the form which consists of stages of working experiences by listing five common stages starting with their entry level as an electrician. They were given time to complete the form and later to present the individual experiences. All participants were considered as skilled electrical wireman based on their broad experiences. The group has working experience of 2 years to 17 years. Each participant presented the personal occupational history to the group. The examples of the participants' occupational history are as follows:

Example1: Personal Occupational History

Table 11: **Personal Occupational History**

Stage 1:	Electrical Domestic Wireman
Task 1:	Wiring
Task 2:	Conduit wiring, duct, concrete
Task 3:	Earth Testing, polarity testing
Task 4:	
Stage 2:	Senior Technician
Task 1:	Motor testing, single phase and three phase
..	Star Delta motor starter
Stage 3:	Senior Foreman
Task 1:	High voltage wiring
..	High tension equipment maintenance



4.3.4 Analysis Of Occupational Task Through Work Process Analysis

The observation and interviews has been conducted in the occupational field of electrical wireman. Skilled work in the field of domestic electrical wireman was analyzed. The analysis, which was undertaken by a team of two researchers, took about 3 hours.

There are two conditions before any domestic wiring work can be proceed:

1) Is the new wiring needed?
2) Is the new and additional wiring needed?

If the new wiring needed for the new premises, an application needs to be made by the registered contractor to the Tenaga Nasional Berhad (TNB).

If the additional wiring or old wiring replacements are needed, the contractor did not have to file any formal application to the TNB.

Workplace

The workplace is located in the personal residence located in Batu Pahat, Johor. The contractor was informed in advanced for researcher to have access to their skilled workers.

Business and work process

The following findings were based on the interviews conducted among two professional workers.

New wiring for new home premise

The appointed contractor (company) by the home owner usually will have the initial discussion on the following issue before any wiring work can be done:

1) How many lighting point needed?
2) How many power (outlet) points needed?
3) How much cost involved?

After all three items discussed with the home owner, the wireman will prepare the application paperwork to the TNB for approval. Once approved, the wireman will inform the home owner on the work schedule for the new wiring.

Out bow wiring for the new premise

The following task will be perform by the wireman for out bow wiring

1) Install the PVC casing – the installation process will involved cutting, shaping, and nailing the PVC casing on the wall.
2) Pull the wire and close the PVC casing
3) Install the switch boxes, socket, and control board (RCB, kWh meter, and main switch)
4) Install the earth rod, earth chamber, and earth clamp
5) Install the home appliances requested by the home owner
6) Perform the continuity test
7) Inform the company the job completion

The company will inform the local authority for supply connection and installing the kWh meter. The wireman will be on site during the kWh meter installed and the power supply connected.

In bow wiring for the new premise

The in bow wiring work normally done right after the wall and roof were installed. The wall must not be plastered yet.

1) Drilling the wall according to the work plan
2) Installing the conduit into the drilled wall
3) Installing the switch boxes on the drilled wall
4) Lay the cable
5) When the wall is plastered and ceiling installed, then the fitting work will take place including the switch, socket outlet, and ceiling rose installation
6) The company will inform the TNB to connect the electric supply and install the kWh meter

The wireman will be on site during the kWh meter installed and the power supply connected

Other wireman task

There are other task that also highlighted by the respondent. The following task may not be a regular task but for most small and medium contractor, they will assign their expert workers to perform this task especially when replacing old wiring is needed.

Trouble shooting the domestic electrical problems

Repair and replace the old wiring

Consultation work including cost determination and work schedule with the home owner (client)

4.3.5 Methodological Challenge And Reflection

1) Selection of participant.
    - Participant should expert in their area of working
    - They should be able to explain about their job description especially related to their daily work.
    - Due to their background as academician, most of the explanation is about the development of curriculum and related area.
    - Expert workers should talk more about the working procedure rather than the learning process. This means that the explanation from the job profile should be related with the working process. The process of step by step with the real working environment and experienced. They should avoid the way how teaching of too much follow the learning standard.

However, it is mandatory, that teacher educators have such methodologies at hand and master them in order:

To include the respective knowledge about requirements at work places in TVET teacher education;

To include the teaching of the methodologies in TVET teacher education, so that teachers in their future job are able to analyse workplaces and competence requirements;

To be able to run research on TVET curriculum development with the purpose to inform national TVET curriculum development.

To be able to analyse work places / work processes in order to compare competence requirements in TVET at the regional and international level, also with reference to upcoming regional qualification frameworks.

4.4 Description of NUTE experience*

Research on Occupational Competence Needs Analysis
In the sector of DOMESTIC ELECTRICAL ANALYSIS
Country report of VIetNam in the framework of RCP P9

Nguyen Tien Hung and colleague in

Namdinh University of technology education

COUNTRY SECTION REPORT FROM NUTE -VIETNAM

4.4.1 Introduction

In the framework of CB8-P9 of the regional cooperation Platform (RCP), the partners of each member country were given the task to research and develop an effective job analysis table. NUTE's work was to carry out "domestic electrical installation" analysis. The research methods implemented were:

- Occupational sector analysis
- Occupational profile analysis
- Occupational task analysis

All three methods were selected by P9 members. This country report is to describe how we apply that method to analyse the 'domestic electrical installation'. In each job analysis a different method was used. The main target of the research is to find what advantages and difficulties arise in each step of the research methodology in terms of each method regarding the details of the job analysis process. Reports were made up three parts:

1) Introduction: rendering an overview and describing the structure of the research.
2) Application of the Instruments: here the three research methods are explained under the headings below:
   - Framework condition
   - Preparation for doing research
   - Implementation
   - Result
   - Experiences
3) Summary: this final section is devoted to discussions of the experiences, a conclusion and recommendations for future research.

The most vital aspect of research is how to apply the research methodology using the instrument supported by CB8 to see what can be modified and where the differences are in each step while applying the instrument. In concluding we discuss the experiences gained while carrying out the research

4.4.2 Application Of The Instrument

4.4.2.1 Application Of Occupational Sector Analysis (OSA)

I. Framework Condition

Domestic electrical installation work is a very old craft in Vietnam but it is a trade that is not bear its own title. The work is concealed in training programme dubbed something like „civil electronics". This title disparity makes it difficult for the analysis to tell us about the role and tasks and provide information on this type of vocational work. We have refined the analysis to get information on this work through many different areas, aggregating the results to obtain the most basic information on domestic electrical installation work.

II. Preparation

The project team ofCB8-P9 responsible for gathering information on the vocational work of "domestic electrical installation" featured the following personnel:

- Ms Nguyen Thi Duyen and Mr Nguyen Tien DUC studied articles and scientific reports related to professional electrical installation in family homes.
- Mr Nguyen Tien Hung gathered information from the database of Vietnam's General Department of Vocational Training.
- Mr La Van Truong, Mr Luu Quoc Cuong gathered information from the manufacturing sector, studying the needs of the cluster of electrical work related to company "domestic electric installation"
- Mr Nguyen Tien Hung and Mr La Van Truong aggregated information to write the "occupational sector analysis".

Once assigned, the person had the deadline for information to be gathered by July 12th2013.

III. Implementation

In performing the analysis the data collected was analysed by comparison with the partial information gathered from articles, professional reports, and what was written on the situation of urban and rural workers.

- Information was gathered by statistical data on the labour situation at each stage and each locality.
- In the framework of "domestic electrical installation" project we surveyed the state of the profession in practice, regarding social needs, skill levels and the status of vocational training in "domestic electrical installation „at vocational training schools.
- Information was collated on the electrical installation workers families via the amount of work or their income from work, and how the level of income earned increased in the installation of household electricity compared to the period previous.

When comparing what was carried out and the guidance provided by the Instrument CB8-P9, nothing further was found. However, in terms of information gathering we do not have accurate figures to tell us the information is primarily qualitative. The fact is that professional electrical

installation in the home is not an independent vocational subject in Vietnam and always is included in the title "civil electrical".

IV. Results of the research

Vietnam is in the process of industrialization/modernization of the country. Urban areas are continuously expanding in all provinces of the country, especially in big cities such as Hanoi, Ho Chi Minh, Da Nang, Hai Phong, Can Tho, Vung Tau and so on. Rural areas are also evolving and there are many new modern buildings. In Namdinh city where I live 4 new urban constructions are under way and thousands of new homes are being built each year.

Regarding the vocational qualification "domestic electrical installation" of workers in Vietnam– qualifications and skills between the regions differ extremely. Workers in large cities are trained via schools, but often not by properly trained professionals. The experts invited to the research workshop had vocational training in areas such as "industrial power", or "automation", "civil electrical", "electrical system" thus difficulties were encountered in terms of identifying qualifications at the outset.

Electricians in rural areas are not only self-trained apprentices. To gain evidence specific to the research the experts invited in rural areas described the history of their profession in the building process.

At that time the electrician learnt on the job assigned initially to work only as directed. They would be scattered over jobs, assigned work in fields such as sound, lighting equipment, installation and wiring.

After about1-2years, man power would be involved in design and construction. Although they would be assigned simple work over 1-2floors of a few kilowatts capacity they did not work to any specific order as would be gained in training or learning from experience. Thus, in many rural areas, fires would break out due to faulty wiring, electric shocks and even death by electrocution occurred. All such accidents happen, because wrong equipment selection, improper wiring and faulty connections cannot guarantee safety.

The training for" domestic electrical installation" in Vietnam, is much more focused, with more training in striving to achieve regional standards meeting standards in Asia and the world. The vocational teacher is always continuing training or retraining, learning at home and abroad. Many overseas curricular purchased including the Malaysia VINOSS qualification. Many short-term training coursesfrom3months to 6monthsare designed according to the carrying capacity and their use to meet the learners' requirements, to learn a new craft or improve professional education.

Short-term vocational training for children in rural areas, mountainous areas takes place in which professional "civil electrical installations" are the most commonly taught. At the University of Technical Education Namdinh (where the authors of this text are employed work) the company organizes regular recruitment meetings annually, including recruitment profession in the "electrical installation" branch. Each year, the number of workers employed in this work number a few hundred. However, the status of vocational training is limited as:

- Training is barely relative to actual demand;
- The vocational training is extensive, not intensive;
- "Domestic electrical installation" does not feature much training in schools or vocational training centres. Vocational training is mainly involved with "industrial power", "power system", "electrical installation engineering and industrial control", "civil electric", "electrical -water installations." This work does not specialize in domestic electrical installation.

The survey team found the problem as follows:
In cities, especially large cities accompany is contracted for power supply design and organization of construction. During construction, workers of the company are employed that may included short-term workers. However, in rural areas or small apartments in the city an individual or group of individuals are usually responsible for the design and construction.

Through the above analysis a great need for the skilled domestic electrical installer's to have basic and intensive training. The training programme "wiring family" should be modified to meet the needs of society. Domestic electrical installation should be provided in vocational school training. There must be a management practice for domestic electrical installations. For those who not in possession of certificates, they are to be equipped with them before they continue practicing.

V. Experiences

- Collecting information on domestic electrical installation training is interwoven with number of other professions, such as professional „electric repair". Therefore, the information collected may be inaccurate.
- The information is collected at different stages and different locations so it may differ when applying it at a different time or location.
- The information gathered from the reports may be misleading due to the conditions and nature of the various surveys.

Through "occupational sector analysis" We could learn more deeply about the domestic profession of electrical installations. We set out to find all the information related to the profession, in articles, scientific reports, statistics and the labour market. Allied to this process we interacted with skilled workers, companies and enterprises to understand the social needs of "domestic electrical installation" work.

Research revealed deficiencies in the existing training programmes for "domestic electrical installation". We also set out to find out the needs for training in social studies and made an overview of the research profession to be able to advise vocational schools on training programmes to support rural schemes being implemented by the Decision of the Prime Minister1956/QD-TTg Government of Vietnam.

4.4.2.2 Expert Worker Workshop (EWW)

I. Framework Condition

In terms of theCB8 tools used for making the chart analysis for "domestic electrical installation", the tool used is „expert workshop worker"

To complete this task, NUTE chose an expert worker, s in the field of domestic electrical installation and proceeded from there to organize the workshop.

To accomplish this we agreed to discuss the content as we are doing important task in university. This work is delivered directly to the University's electrical and electronics departments to organize and implement. We also received support from the other parts of the university, such as the participation of the expert teaching methodology, department of science and international cooperation, an administration department. The picture below is presentation at the NUTE workshop carried out in the context of our project.

The‘expert workers workshops’ have the following two main objectives:

- To describe modern skilled labour in terms of core occupational tasks that can be classified according to occupational fields or a specific field of work.
- To distinguish between different tasks according to the level of skills they involve.

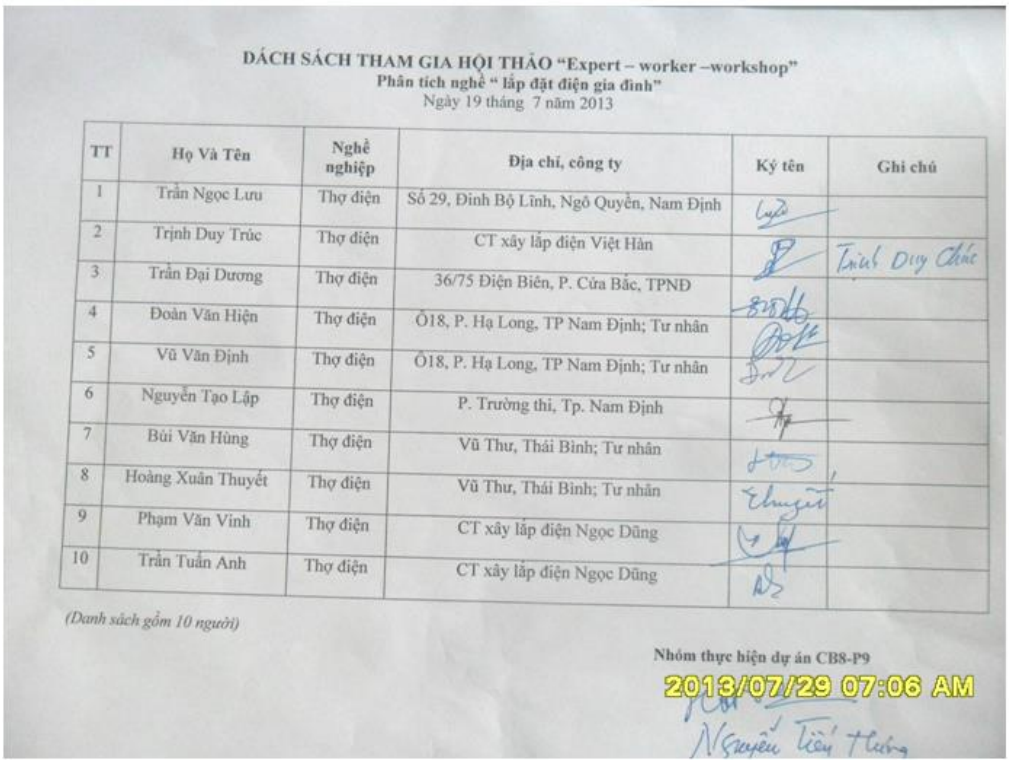
II. Preparation for the workshop

Select the participants

In Vietnam, family electrical installation is fairly extensive and there are many employed in home electrical installations. And families often are developed directly by the hiring of team building stock as well as electrical installation. The teams provide workers with VAT tax bills to be paid by home owners which naturally they do not wish to be burdened with.

This had led to home installation of electricity of a primarily private nature. They join established company or when demand for payment of a large sum of money or the work involved in large projects that have to take into account taxes. Of the high level workers we invited to the workshop most worked privately and only a handful work in accompany.

The vocational experts, chosen primarily living in the area around the city of Namdinh are listed below.



DÁCH SÁCH THAM GIA HỘI THẢO "Expert – worker –workshop"
Phân tích nghề " lắp đặt điện gia đình"
Ngày 19 tháng 7 năm 2013

TT	Họ Và Tên	Nghề nghiệp	Địa chỉ, công ty	Ký tên	Ghi chú
1	Trần Ngọc Lưu	Thợ điện	Số 29, Đinh Bộ Lĩnh, Ngô Quyền, Nam Định		
2	Trịnh Duy Trúc	Thợ điện	CT xây lắp điện Việt Hàn		Trịnh Duy Chúc
3	Trần Đại Dương	Thợ điện	36/75 Điện Biên, P. Cửa Bắc, TPNĐ		
4	Đoàn Văn Hiện	Thợ điện	Ô18, P. Hạ Long, TP Nam Định; Tư nhân		
5	Vũ Văn Định	Thợ điện	Ô18, P. Hạ Long, TP Nam Định; Tư nhân		
6	Nguyễn Tạo Lập	Thợ điện	P. Trường thi, Tp. Nam Định		
7	Bùi Văn Hùng	Thợ điện	Vũ Thư, Thái Bình; Tư nhân		
8	Hoàng Xuân Thuyết	Thợ điện	Vũ Thư, Thái Bình; Tư nhân		
9	Phạm Văn Vinh	Thợ điện	CT xây lắp điện Ngọc Dũng		
10	Trần Tuấn Anh	Thợ điện	CT xây lắp điện Ngọc Dũng		

(Danh sách gồm 10 người)

Nhóm thực hiện dự án CB8-P9

2013/07/29 07:06 AM

According to a list of 10people, 6worked privately, 4workersworking in an electrical construction company.

Prepare the facilitator

For the division of labour in the workshop process, we have more choices of consultants with professional experience in the analysis of learning. They have taken part in overseas trade analysis, developed programmes for programme implementation capacity. However, within the framework of project-P9 CB8 we distribute, share project instruments put together from uniformly implemented instruments according to the project plan schedule. We have tried our best to make the difficulties or advantages of this research method visible.

For this reason, the facilitatorselectedincludes3people, 2work directlyinatCB8-P9 all 3 of them work at the Department of Electrical-Electronics, 1hasa PhD in engineering pedagogy.

Prepare the rundown of workshop

Based on guidance provided by theCB8Instrumentwehave prepared the following:
Facilities: ensuring a well-appointed conference room, featuring materials such as tables, colour covers, various pens and media presentations.

Planning, selecting and inviting participants to participant by calling, sending the invitation letter, obtaining confirmation from participants to attend the workshop.

Uniformly selecting time and place, planning workshops.
i.e. July 19th2013, conferencevenueB2, University of Technical Education Namdinh (Nute). Address: Loc Haward, Namdinh city.

III. Implementation

DuringtheworkshopweappliedCB8instrumentprovided. At each step of the implementation following basic points were observed.

Opening, welcome and introduction workshop content:

- Facilitators presented reasons, explained the concept of the workshop, the relevant objectives and how participant shad been selected.
- Welcome speech by University's leader
- Facilitators introduced themselves and their role.
- The goal of the "expert workers workshop'': Analysis and construction of the core occupation tasks of the work, assigning them to different skill levels, and informing them of the purpose for which this is done.

Step1. Personal occupational history

A few problems arose here that need to be solved:

- Participants completed the "check list of selected participant (attached document) to ensure they were expecting participants to be invited to join the workshop.
- Explain the concept of stages and tasks that help participants comprehend the next step.
- Write down maximum5important stages and the tasks have been done in each stages of each participant' professional development to become expert worker. This done by filling in the given form (in 15 minutes)
- Participant presents occupational history 10 minutes for each (explaining work experience from beginning of career until current position, stages passed through in becoming an expert worker)

Step 2. Identifying the challenging and qualifying tasks that made up the development of the personal occupational history

- Presented by participants.(3-5 minutes)
- Participant may have to answer the questions:

What was challenging about the occupational tasks you mentioned? What was difficult about the task? When did you realize it was difficult? How would you deal with such a difficult task today?

The participant's presentations

Step3. Compiling professional tasks

- Form 3 groups of 4 people to describe their professional tasks (titled group A,B,C): Mr Ho - group A; Mr Duong - group B; Mr Hung - group C.
- Compile different kind of occupational tasks
- Write the title of each professional task on a metaplan card in numbered order, e.g. Group A: A1, A2, A3 and so on…
- Present the professional tasks participant listed in a plenary session (approx. 60 minutes).

Group working on finding the occupational tasks

Step4. Presentation and classification of occupational tasks

- Group A presents and explains the first occupational task as A1
- Other participants ask questions to clarify the task presented.
- Other groups attach similar occupational tasks classified as belonging to task A1.
- Group B continues presenting and explaining the second occupational task as B1
- This procedure continues until all occupational tasks identified during the group work have been presented and discussed.
- Unified by giving the name of each tasks group related to the core occupational tasks. In the picture below the yellow card gave the name of the core occupational tasks.

Step 5. Analysis of occupational tasks

All the participants and their other team members, check whether the statements on the worksheet for the occupational tasks are applicable (+) or not applicable (-).

- If the team cannot agree upon a definite classification, please mark the case with (o).
- About 45 minutes was allotted for completing this questionnaire.

This part is exemplified in the figure below.

Step 6. Assigning occupational tasks to different skill levels

Assigning occupational tasks to different skill levels was based on the analysis of statements in the questionnaire.

- The occupational skill in Vietnam was separated into 2 different skill levels: basic and advanced level.
- Group A suggests a classification for the first task while the other working groups either agree or provide a counter proposal.
- The alternative proposals are discussed. Should no agreement be reached, two versions of the occupational task can be created and assigned to 2 different skill levels.
- The double classification should also be reflected by selecting two different titles which mirroring how the two versions differ.
- Group B makes a proposal for the second task, etc. to the end.

The detailed occupational tasks as following:

Table12: **The detailed occupational tasks**

No	Task code	Tasks and subtasks	Skill level	
			Basic	advance
	A	**Survey the site**		
1	A01	Reading blueprint	+	+
2	A02	Survey the work place	+	+
3	A03	Choosing working method	-	+
	B	**Preparing material, tool, equipment**		
1	B01	Getting material, tool	+	+
2	B02	Checking the amount, parameter of materials	+	+
4	B03	Checking the number ,parameter of tool	+	+
	C	**Installing**		
1	C01	Installing lighting equipment	+	+
2	C02	Installing safe equipment	-	+
3	C03	Installing cable	-	+
4	C04	Installing motor (ventilating, pumping...)	+	+
5	C05	Installing control box	-(+)	+
	D	**Checking**		
1	D01	Checking installation	+	+
2	D02	Checking without power supply	+	+
3	D03	Checking when power supply	-(+)	+
	E	**Calibrating**		
1	E01	Calibrating lighting system	-	+
2	E02	Calibrating safe system	-	+

3	E03	Calibrating motor system	-	+
4	E04	Calibrating control box	-	+
	F	**Operating and transferring**		
1	F01	Operating and transferring lighting system	+	+
2	F02	Operating and transferring safe system	-	+
3	F03	Operating and transferring motor equipment	+	+
	G	**Repairing**		
1	G01	Repairing lighting system	+	+
2	G03	Repairing safe system	-	+
3	G05	Repairing motor system	-	+
4	G09	Repairing control box	+	+
	H	**Maintaining**		
1	H01	Maintaining lighting system	-	+
2	H02	Maintaining safe system	-	+
3	H03	Maintaining motor system	-	+
4	H04	Maintaining control box	+	+

IV. Results

The workshops enabled us to obtained relatively good results and they are analysed in the following:

Develop a job analysis for practical purposes.

Ensuring it contains the core content of domestic electrical installation. In so doing the following core occupational tasks should be included:

A) Surveying the site (reading blueprint, surveying the site)

B) Preparing materials, tools, equipment

C) Installing (electrical equipment in the house)

D) Checking (post installing, repairing)

E) Calibrating (correcting all parameters as required)

F) Operating and transferring (to the owner)

G) Repairing (after using)

H) Maintaining (to keep the system in good order)

Other results from workshop

- The vocational expert had never been a participant, so tended to be reluctant to participate. However, after feeling welcome and made at ease by our people a feeling of security and

confidence prevailed. Furthermore largely unknown members were happy to have the opportunity to communicate and exchange with one another and be at the centre of communication in everyday work. After the workshop the experts were both willing and proud to attend the conference and are look forward tom anymore such opportunities in which they are willing to support us with all that they know.

- It was also discovered in the workshop that the workers who attended often tried to present all the professional experience they had encountered. Therefore, in addition to meaningful analysis of effective training they also share experiences and have the opportunity to share the work they are doing in society.
- Our teachers that attended as invited guests also learnt more about the job analysis method itself as for some it was completely new to them. The teachers also benefitted a great deal from what they learnt from the well-trained workers.

V. Experiences

Experience on selecting the experts.

- We cannot accurately test for fully set criteria before inviting experts to attend the workshop. When selecting the skilled workers, even though we know they did a great job installing phones, they may still lack some of the selection criteria proposed. For example, they do not qualify for class vocational training by only learning from experts in their work experience. Many such skilled craftsmen of this kind are at work in Vietnam.
- Skilled workers should be selected from many different areas: the selection of skilled workers in the region (the city) and certain localities will have a direct impact on job analysis. This is registered by the fact that small cities or rural areas do not feature many apartments. I know that work in the apartment is a kind that many workers have never encountered in their work experience. The choice of experts is vital for choosing the higher-skilled workers from regions in which graduate students will be able to find work. For this reason we have observed that some good graduates are rather crest fallen upon encountering the difficulties of working in a big city.

Experience in organization.

- Initial reception is most important; it makes things clear to the participants and generates the confidence they need to build in communication and the kind of exchange of professional experience that contributes to a successful workshop.
- A detailed analysis of the subtasks, that is to say each task has not been deeply analysed. We feel that more time is required for this job.
- Some forms also need to be more lucid to make them more effective. For example, step 5 forms on why the professional task is only consider in the application in response to content of 8 and no more. In step 6, when the assigned task and subtask is not broken down into a smaller activity it is very difficult to arrange skill levels. When implementing this section we are required to take into account the sort subtask rather than the professional task when considering the skills levels as a guide.
- Teachers should be invited to attend workshops and learn the methods of analysis via expert workshops, and learn the many useful things from the workers

- The results have shown we have accumulated more experience in job analysis. As a result it helps in building training programmes that are relevant to the actual conditions, trends and nature of regional integration.

4.4.2.3 Work Process Analysis (WPA)

I. Framework Condition

With the tool of expert workers workshops we obtained valuable information on core occupational tasks, which make up an occupation. This, however, is information which is passed verbally, during the actual work process.

Occupational task analysis presents an easily approachable means of analysing work for those in the field of technical and vocational education and training. It enables a better understanding of occupational tasks in work and the business process through analysis. A curriculum developer that permits the teacher to get an impression of the characteristics and requirements of skilled work.

The results of occupational task analysis help to define and further differentiate the description of the occupational field regarding work and qualification goals, and the very subject matters of work and study in each occupational task.

The analysis of occupational tasks is also often termed "work process analysis" and occurs in the following three phases:

- Preparing for the research;
- Carrying out the research;
- Evaluating and documenting the research.

II. Preparation

After eight occupational tasks carried out in the expert worker workshop, providing a complete occupational profile, has to be shaped for an educational perspective. As a basic principle, each occupational task represents one curricular learning field. Thus, it is necessary to analyse each occupational task. Normally, each occupational task should ideally be analysed three times at different work places.

Choosing work place

- For the 2 first occupational tasks work places were chosen at 3 new houses, all without a power supply.
- For the next 3occupationaltasks we choose the houses workers were already working there.
- In the last 2 occupational tasks houses were chosen featuring an electrical system that was either out of order or in need of maintenance.

Establish the analysis team

- The analysis team consists of 12 people made up of lecturers at Namdinh University of technology education (NUTE), teachers at vocational training school No 20 and highly skilled electricians.

- They were separated into 4 groups, each group consisting of 3 people.
- The following 5 duties were to be accomplished by the group during the analysis:
  - Observation
  - Interviews
  - Taking minutes or notes (using keywords)
  - Taking pictures and making sketches
  - Ensuring the necessary work materials were available (e.g. drawings)

Preparing tools to be used in research

To obtain the best analysis results, these questions were asked during the analysis:

- What work process is the occupational task integrated into?
- At which workplace is the task to be carried out?
- Which objects will be worked on for this specific task?
- What tools, methods and organizational forms will be implemented?
- What demands on skilled work have to be met and at which site?
- Are there interfaces with other occupational tasks?

III. Implementation

The group was assigned the task carried out from20thto 25thJuly2013.

To analyse each occupational task we used the category to support as an instrument. Here is a list of the requirements that needed to be met:

- Occupational task: give the name of occupational task (8 tasks)
- Workplace: describe the workplace to provide knowledge of environment conditions.
- Business and work process: this section focuses primarily on market issues and methods for warehousing, goods, issues related to the economy, and what the result of the labour process creates.
- Work task object: describes the work context and the work process and the object of work in the work process
- Tool, methods and organization of work: the context of the work process is crucial when describing the tools and means of skilled work. Issues are taken into account such as what equipment to use and how it can be used to accomplish this task; the way to do the job? How organizations work.
- Demands made on skilled work and technology:
- Interfaces: occupational tasks are allied to other tasks in practice. They usually closely tied to other tasks the skilled workers accomplish. Here one can also reflect critically on the analysis results of an occupational task analysed at another workplace. Thus in this section we must discover what the relationship is to other occupational tasks.

IV. Results.

Following analysis work we gathered the detailed analysis of each occupational task. The pertinent content is described as follows:

1. Occupational Task A

Occupational task name:

Surveying the site (reading blueprint, surveying the site)

Workplace:

This work takes place at the site (house) .The selection of apartments in same areas and different areas where the work is carried out by different workers.

Business and work process:

Based on the information obtained in the first step, the workers read blueprints and discussed with each other, during the drawing and graphics process, the preliminary and necessary modifications from their fieldwork consultations with one another. Both the drawings and the detailed plan were then displayed to the division leaders/groups, who make the decisions on work continuation. The final results were then presented to the host or client who offered comments and expanded upon them if necessary.

Objects of the work task:

drawing construction documentation offers an overall solution for electrical installation. The construction documents, especially the blueprints, are the guideline for all the following construction processes. They also provide the standards by which quality control is carried out.

Tools, methods and organization of work:

The drawings for rendering and blueprints were done with tools such as -

T-square, triangle ruler, protractor; work is normally divided between several workers. First they complete the documents in line with technical standards, then the group leader analyses the following.

Demands made on skilled work and technology:

It is extremely important to understand the blueprint via drawings combined with practical survey. The workers must be able to give the exact location of the device and the appropriate wiring and choose the most efficient plan of execution.

2. Occupational task B

Occupational task name:

Preparing materials, tools, equipment

Workplace:

This work either takes place at the site (house) or at the electrical shop.

Business and work process:

Workers must make a list of all the materials needed for the installation and repair by reference to the drawings and the current conditions of the construction. They have to list the necessary components, marking the name and number to arrange components, listing all its specs, taking into account cost and

accuracy. The prices of all materials will be calculated thus cost is taken into account while the list of supplies and equipment is being prepared.

Objects of the work task:

The work object here is the list of the materials and their prices. Both economic and the technical aspects are to be taken into account. Making the list determines the materials to be used and informs on the overall cost of the entire construction and therefore an estimation of profit.


Checking and collecting materials in shop

Tools, methods and organization of work:

The basic tools needed are simply paper and computer. One thing must be remembered: the number of listed materials has to take into account the losses required in the construction process, different materials have different losses. All this will affect the price of the entire work. Using computer software is an essential support here.

Demands made on skilled work and technology:

Workers performing this task must have good expertise in dissection drawings, an understanding of the types of materials and equipment, including: technical specifications and the price of each item and the potential losses incurred during construction. As well as taking into account the profits gained through the process and methods of construction.

3. Occupational task C

Occupational task name:

Installing (electrical equipment in the house)

Workplace:

This work takes place at the site (house) .The selection of apartments in same areas and different areas where the work is carried out by different workers.

Business and work process:

Workers have to read blueprints carefully, investigate all components and units shown on a tight design. They should also discuss with the designers of the project to obtain a deeper understanding of it design their own work better. In some cases, workers can apply a different approach to the installation meaning there may be slight differences between the actual installation and detailed plan. Overall, however, functionality and performance applications remain the same.
While cutting the electrical wires, marked for mounting equipment, workers have to calculate the size and mark them on the table standards. This has to be done in as brief a way as possible. Then the workers look and see how construction to begin their work done.

Depending on different devices one can analyse previous wiring or installation of equipment. Ask questions such as how has it been wired? In fact, the way electrical wiring may have been carried out: wire rope stuck in the wall or floating in plastic tubes.

Each device has a different capacity, for different uses, so conduct or size may vary.

The equipment installation location can sometimes change according to the actual conditions and requirements of the owner.

You must claim the right to save as much material as possible.

Objects of the work task:

The object of the installation process is the installation of electrical equipment ensures the wiring is correct and suited to the reasonable requirements of the user

Electrical installation in process

Tools, methods and organization of work:

Employees must use construction tools such as drilling machines, coating, cutters, types of pliers, scissors, screwdrivers etc.

During installation workers often have to read the drawings. Where necessary, the worker must ask the designer or landlord how to obtain the best installation.

The distribution of tasks and work organization depends largely on the volume or the complexity of the installation. Sometimes a number of small installations can be done by a single employee, but in some cases, such as numerous installations, installing heavy equipment, a difficult location, or danger, means the work has to be coordinated by a number of workers.

Demands made on skilled work and technology:

To do a good job the workers must have the following basic skills: reading skills, drawing skills, using tools and equipment, skill and experience in construction, practical abilities and security occupational

safety and teamwork competence. Workers must be cooperative with other units such as the construction team. Saving and preserving materials is vital.

4. Occupational task D

Occupational task name:

Checking (after installing, to repairing)

Workplace:

This work takes place at the site (house) .The selection of apartments in same areas and different areas where the work is carried out by different workers.

Business and work process:

The test is done upon completion of the installation or when repairs are required or maintenance in the electrical system.

Upon completion of the installation, the inspection is carried out to determine whether the installation is good or not. Testing can be done in the following ways: observing the location and installation of equipment, use a multimeter to measure resistance and obtain short circuit measurements of each device or the system, measure the voltage when system has been electrified. Remember, the measurement and test systems in the power supply status are only done after the system has been measured and its condition checked without electricity.

Experience shows that after each part has been installed, it should be checked immediately rather than leaving and performing the test after completing the entire system.

Objects of the work task:

Here the tests mainly measure the insulation resistance and the circuit status of each section of the system. Voltage and current is measured when the system is working.

The purpose of the test is to check the safety of the system for damage and the danger of electrical shock.

Tools, methods and organization of work:

Measuring instruments, test here is based primarily on a multimeter, megommet and clamp. However when testing and measuring performance, a combined analysis of drawings is essential in finding out where to carry out the test.

When more than one measurement or test is necessary to record the results and note them.

Results of test measurements allow us to conclude the status of the electrical system.

For some complex measurements or distances between the measuring points it is necessary to cooperate with the other workers.

Demands made on skilled work and technology:

To perform the test, the worker must have the skills to use the instrument, be able to read the results and determine they are accurately measured, and be in possession of the theoretical knowledge and experience to make adequate conclusions on the results of measurements.

5. Occupational task E

Occupational task name:

Calibrating (correcting all parameter as standard requirement)

Workplace:

This work takes place at the site (house) .The selection of apartments in same areas and different areas where the work is carried out by different workers.

Business and work process:

After the system is installed, system calibration is necessary. The work is done to adjust the parameters of devices in the system to meet the device requirements and the user's needs.

- Adjusting and positioning the installation of equipment. For example, low level flight bulbs, correct location for power switches.
- Edit specifications, the output parameters of the system that work. For example, the temperature of the hot water, the effectiveness of the lighting equipment and the range of protection met by the safety equipment.
- Other things can arise in a room such as a device that changes, (fitting) after installation and the power supply requires (fitting) a greater capacity, and the position of the power switch is no longer adequate and it cannot operate.

Objects of the work task:

Major correction tasks are to do with the position of the system or device, or the parameters of the system. Sometimes they need to be adjusted to the particular user's needs.

Tools, methods and organization of work:

In modifying systems the tools mainly used are construction tools and the measurement devices.

Typically this is done by skilled workers who have experience in construction. However, in many cases collaboration with other workers is required as the calibration measurements of the systems usually have power status.

Demands made on skilled work and technology:

In modifying systems the worker must have a good knowledge of the power supply system and the use of proficiency testing instrumentation. Workers must have a sincere attitude and a willingness to cooperate with any request for correction. In certain cases modifying the system may affect other aspects and it is vital here to cooperate well to ensure knowledge of what may be altered in the modifying process.

6. Occupational task F

Occupational task name:

Operating and transferring (to the owner)

Workplace:

This work takes place in the site (house) now ready for use.

Business and work process:

The operating system and handover of power supply is necessary as it is directly affected by the use of the landlord.

The handover has to comply with the scheduled agreement. If something affects progress it must be reported to the project owner or landlord to discuss a solution.
During the handover process attention must be paid regarding the handover of the operation for each device.

The handover operation helps home owners understand the system and how to operate the system safely. This is even more important when the owner is elderly

To avoid future problems the workers noted it necessary to include a guide for home owners to handle the electrical system should a malfunction occur.

The right hand over should include technical documents. Those afterward may not know where the power lines are under plaster work and can drill through them risking electrical shock.

Objects of the work task:

The object of the operation was to hand over everything home owners needed to obtain from the electrical workers. Everything records on paper have to be handed over. How was the operation experienced by you, note what you use. Do not hesitate to ask the landlord for what is needed or not required. Remember you are dealing with a very important person who will pay you and introduce you to your new job.

Tools, methods and organization of work:

All operation tools are handed over and the skill used is handed over in explaining the knowledge implemented. Here you canal so implement the drawings for the owner's reference to prove that you have done a good job. The main tool here is the use of sincere and correct words that is to say your attitude which must be social and pleasantly communicative.

Demands made on skilled work and technology:

The operation results are handed over the precise location and time. The workers should have a good knowledge and understanding of the entire system after installation. Should a home owner ask: why does this wall not have a power socket? I wanted drill to hang an ornament and it is not in place? How would you answer if you are not equipped with a full knowledge of all the tasks?

When workers operate correctly the must be capable of dealing with each device. Meticulous guidance must be available if needed.

7. Occupational task G

Occupational task name:

Repairing (after using)

Workplace:

This work takes place in the site (house) here you should select a house where problems in the electrical system had to be dealt with.

Business and work process:

The work was conducted while repairing a certain problem. The worker has then to conduct the following tasks:

- -Ask the landlord how the damage was incurred?
- -Refer to the drawing or not? Alternatively you can ask the landlord for the location of the basic installation, circuit breaker, wiring and so on.
- -Conduct a preliminary check for damaged parts and make a detailed inspection to locate damages to equipment or installation.
- -Find ways to treat the repair or replace equipment or damaged cable-Make test measurements to determine the state of the system after repair
- -Supply power to operate and hand over
- Remember the landlord requested the repair and it is very important to deal with the problem quickly.

Objects of the work task:

The object of the repair is household electricity use. Damage to the electrical system normally occurs for a number of devices as follows:

- -A power switch is burnt out
- -Lights are damaged in the course of time, or by certain cables have been broken
- -The socket contacts are not good and cause electric fire.
- -Fire can occur through too large loads carried through electrical conductors or circuit breaker protection causes these effects.

Tools, methods and organization of work:

Electrical repair tools are: measuring instruments, testing and construction tools, technical drawing documents.

The landlord must know what caused the failure.

Demands made on skilled work and technology:

To be able to carry out responsible electrical repair workers must have the following skills:

- Good communication skills in asking what may have caused the damage
- Be capable of measuring and testing to get down to the cause
- Read drawings and give reasons for his/her judgement
- Select the most rapid recovery plan so the family is not without power for too long.

8. Occupational task H

Occupational task name:

Maintaining (keeping the system in good working order)

Workplace:

This work takes place in the site (house) or at the electrical shop

Business and work process:

In the profession "electrical installation" maintenance tasks are very important and equipment itself has to be maintained for long term work. Maintenance work is usually done within a certain time period. Thus it can be classified into regular maintenance (after a short period of time) and periodic maintenance (after a longer period of time has elapsed).

To perform maintenance workers need to have the following skills:

- Identifying equipment and maintenance intervals
- Developing maintenance plans
- Performing scheduled maintenance
- Operation and maintenance handover after work is completed

Objects of the work task:

The maintenance work of electrical systems is manifold and can include:

- Maintenance of equipment such as electric motors, exhaust fans, cooling fans, water pumps. When maintenance work is clean of dust, grease the dock ball bearings or replace when necessary.
- Rinse water heaters, heat panels ensure they are clean.
- Adjust the exposure, clean contacts in the socket, switchgear
- Replace old lamps bright new ones
- Check wire connections, particularly between different conductive materials

Maintenance work associated with an incident requires the knowledge of the life expectancy of each device

Tools, methods and organization of work:

Tools to perform maintenance tasks:

- Pliers, scissors, screwdriver, multimeter, and such basic materials as oil, and grease for instance.

- The maintenance of equipment required by the host means servicing water pumps, exhaust fans, light bulbs
- Construction equipment safety.

Demands made on skilled work and technology:

To maintain electrical systems properly in the home electrical workers must be capable of the following:

- Good communications skills when asking if anything unusual occurred in the system or not?
- Finding the required maintenance items
- Developing a maintenance plan
- Performing scheduled maintenance
- Selecting the fastest maintenance plan(most essential)

V. Experiences

Through implicated "work process analysis" the method used to analyse the occupational tasks. The NUTE team came across a few problems:

- The survey group is relatively consistent as it comprises all the related components lecturer, vocational teacher and electrician
- The occupational survey group is made up appropriately but finding the required construction workers survey is difficult.
- Due to survey time being short some subtasks were without surveyors.
- At the time of the survey workers often perform a predetermined action, so observations cease at a certain level
- The workers do not like answering questions while doing their job
- The results we obtained are important for a number of issues that are very useful for building programmes. These are: reading and analysing drawings which is almost mandatory in nature for if the worker cannot read drawings they are only servants and cannot carry out the work themselves. Further to the skills required of workers the school should give more training during the training process. The way the workers are organised works very well, they did not acquire that in the training process but only from experience (They say they only know what is the fastest as the best)
- Through the survey, we also found a working environment that often depends on the weather and location of construction and is a very difficult environment wholly unlike the students' practical environment in the workshop. Thus we obtained answers to questions such as „Why do graduates, new people on the job say that the work is so hard" this explains why so many people missed out on job opportunities as they could not become accustomed to the working environment.
- Through research, we found this method has many advantages because the result revealed the real problems.

4.4.3 Summary

A. Discussion of the Experiences

During the implementation of the subject, we were compelled to engage and exchange and thus learn from the experts in the framework of the RCP,. All of whom were colleagues in the field at home and abroad involving the workers, companies and enterprises. In the process we faced many of the advantages and disadvantages, but found ways to overcome difficulties and complete the project. Here we would like to share some of those experiences had on the project:

Documenting the first study received from the sending partner. Talking to the members of the group to do the task and assigning specific tasks to each member. The task does not clearly discuss things prior to construction work done for the purpose of avoiding false directions leading to wrong results.

The invited experts attending the workshop to introduce the purpose of the seminar held exchanges they were open and sincere. One should introduce oneself clearly when working in public institutions. The desire is to build training programmes linked to actual and specific needs. There for those invited to participate in workshops or interviews participate enthusiastically as they can really see the contribution they make to society.

To use the project team to create a relationship with vocational training institutions, companies, people in job-related topics. For work group sessions in factories, apartments, skilled workers must make an appointment in advance to schedule a proper survey.

4.4.4 Conclusion

The combinations of all three methods provided by the instrument CB8 project is a very suitable choice. This can easily be seen through the logical structure of the analysis process results. We found the following:

OSA method gives us an overview of training needs analysis and the occupational task that follows results in the workshop method after consultation with experts, and in conclusion the detailed analysis of each task can be gained from the WPA method.

Through the implementation ofP9topicswe have learned valuable lessons:

- Surveying the real needs of human resources for the domestic electrical installations in the areas we are active in.
- We can organize a successful career analysis of certain related subjects.
- Develop a core mission for a vocational career in domestic electrical installations.
- Contribute to modifying training programmes to suit real social requirements in vocational training institutions.
- Establish a relationship between the companies, skilled workers to the training facilities.
- From trade analysis of "domestic electrical installation" we can organize job analyses for other related professions.

Through the research and application of tools for the professional analysis of „domestic electrical installation" we have obtained very positive results. The benefits are a meaningful professional

development of the participants as well as promoting relationships and lasting cooperation between countries in the region in career training for teachers creating jobs and generating a technical workforce.

4.4.5 Recommendation

Resulting from participating in the research conducted for P9, NUTE, as a member, suggests the following topics:

1-P9contenttopicsmainlyfocused on the application of the method for analysing specific job analysis processes so it only exists at certain levels.

As we invite people to participate in research, NUTE is very keen to get to the bottom of things and really find job analysis details instead of rather than stopping at the application level method. For this, we hope UPI continues to deepen this subject which will help participants to accumulate the experience for organizing occupational analysis.

2-Whenparticipating in research projects in the same forum, the contents and the list of members of the country should also posted on the RCP website. This will help other members understand information and enhance the exchange of information via forums. Mr Hung for instance puts up threads of P9 involvement, thus other people in the country wanting to find out about job analysis may contact Mr Hung and learn of them. This will make the forum more widely known and promote the forum's role significantly.

4.5. Description Of UNY Experience

4.5.1 Introduction

A. Background

Electricity cannot be separated from our daily lives. Almost equipments around us needed an electricity to operate them. In Indonesia, electric energy supplies are carried by the State Electric Company of Indonesia (Perusahaan Listrik Negara - PLN Persero). There are six groups of electricity users, namely: residential users, commercial users, industrial users, lighting utilities, social users, and government users. Data of PLN (2012) can be shown the percentages of electric energy consumption of the six groups of energy users respectively are residential users by 41%, commercial users by 18%, industrial users by 35%, lighting utilities by 2%, social users by 3%, and government users by 2%. Those data indicated the residential electricity users ranked in the first level compared to the other. This means that the occupational associated with the residential electric need to be studied in depth, primarily on residential electrical installations.

Initial studies obtained information that there are three occupational types of residential electrical installation, namely: (1) small house electrical installations, (2) middle residential electrical installations, and (3) luxury house electrical installations. Furthermore, the power supply utilized to each group of residential installation can be distinguished into three groups respectively, namely: (1)

450 VA - 2200 VA, (2) 3500 VA - 5500 VA, and (3) 6600 VA in upwards. The detail identification of those occupations will be described in the further chapter.

B. The Objectives

These objectives of preliminary occupational study on residential electrical installation workers are:

1) Conducting the expert workers workshop on residential electrical installations.
2) Identifying an occupational task based on the results of those workshop activity.
3) Preparing a curriculum development analysis for residential electrical installation occupation using DACUM and DCCD approaches.

4.5.2 The Expert Workers Workshop On Residential Electrical Installation

A. Workshop Activities

Before the workshop activities undertaken, the researcher team, as facilitator, had prepared the supporting documents needed in the workshop activities, include: invitation to expert workers, designing workshop activities, preparing the occupational analysis draft of residential electrical installation, and other administrative activities. The workshop was conducted on July 8th, 2013, starting from 8.00 am until 13.00 pm, and located at room meeting of Faculty of Engineering, Yogyakarta State University (YSU).

Opening Speech of the Workshop by Dean

Using Invitation letter from Dean of Faculty of Engineering YSU, 11 expert-workers of residential electrical installation participated on the workshop. The name of participants are attached in Appendix 1. The workshop was opened by Dean of Faculty of Engineering YSU then continued the explanation of direction and purposes of workshop by the research team. To explore residential electrical installation on this workshop, the discussions also are conducted. The agenda of this workshop can be shown in Appendix 2.

Workshop's Participants

B. Method of Workshop

To optimize the results of the workshop, after describing expected results of workshop, participants were separated into three discussion groups according to their expertise and experience. The three discussion groups were namely residential electrical installation for: (1) small house, (2) middle house, and (3) luxury house. Each group discussed intensively related to their occupational sector that had guided using a professional task instruments that prepared by facilitator.

The participants should be given remarks using the symbols (+) or (-) into the different occupational tasks on the prepared instruments. Participants choose the remark or check by symbol (+) means that the occupational tasks are appropriated to apply or cannot be applied by symbol (-). The results of those discussions can be read in detail on Chapter III.

4.5.3 The Results Of The Workshop

A. Classifications of Residential and Electric Power Supply

According to the government regulation of Indonesia, residential electrical installation communities can be classified into three groups, i.e small house, middle house, and luxury house. A small house is a dwelling place that habitable and affordable by people who got low and moderate salary. Usually, a small house has specification of a floor area around of 36 m2 or less; type of flooring was tile or ceramic; walls made of concrete block or plastered brick; ceiling covered by plasterboard or polywood; roof truss made of wood; roof covered by asbestos waves, ordinary tile, or zinc; and be utilized electric power supply from 450 VA until 2,200 VA. An example of small house layout and electrical wiring installation can be shown in Appendix 3.

A Small House Building

A middle house is a home which was built on land plots with an area of 54 m2 until 600 m2. A specification of middle house almost similar to a small house and be installed with electric power supply from 3,500 VA until 5,500 VA. An example of middle house layout and electrical wiring installation can be shown in Appendix 4.

A Middle House Building

A luxury house is home built on plots of land with an area of 54 m2 until 2,000 m2, located in an elite region, and has specification type of flooring: tile, marble, granite; walls: plastered brick or reinforced

concrete; ceiling: plasterboard or gypsum reinforced concrete plate; and roof: concrete tile, tile glasur / ceramic, reinforced concrete slab; and be completed with electric power supply from 6,600 VA or more. An example of luxury house layout and electrical wiring installation can be shown in Appendix 5.

A Luxury House Building

B. Occupational of Residential Electrical Installation

Results of expert workers workshop can be concluded to classify the occupational task of residential electrical installation into two groups of electrical installation, i.e.: new electrical installation works and extended electrical installation works. Each of those occupational tasks had categorized into three tasks, namely: (1) electrical installation for small house, (2) electrical installation for middle house, and (3) electrical installation for luxury house. And, each group divided into five tasks, i.e.

1) Lighting installation.
2) Cooling installation.
3) Heating installation.
4) Motoring installation.
5) Protecting and security system installation.

Furthermore, each of tasks can be decomposed into five learning areas, i.e.: planning, constructing, operating, maintenance, and inspecting.

The detail task for each type of house as mentioned on Table 1 and respectively learning area on Table 2, 3, and 4.

Table 13: **Confirmation results of professional task and task on residential electrical installation**

Task/ Proffesional Task	Small House	Middle House	Luxury House
Lighting installation	+ (installed)	+ (installed)	+ (installed)
Cooling installation	+ (optional)	+ (limited)	+ (installed)
Heating installation	+ (optional)	+ (limited)	+ (installed)
Motoring installation	+ (optional)	+ (installed)	+ (installed)
Protecting and security system installation	+ (optional)	+ (limited)	+ (installed)

Table 14: **Learning Areas for Small House Electrical Installation (New and Extended Electrical Installation)**

Task/Proffesional Task	Planning		Constructing		Operating		Maintenancing		Inspecting		Remark
	New	Ext	New	ext	new	ext	new	ext	new	ext	
Lighting installation	+	+	+	+	+	+	-	+	+	+	optional
Cooling installation	-	+	-	+	+	+	-	+	-	+	optional
Heating installation	+	+	-	+	+	+	-	+	-	+	optional
Motoring installation	+	+	+	+	+	+	-	+	-	+	optional
Protecting and security system installation	+	+	+	+	+	+	-	+	-	+	optional

The detail of learning areas for the small house electrical installation (new and extended installation) for planning, constructing, operating, maintenance and inspecting can be shown in the Appendix 6.

Table 15: **Learning Area for Middle House Electrical Installation (New and Extended Installation)**

Task/ Proffesional Task	Planning		Constructing		Operating		Maintenancing		Inspecting		Remark	
	New	Ext	New	Ext	New	Ext	New	Ext	New	Ext	New	Ext
lighting installation	+	+	+	+	+	+	+ (testing)	+	+	+		
Cooling installation	+	+	+	+	+	+	-	+ (periodically)	+	+	limited	
Heating installation	+	+	+	+	+	+	-	+ (periodically)	+	+	limited	
Motoring installation	+	+	+	+	+	+	-	+ (periodically)	+	+	limited	
Protecting and security system installation	+	+	+	+	+	+	-	+	+	+	limited	

Note: maintenance including checking, repairing, and spare part replacing

The detail of learning areas for the middle house electrical installation (new and extended installation) for planning, constructing, operating, maintenance and inspecting can be shown in the Appendix 7.

Table 16: **Learning Areas for Luxury House Electrical Installation**

(New and Extended Installation)

Task/ Proffesional Task	Planning		Constructing		Operating		Maintenancing		Inspecting		Remark	
	New	Ext	New	Ext	New	Ext	New	Ext	New	Ext	New	Ext
lightning installation	+	+	+	+	+	+	+ (testing)	+ (checking)	+	+		
Cooling installation	+	+	+	+	+	+	+ (on scheduled)	+ (on scheduled)	+	+	installed	installed
Heating installation	+	+	+	+	+	+	+ (on scheduled)	+ (on scheduled)	+	+	installed	installed
Motoring installation	+	+	+	+	+	+	+ (on scheduled)	+ (on scheduled)	+	+	installed	installed
Protecting and security system installation	+	+	+	+	+	+	+ (periodically)	+ (periodically)	+	+	installed	installed

The detail of learning areas for the luxury house electrical installation(new and extended installation) for planning, constructing, operating, maintenance and inspecting can be shown in the Appendix 8.

A. Further Occupational Analysis of Residential Electrical Installation

After finding those of occupational maps of residential electrical installation, the next occupational analysis of residential electrical installation will be focused on developing a curriculum using DACUM and DCCD approaches.

5 Discussion Of Findings From Pilot Application

5.1 Comparative Analysis And Result

The research project is first and foremost not intended to develop vocational curriculum as its goals, but rather to bring the researchers involved in the implementation the methods of occupational competence need analysis. Thus, the result discussed in this chapter does not much deal with the output of the analysis, which is job profiles of wood construction and domestic electrical installation. Hence, the finding and experiences obtained from the research process will be the focus of explanation of the chapter.

The following description of results in this chapter will present some valuable practices demonstrated by RCP-P9 research partner during their pilot project of competence need analysis. Facts and findings explained in this chapter are not meant to criticize the way the research teams applied the method and how the result look like. It is rather to describe experiences of the pilot project, from which readers can get insight about the process of competence need analysis and get some valuable lessons.

Two main domains will be highlighted in the chapter in a comparative way, which are:

- experiences acquired from the application of selected method for competence need analysis; and
- some aspects with regard to the results of undertaken research which are written in country reports. Furthermore, information collected during seminars which held before will be referred.

In the end the explanation in this chapter should give an overview about similarities and differences of the methods application with respect to various contextual aspects of respective partner countries.

5.1.1 Application Of The Methods Of Occupational Competence Need Analysis

Methods and Approach of Work

For the application of selected method for the analysis of occupational competence needs a set of methodological instrument has been developed by Dittrich (2013) as project advisor at the UPI. The development of the instrument was based on the methodological instrument of DCCD project developed by University of Bremen (Dittrich, 2008). The tools provide detailed and clear guideline for the execution of the research. Despites these guidelines the research could and should be undertaken with respect to the given circumstances and cultural setting of respective partner countries. This means researchers can apply certain work approaches and strategy to reach their goals. Nevertheless the basic design of the methodology such as the sequence of the methods application with its respective instruments remains to be unchangeable. Otherwise it could lead to some deviation of the expected research outcome.

Based on the submitted country reports it was indicated that some partner institutions have applied bit different work approach in their research process than it is supposed to be. One of the obvious

cases is shown by the research team of Tongji University. The team has, for instance, organized the expert workers workshop in the work place of the workers Instead of getting them together in any place outside the workshop like the default of instruments required. The researcher interviewed the workers directly in a work situation. The application of such approach is understandable due to the tight schedule of the workers, which is not allowed them to leave their workplace. Somehow, such research organization is not really of the advantage. It can lead to the reluctance of the workers to freely explore and explain their work profile due to their work activities that they have to perform in the same time. Furthermore the interview might be undertaken under supervision of their employer. This can lead to subjective opinion. However, this strategy was chosen due to the limitation of researcher to get in touch with the workers.

Another critical practice according to the report and discussion among the researcher was the way of researcher in grabbing and explore information from expert worker, when they described their occupational profile. The practice was demonstrated by the research partner from Yogyakarta (UNY).

It was expected that researchers provide a wide communication space for the expert worker to illustrate what they do, how many and what kind of tasks make up their occupation. By profiling their job by themselves the researcher position the worker as a subject in the communication process and as main source of the information. With this approach the researcher should obtain much more accurate, actual and original information about the current job profile of the worker. The approach applied by the colleagues from UNY was deviated from the guideline, and this is indicated in the following statement of their report:

"Before the workshop activities undertaken, the researcher team, as facilitator, had prepared the supporting documents needed in the workshop activities, include: invitation to expert workers, designing workshop activities, preparing the occupational analysis draft of residential electrical installation, and other administrative activities."[4]

*"...Each group discussed intensively related to their occupational sector that had guided using a professional task instruments that prepared by facilitator. The participants should be given remarks using the symbols (+) or (-) into the different occupational tasks on the prepared instruments. Participants choose the remark or check by symbol (+) means that the occupational tasks are appropriated to apply or cannot be applied by symbol (-). "*5

The two statements indicated that before running the discussion, the invited workers were provided with a draft of occupational analysis by the facilitator. This draft contains a number of related job tasks, which should be discussed among the workers and facilitator. By using such approach a facilitator has indirectly provided a fix framework of thinking and dictated the discussion of the workers which in the end do not let them independently describe their job tasks.

Another valuable experience obtained from the research was the way to define job occupational tasks. The research instrument has suggested or instructed to split an occupation into about 8 to 12

[4] Project Report of UNY, P. 3
[5] Ibid, p. 4

core occupational tasks. The instruction did not come along with an abstract definition about how to determine an occupational task. This abstraction has led to differ interpretation among the researcher. As an output of the differ interpretation we can see some different conception of occupational task. It can be found e. q. in the report from UNY, whereby the researchers define occupational tasks not as activities performed by the worker in real work situation. Instead, they define it as abstract categories of task, which still do not represent real work activity which deliver information about what to be performed and executed by a worker in their workplace. an example to this case is show in the following statement:

"....Each of those occupational tasks had categorized into three tasks, namely: (1) electrical installation for small house, (2) electrical installation for middle house, and (3) electrical installation for luxury house. And, each group divided into five tasks, i.e.

1) Lighting installation.
2) Cooling installation.
3) Heating installation.
4) Motoring installation.
5) Protecting and security system installation."

Now we can compare the division of tasks above with the following breakdown of occupational profile developed by NUTE, which analyzed occupation field was the same, which is domestic electrical installation:

List of occupational tasks and it's subtasks

Table 17: **List of occupational tasks and it's subtasks**

No	Task code	Tasks and subtasks
	A	**Survey the site**
1	A01	Reading blueprint
2	A02	Survey the work place
3	A03	Choosing working method
	B	**Preparing material, tool, equipment**
1	B01	Getting material, tool
2	B02	Checking the amount, parameter of materials
4	B03	Checking the number ,parameter of tool
	C	**Installing**
1	C01	Installing lighting equipments
2	C02	Installing safe equipments
3	C03	Installing cable
4	C04	Installing motor (ventilating, pumping...)
5	C05	Installing control box
	D	**Checking**
1	D01	Checking installation
2	D02	Checking without power supply
3	D03	Checking when power supply
	E	**Calibrating**
1	E01	Calibrating lighting system
2	E02	Calibrating safe system
3	E03	Calibrating motor system
4	E04	Calibrating control box
	F	**Operating and transferring**
1	F01	Operating and transferring lighting system
2	F02	Operating and transferring safe system
3	F03	Operating and transferring motor equipments
	G	**Repairing**
1	G01	Repairing lighting system
2	G03	Repairing safe system
3	G05	Repairing motor system
4	G09	Repairing control box
	H	**Maintaining**
1	H01	Maintaining lighting system
2	H02	Maintaining safe system
3	H03	Maintaining motor system
4	H04	Maintaining control box

The comparison shows an obvious discrepancy. While the first conception of occupational task is not saying about what to do in occupation, the second one gives already the information about real activities a worker must execute in workplace.

Good understanding of researcher about such basic conception is pretty crucial in doing this research, since the research costs much money and energy.

Organization of Methods Application

The success of the work on occupational needs analysis is obviously dependant on the way researchers organize the application of predetermined methodology. Hence, it is very advisable that researchers do the best to understand and follow the instructions prepared in the research instrument, so that certain deviation of the research result can be minimized. Thereby, the results will have high grade of reliability and validity. Nevertheless every research design is limited by various influencing factors and resources, such as time, money, working environment, cultural setting, etc.

In case of the UPI the research was organize so, that the team was able to bring a number of expert workers from several furniture companies together to attend expert workers workshop.

The attending carpenters are the ones that possess experience in the wood furniture-making industry. FPTK UPI invited eight expert carpenters to the workshop. Those carpenters are specializing in the making of furniture, with various materials from wood. They were coming from 4 different companies, all of them are in the scale of home industry (small to medium scale industry).

The number of invited companies plays a role in enriching information and data to be collected. It also indicates the depth of obtained information which makes the results more reliable. However, all of the invited companies come from small-class or home-industry companies, which cannot really represent the big picture of the furniture industry in Indonesia with its complexity. Nevertheless, during the piloting of expert workers workshop and work process analysis the workers were cooperative and actively engaged, so that they could provide all constructive information about their occupational profile, which we targeted to.

In the case of China, there was only single furniture company visited by the researcher, since the furniture companies as informants or respondents were reluctant to get involved in the research

"It has been very difficult finding the expert workers in wood furniture industry. First attempts were unsuccessful. We have tried to get in touch with factories/bosses of some small workshops through the furniture shops near university. However, because the owner of the shop does not know us very well (despite the fact that I have bought furniture of over 1000 Yuan at the shop), she could not offer me very strong support."

The very limited number of researched workplaces determines the grade of representativeness of collected data. Theoretically, the bigger number of research sample[6], the more representative the result of a research.

5.1.2 Results Of The Methods Application

By means of the research instrument developed by Dittrich (2013), the P9-Research project conducted by partner's institution from several Asian countries was designed to yield relative homogenous and comparable results, which constitutes a modality for the development of TVET curriculum in the respective partner countries.

However the results bundled in country reports indicated some different output of the research. In the following part the differences will be briefly described with the purpose that it would become a reference for better work in the application of the three methods of competence needs analysis described in the chapter of research methodology.

Differences of Occupational Profiles and the Depth of Research Results

Most of the occupational profiles obtained from the research project were reported in the similar direction as proposed. Among the indicators is the profiling of occupational tasks, which all together form an occupation.

[6] Sample, which fulfills research criteria

The table below shows the comparison of core tasks of the occupation "cabinet making", which was selected by UPI and IBB Tongji as a sample:

Table 18: **Comparison of core occupational task in cabinet making**

Comparison of core occupational task in cabinet making		
	Indonesia	**China**
TASK 1	Marketing and Promotion	Finding out and understanding the requirements of the client
TASK 2	Design	Drawing and revising blueprint
TASK 3	calculating the cost calculating the cost	making list of materials to be processed
TASK 4	procurement of materials	purchasing materials
TASK 5	furniture shaping	Cutting the wood planks/boards, making all the components and units
TASK 6	Finishing	painting the surface
TASK 7		assembling
TASK 8		Painting, surface treatment
TASK 9		Quality control

The table above shows a similarity of the occupational profile of cabinet making in both countries, in term of number tasks sequence. The number of the tasks looks different. However, the basic principal of the task is similar. Task 5, 6 and 7 in Chinese version is actually included in task 5 of Indonesian version. The same case is also applied to the task 9 in Chinese in comparison with task 6in Indonesian version.

As depicted on the table, the titles of each task are different. However, the essence of the task is relatively similar. A deeper insight to respective tasks, like shown in the following figure, shows more both similar and different aspects of the core tasks:

Sample of Task Description in China

Table 19: **Sample of Task Description in China**

<table>
<tr><td>Learning area 1</td><td>Title of the professional task
Finding out and understanding the requirements of the client</td><td>Duration :
Depending on the type of tasks; ranging from 1 hour to 2 days.
Workplace:
by client</td></tr>
<tr><td colspan="3">Description of the occupational field of the activity
Paying attention to what the clients talk about their requirements, helping them describe accurately what they want; understanding their expectations and demands concerning the products</td></tr>
<tr><td colspan="3">Contents of work and learning</td></tr>
<tr><td>Objects:
Understanding requirements of the client, determining the materials and structure of the furniture.</td><td>Tools:
Pen and paper.

Methods:
Dialogue with client, guiding clients with words, understanding the implicit wishes, basic measuring

Organization:
In large companies, normally conducted together by personnel from business department and design department; in small companies, oftern conducted by the boss with the assistance of a technician.</td><td>Demands:
The clients expect the workers to be communicative and professional. Bad impression of the workers can be harmful for the business.
Accurate and professional understanding of the wishes and demands of the client is crucial to the success of entire project.</td></tr>
</table>

Sample of Task Description in Indonesia

Table 20: **Sample of Task Description in Indonesia**

<table>
<tr><td>Core Working Task1</td><td>Title of the professional task
Marketing</td><td>Duration :
Depending on the client
Workplace:
in the workshop, in exhibition, meeting directly the clients in various places</td></tr>
<tr><td colspan="3">Description of the occupational field of the activity
Marketing was done by traditional way and modern way of marketing incorporating information technology. Marketing done through words by mouth, participating in the exhibition, distributing name cards to potential clients, updating company portfolios, or discuss projects with potential customers. Marketing process also done through online media, by updating company website, campaigning using social media, and communicating through email.</td></tr>
<tr><td colspan="3">Contents of work and learning</td></tr>
<tr><td>Objects of work:
Understanding the demand of specific client and recent market trend/style of furniture</td><td>Tools:
Website, flyer, name card, email account, portfolio of previous works.

Methods:
Promoting through website, promoting through participating in the furniture exhibition, through word by mouth of previous clients,

Organization:
In small/medium size companies, often conducted by the boss with the assistance of other designer/carpenters.</td><td>Demands/requirements:
The clients requires the carpenter to be communicative (abundant communication skill), assertive, utilize various promotion and marketing media, knowledge in information technology. The carpenters need to be able to give design ideas to enrich the ideas from the client.</td></tr>
</table>

The description of all core tasks are structured in a way like the instrument requires to. It includes three main aspects of the tasks:

1) Object of work
2) Tools method and organization of the task; and
3) Demand/requirement needed to perform the task.

The overall differences between the profiles in the two country settings are summarized in the following table of comparison:

Table 21: **Summary of Core Task Differences**

Task 1: about marketing	**China**	**Indonesia**
Title	Finding out and understanding the requirements of the client	marketing and promotion
Duration	-	-
Workplace	-	-
Description	client demand oriented	tend to be supply oriented
Object	client as orientation	market as orientation
Tools	pen and paper	website and exhibition
demands/requirements		knowledge of marketing media
Methods	interpersonal communication	more communication by media (website)
organization	-	-
Task 2: about design	**China**	**Indonesia**
Title	Drawing and revising blueprint	design
Duration	depending on client	depending on client
Workplace	office	by clients
Description	design not shared with client	design can be discussed with clients
Object	drawing construction for solution	understanding clients wants and determining materials
Tools	t-square, ruler template, computer	pen tools, computer
demands/requirements	understanding drawing stereogram, certain basic mathematic	communicative, sketching skills and technical knowledge
Methods	interpersonal communication	more communication by media (website)
organization	work divided to several workers	boss or carpenter (depending on companies)
Task 3: budgeting	**China**	**Indonesia**
Title	making list of materials to be processed	calculating the cost
Duration	fast, after the blueprint	fast, accommodate the clients specification
Workplace	office	workshop, by client

Description	listing materials and their specs, calculating the waste, distinguishing net material and wastes, considering leftover bits and pieces	making estimation of cost
Object	lay the foundation for preparing the material for construction	determining the production cost
Tools	paper and calculator	pen tools
demands/requirements	familiarity with material and possible losses	familiarity with material
Methods	taking into account the net size and losses of the material according to the blue print	only calculating cost estimation
organization	worker who draws finish the task	boss of enterprise
Task 4: procurement/purchase	**China**	**Indonesia**
Title	purchasing materials	procurement of materials
Duration	n. i.	2-3 days
Workplace	-	-
Task 5: building the furniture	**China**	**Indonesia**
Title	cutting, edge sealing, assembling (3 separated tasks)	furniture shaping
Duration	depending on work load	approx. 1 week/depending on work load
Workplace	-	-
Description	-	
Object	-	-
Tools	mix of manual and and semi-mechanized	mix of manual and and semi-mechanized
demands/requirements	-	-
Methods	operating tools and machines	operating manual tools
organization	Work distributed, each handles one steps. Worker work independently	sometimes not systematic, multi tasking work (certain work tasks can be executed by unspecific worker)
Task 6: finishing	**China**	**Indonesia**
Title	painting the surface	finishing
Duration	depending on work load	depends on work
Workplace	-	-
Description	-	-

Object	protect furniture and make it beautiful	sanding, basic painting, painting
Tools	mix of manual and semi-mechanized	manual tools
demands/requirements	-	-
Methods	operating tools and machines	operating manual tools
organization	Normally by professionals.	sometimes not systematic, multi tasking work (certain work tasks can be executed by unspecific worker)

Generally the occupational profile seems to be similar. Notwithstanding, there are some different aspects indicating the different working behavior and ethos and requirements. An example hereby is the way of how the Chinese carpenters calculate the cost regarding the waste produced by the production. It's also in regards of the consideration of Chinese furniture business about the hazarding effect of their production to the environment.

Furthermore, the differences between the profiles are influenced by a diversity of contextual factors which exist in the respective country. According to the discussion among the researchers the following factors were identified:

- legal procedures
- standards of requirements
- purchasing power of clients
- size of enterprise
- conditions of enterprise
- type of materials/ furniture

In the second occupation, domestic electrical installation, which was selected by the partner from Vietnam and Malaysia, remarkable differences were identified in the following comparison table:

Table 22: **Comparison of the Occupation Profile of Domestic Electrical Installation**

	Vietnam	**Malaysia**
TASK 1	Surveying the site	<u>Out bow wiring for the new premise.</u> Tasks: 1. Install the PVC casing – the installation process will involved cutting, shaping, and nailing the PVC casing on the wall. 2. Pull the wire and close the PVC casing 3. Install the switch boxes, socket, and control board (RCB, kWh meter, and main switch) 4. Install the earth rod, earth chamber, and earth clamp 5. Install the home appliances requested by the home owner 6. Perform the continuity test 7. Inform the company the job completion
TASK 2	Preparing material, tool, equipment	
TASK 3	Installing	
TASK 4	Checking	
TASK 5	Calibrating	*<u>In bow wiring for the new premise</u>* Tasks: 1. Drilling the wall according to the work plan 2. Installing the conduit into the drilled wall 3. Installing the switch boxes on the drilled wall 4. Lay the cable 5. When the wall is plastered and ceiling installed, then the fitting work will take place including the switch, socket outlet, and ceiling rose installation 6. The company will inform the TNB to connect the electric supply and install the kWh meter
TASK 6	Operating and transferring	
TASK 7	Repairing	
TASK 8	maintaining	

According to the table above differences of occupational profile analyzed in the two countries can be summarized as follow:

1) While the researchers from NUTE followed the proposed methods, conception and structure as stated in the instrument, the Malaysian researchers tend to apply a different conceptual approach in identifying and describing the core occupational tasks. This difference can be clearly identified, whereby the Malaysian have split the core tasks into smaller unit of work task.
2) As a consequence of the application of deviated conception and method, the report of the research of UTHM does not fully fulfill the output expected from the application of the proposed competence needs analysis. As obvious example, the submitted report does not contain basic information of the core tasks, such as tools, demand and requirements to perform the task. The same case is also applied to the research partner of UNY (Indonesia).
3) In the application of occupational sector analysis, both research team from UTHM and UNY did not deliver neither sufficient nor deep information about various aspects required to describe the selected occupational sector. The following Information aspects are still missing or quite poorly described:
   - Structure of employment
   - Structure of companies and business
   - Work organization in the companies
   - Existing qualifications, initial and further education and training and their boundaries
   - Employers, employees and professional organizations and their influence
   - Labor market
   - Technological trends
   - Contribution to and velocity of innovation
   - Contribution to social modernization

6 Conclusion and Recommendation

The P9-research project is among other aiming at gathering empirical experiences of the application of the competence need analysis. Together with the expected teaching material obtained from the research, the experiences constitute an important modality for involved the researchers be able to contribute to the improvement of TVET teacher education. By means of the material and experiences which will be imparted to the teacher student, the future teachers should be methodologically able to link their curriculum with the current competence need in related workplaces.

Facts found based on the submitted country reports and experiences exchanged upon the P9 researchers during the seminar have shown that application of the method is complex and accordingly need to take various aspects into consideration. One of the key aspects is the settlement of researchers, i.e. the good knowledge and deep understanding of the methodological concept, which the researchers deal with. Shortage of this aspect will automatically lead to the deviation of expected research results as already come up in the previous chapter.

Given the fact that most of researchers were not really familiar with the selected methods it is necessary to invest more effort and time to firstly and intensively build the capacity of researchers about the methods. Otherwise the research, which cost many resources of time, energy and material, will come up with unexpected results.

Another aspect to be re-considered is the degree of reliability and representativeness of the collected data during the research. The researchers come up with data mostly without some clear definitive boundaries. It means, the data was collected with less consideration to criterion of sources where it comes from. Clear definition of the e.g. company size characterize by worker body or probably certain level of modernity with respect to used working tools and working organization will be an advantage in obtaining reliable and comparable data. In the end such data will represent the actual picture of an occupation and the result of the research can be generalized. Therefore, the development of a set of clear standard providing a certain definition and criteria of workplaces would be recommendable.

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