New Frontiers of Educational Research

Zhiqun Zhao
Felix Rauner *Editors*

Areas of Vocational Education Research

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Contents

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Introduction

Zhiqun Zhao and Felix Rauner

The change of the world of work and the challenges of innovation in their action fields require education planners, teachers, trainers, and staff developers to have a basic understanding of the contents, forms, and structures of the technical and vocational education and training (TVET) at the macro, meso, and micro levels. TVET research can make a significant contribution to the understanding and shaping of education systems, education courses, and processes with its research and development projects. This book contains studies of the profiles of TVET researches in China, Germany, Israel, Korea, and The Netherlands, and in the United States.

This book along with his 12 contributions opens up an access to the questions, methods, and results of TVET research for the researchers and students of vocational pedagogy, education sciences, and the students in vocational teacher training. It has two functions. It describes the TVET research in its fundamental research fields with its questions, methods, and results—at a glance—so that the reader can acquire a solid know-how, which they can use it for their future TVET praxis. For students who strive for a career in the TVET research, it provides a broad basis, which makes it possible to acquaint themselves deepening with specific fields of TVET research on the basis of further literature.

Chapter 1
TVET-Research: An Introduction

Felix Rauner and Zhiqun Zhao

Research on technical and vocational education and training (TVET research) is an established sector of educational research, because TVET is considered as part of the national education system, even if it is often only insufficiently integrated into it. The features of TVET and VET research already become clear, similarly the difference between occupational research and TVET research. The difference is caused by the phenomena of vocation (Petersen 2006; Dostal 2006). The occupational research is different between employment occupation and training occupation. The start point for TVET research is training occupation, while the employment occupation is subject of the labor market research. They are classified internationally by the ILO as the "International Standard Classification of Occupations" (ISCO), thereby the ILO aims to increase the transparency and comparability of the national labor job markets and the national occupation classification systems. In the "Dictionary of Occupational Titles" (the USA) is often distinguished among more than 10,000 employment occupations. The classification and survey of employment occupations is therefore subject of the occupational research with the orientation of the development of labor markets and employment systems. It is different from occupational research as a research field of TVET research, whose concern is development and analysis of training occupations as the start point for shaping and organization of TVET programs. Finally, occupational research is also the subject of labor science and human resources research as subarea of business administration research. The research and development interest here results from the effects of job design and work organization on human resources management and thus on the increasing productivity as well as competitiveness of companies and branches. As a dimension of education, economy,

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social politic, and labor market politic, TVET is a subject of interdisciplinary education research. On the level of TVET governance system, it becomes clear that it is mostly based on the outside parts instead of TVET governance system itself. Normally not only the educational, labor, and economic departments as well as the sector administration departments in the government but also the organizations in the world of work (such as labor unions and trade associations) are involved in the TVET governance. This applies primarily to all forms of dual vocational education organization. The plurality of governance structures of TVET and TVET systems increases the complexity of research and development tasks for the TVET research. The TVET research is a unique education sector, which is directly related to the shaping of transition from education to the employment system. This characteristic of TVET, which distinguishes it from all the other sectors of education systems, has far-reaching consequences.

1.1 The Content of TVET

The initial vocational training is classified as the secondary education (senior high school level) and competes against the general education which is prepared for the university study and usually ends with a certificate to higher education. Comparing TVET and general educational programs in the aspect of teaching and learning content, the fundamental differences appear whose implications are far-reaching for the educational research.

The content of TVET is based on occupation descriptions (occupation profiles), in which the training objectives and vocational action field are summarily described. An occupation profile summarizes the characteristic professional competences of an occupation, which is generally understandable for the addressees of the labor markets (graduates, parents, and skilled workers) as well as for the personal development of companies and institutions of labor administration. The occupation profiles and the related training programs are developed with the participation of experts from the world of work and TVET researchers.

The methods of occupation development and domain-specific qualification research (Rauner 2000, 2002) belong to the rather underdeveloped fields of TVET research. The reason for this lies in the salient interest of the companies and trade association organizations, which align the occupation development with their association interests (Schmidt 1995).

The interest-guided TVET plan aims at the determination of exam requirements. The exam requirements define how the occupational skills should be tested. For the realization of safety and quality standards as well as the award of authority by the perception of professional tasks, the exam requirements are the decisive basis. Only if the occupation-specific safety and quality-relevant skills are mastered by the trainees, the occupational qualification can be acknowledged. In the TVET system, a passed exam is connected with the award of occupational qualification and thus the authority to practice an occupation. By determining the content and structure of

occupational action and learning fields, the TVET research is challenged to translate typical professional tasks into training tasks, including the training objectives, contents and verifiable competences. In the Chaps. 4, 9 and 10, the complex relationship among the organization and shaping of work processes, the professional development as well as the development of curriculum as a central concern of the TVET research gets unfolded.

The fundamental difference between TVET and general education is the goal and content of learning. The TVET aims at competence development, while general high-school education lays emphasis on student's language and mathematics skills. This paradox results from the education-theoretical guiding idea that the educational content of general high school education functions as a medium, which brings the study ability in the education process. Therefore, a variety of different content-oriented high schools have been established in many countries: mathematics-nature science, linguistic, classic, and art. In Germany, there are vocational high schools beside these. This praxis shows that the contents of high-school education are largely interchangeable. The successful completion of high school education qualifies, regardless of their content orientation, for a university study in any major. For the training and further training of professional specialists, the specific contents to be taught are of fundamental importance. The question, whether and to which degree also cross-discipline competences (meta-competences) are acquired in a specialized or vocational education, is a central subject of the TVET research in this context.

1.2 TVET Systems and the Governance of TVET-Systems

As in no other sector of education systems, a wide variety of TVET systems that compete with each other is developed in the TVET area. What in common is to form her function for TVET systems, for young people in the transition from school to work through the mediation of occupational competences as seamlessly as possible?

An international comparison research of school-to-work transition problems has become more topical since international labor markets started forming as a result of the globalization of markets and the formation of supranational structures such as the European Union. The transition for young people from school to work is still characterized by national traditions and different industrial cultures (Dybowski et al. 1995). A comparison of school-to-work transition problems in OECD countries requires, therefore, an analysis of each national situation. It also suggests that this assessment of the situation and problems be systematized. For this reason, a framework was outlined, in which the report on the German situation can be categorized.

The school-to-work transition refers to:

- The period in one's life between completion of general education and the beginning of gainful employment—the individual aspect

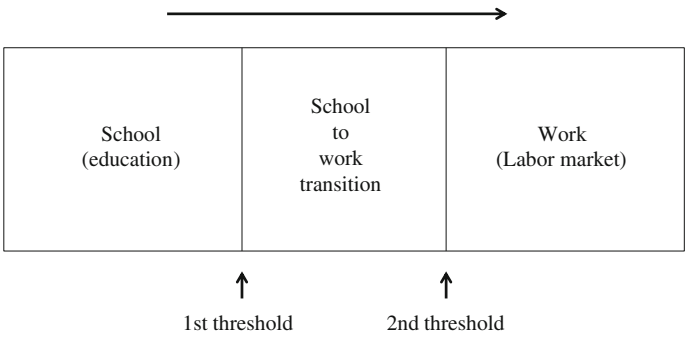

Fig. 1.1 Thresholds in the transition from school to work

- Training systems, institutions and programs that prepare young people for employment after completion of general education—the institutional aspect
- The transition from school to vocational training (first threshold)—the training market aspect
- The transition from vocational training to work (second threshold)—the labor market aspect (see Fig. 1.1).

Four models of the school-to-work transition can be distinguished in an international comparison. Each is characterized by great differences in the transitions from (general education) school to vocational training (first threshold) and vocational training to work (second threshold), with regard to time, institutions and content.

In the first model, the first and second thresholds of the transition are reduced to one threshold, for two reasons. On the one hand, in-company labor markets in which the occupational form of work plays a subordinate role or one that is not at all dominate; on the other hand, vocational training on the basis can be dispensed with as an independent career step between school and employment systems. Training is carried out as a dimension of company organizational development. The Japanese situation was and is still the closest to this model (Bowman 1981; Georg 1990; Moritz et al. 1995).

The second model is characterized by a relatively long and little-regulated transition phase with extended search and orientation processes for youths, a simultaneous high rate of youth unemployment and other social risk situations, and an extremely demand-oriented flexible, continued training market with low-qualified, industrial jobs. This model is also characterized by a high first and second transition threshold. Participation in training programs is closely linked to entry into the employment system and commencement of gainful employment and can be a temporary solution during one's search for a job. To avoid qualification deficits, this model focuses on jobs with the fewest requirements at the level of operational tasks and on-the-job training. The United Kingdom and the United States have definite affinity to this model (Department for Education 1994;

Doeringer 1991; Münch 1989; Rauner 1995a, b). Both the first and second threshold is of a relatively low level. The transition to the training system is smooth because the role of the youth as a student is gradually taken over by the role of the youth as a skilled worker.

In the third model, the transition takes place via a regulated system of dual vocational training. Young person is a trainee, a student (in a vocational school), and an employee in a training company at the same time. TVET becomes a bridge between the world of work and the education system. Youth unemployment is correspondingly low in numbers. In central European countries such as Belgium, Germany, Switzerland and Denmark this model dominates.

In the fourth model, the transition from school to work is set up as a system of school-based vocational training. Completion of general education is followed by a vocationally related or vocation-oriented form of school. Whereas the first threshold poses no problem for the youths, the second threshold becomes the decisive transition to the employment system. The transition is postponed for the duration of the school-based vocational training. School and work remain institutionally separate. Vocational training is definitely supply-oriented. The large number of countries with a well-developed, school-based (state) vocational training system can be classified under this model.

The four school-to-work transition models essentially differ depending on the significance of the occupation as the organizing principle for labor markets, the company work organization, and vocational training. In the first model, the vocational form of work and thus the related vocational training has limited significance, whereas vocations represent the central aspect of the third model.

International comparative TVET research deals with the genesis and the structures of different TVET systems. Besides the question of transition from school to work and the permeability between vocational and college education, the international TVET research focuses increasingly on the investigation of the relationship among the structures of TVET systems, the competitiveness of the companies, as well the social prosperity and the poverty prevention.

An international comparative study on governance of dual vocational education systems in Europe conducted by the Bertelsmann Foundation gave an impetus for a new form of TVET research. The awareness that the TVET in different countries such as Germany, Switzerland, Denmark, and Austria is different in quality led to the issue of different governance and support systems as well as their impact on the quality of dual vocational education. The analysis and evaluation concept for this study applies since then to a reference model for the international comparative TVET research on governance structure.

It is due to a two-dimensional evaluation structure that results from a four-field matrix (see Fig. 1.2). The assessment of governance systems is carried out on the basis of a rating procedure. The participants in the workshop assess every item independently of each other and before they justify and correct (if necessary) their assessments in a group discussion. The corrected rating values and the reported reasons are the basis for the quantitative and qualitative evaluation result (Bertelsmann Stiftung 2009, p. 15).

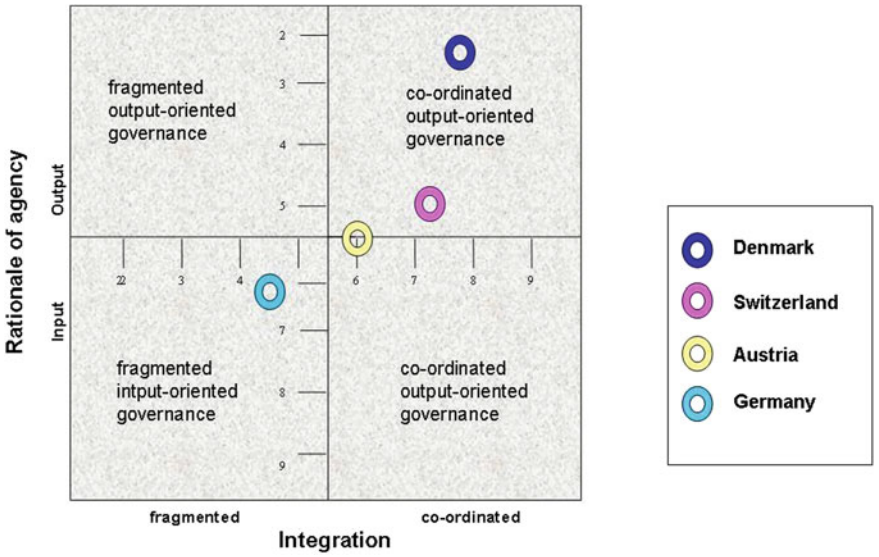

Fig. 1.2 Governance in dual TVET systems in transnational comparison (Rauner and Smith 2010)

The research situation in this new field is characterized by the objective need for methods of international comparative analysis and assessment of TVET systems, as the internationalization trend in the education sector and in the field of TVET has been reinforced in the last decade. In a European joint project, the comparative evaluation methods of TVET systems were developed further.

1.3 Permeability Between TVET and Higher Education

With the quantitative expansion of higher education, the shaping of the transition from TVET to higher education becomes a subject of the TVET research. The international trend of education academization is named "academic drift" (Harwood 2010). Academization here refers to the quantitative expansion of universities/college and general high-school education and to a stronger weight of science-related education content in TVET. The "College-for-All" -Policy of the United States, a striking expression of education academization, is called by Norton Grubb and Marvin Lazerson as expression of a faith's confession: *We call this ritual the educational gospel because it has become an article of faith, rather than inviting questions about its empirical assumptions* (Grubb and Lazerson 2012, p. 101).

In the "College-for-All"-Discussion in the USA, a development of professionalization, which has led to a strong expansion of high school (academic)

education in the first half of the twentieth century, is often transferred to today's "College-for-All"-Policy without reflection: *The movement of professions into colleges and universities was closely tied to the growing authority of science, in a broad sense […]. The expansion of occupational preparation training in higher education—always called professional education to distinguish it from lower-level vocational education in high schools […] has led to more formal schooling. In the process, school-based knowledge came to be more highly prized than work-based knowledge; older conceptions of useful knowledge, arising from the workshop and experience, gave ways to conceptions of knowledge rooted in the university lab and in scientific procedure* (Grubb and Lazerson 2012, p. 106). Grubb and Lazerson cite in this context Geiger (2000), Bledstein (1978) and Sullivan (1995).

In Germany, the Education Gospel of a "College-for-All"-Policy was taken up only at a time when the weaknesses of education academization were elucidated long ago. For example Baethge et al. (2007) explicit it as this: *The development of the pre- and post-industrial acquisition society referred to the knowledge types—as a shift from experience knowledge to systematic (theoretical) knowledge—gets described […]. The centrality of systematic (theoretical) scientific knowledge is emphasized as the essential feature of post-industrial societies.* From this the authors conclude: *for the society, which increasingly sees itself as a knowledge society, the colleges form the critical source for the development of cultural orientations, economically usable knowledge and highly skilled workforces* (Mayer 2003, p. 581, cited from Baethge et al. 2007, p. 75). Thereby they repeat the central thesis in Daniel Bells Book "The coming of post-industrial society" from 1975, which has determined the education scientific and political discussion over decades: *The theoretical (scientific) knowledge will crowd the in industrialism dominant development principles labor and capital out. All social spheres, especially the economy, the policy and the social structures will center round the new axial principle of theoretical knowledge in the post-industrial society. This knowledge will be generated in the research processes and mediated especially in the college education. With this it is,* he added warningly as this*, to avoid the lowlands of qualification requirements from gainful employment, since this would lead to the devaluation of the knowledge aligned with the systematic of sciences* (Bell 1975).

The Education Gospel has contributed significantly to the establishment of a worldwide "College-for-All"-Policy. The OECD Statistic about the rate of freshman shows that a large part of OECD countries is already very close to the implementation of the goal of "College-for-All"-Policy. For example, the freshman rate in Australia has reached 94 % (2009). It was inevitable that a large part of the college graduates in the countries with an established "College-for-All"-Policy find employment in the middle-skilled sector.

The OECD statistics about the ratio of high-qualified and highly skilled workers, for example, represent a rather high proportion of workers in the high-qualified segment. The proportion of college graduates who are employed as highly skilled in the OECD countries is with 69 % in the middle. In some countries, the rate of under their education level employed workers is significantly

higher, so for example in Denmark (61 %) and Spain (37 %). In countries with highly developed dual vocational education systems, for example in Germany and Switzerland, only 10–11 % of college graduates cannot find adequate employment or a small group of unemployed graduates are attributed to it.

Whether this situation will change in favor of high-qualified is disputable. The introduction of flat company hierarchies and concomitant relocation of professional competences and responsibilities in the directly value-added area of the companies plead for a reduction of management levels and thus for a lower demand for executives. This development is offset by a strengthening demand for the research. How the two opposite developments fail is the subject of the research. As for the foreseeable future, the share of low-qualified workers decreases more obviously when the share of high-qualified workers increases, the labor market research predicts one share from about two-thirds employees in the intermediate sector with a slightly increasing trend (Müller 2009).

Through the growing disproportion between the share of college graduates and the relative stable share of high-qualified workers absorbed by employment system, the tendency of vocationalization of college education and the concomitant employment of college graduates in intermediate sector of the employment system increases.

The answer to the education academization and the concomitant vocationalization and finally the trivialization of academic (college) education is an educational system architecture, which has two cornerstones as pillars: one in the science development embedded education, as it can be observed in many top universities worldwide.

One interdisciplinary and participatory oriented teaching and research targeted at the shaping competence, as it is increasingly required in the science system, forms the bridges between the academic and a dual—aligned with vocational training and professionalization—education pathway.

With a general dual education pathway besides the interdisciplinary elements, the insight would be taken into account that education cannot be limited to an understandable and purposeless education, but must aim at anchoring the understanding, shaping and responsibility as an inseparable part. This particularly applies for a general dual education course. It is distinguished by three characteristics:

- At the established levels of its vocational programs, the professional ability can be achieved continuously. The entanglements of learning content in the work process and human development in company with the reflection of work experience and the exchange from work process knowledge into vocational college/school courses enable it to learn an occupation so that it can be exercised without further training periods after the completion of the training course.
- The training to a bachelor (Professional) and to master (Professional) qualifies especially for the awareness of management tasks at the middle and senior management levels. The awareness of management tasks for example as department leader or company director is call for the ability of holistic task solution.

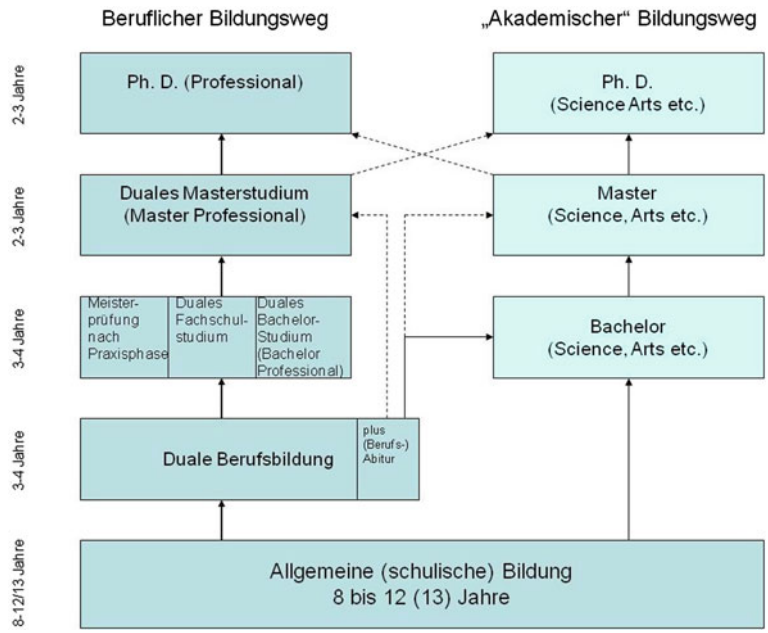

Fig. 1.3 The architecture of parallel education pathways with a universal dual education

- At the level of promotions a gap, which is caused by the research work of post-graduates and doctoral programs aligned to the tradition of disciplinary research, can be closed in this way: the exploration of related knowledge and of practical knowledge (Benner 1995; Schön 1983; Reckwitz 2003; Rauner 2004).

The architecture of parallel education pathways (Fig. 1.3), can develop its education and research potential in practice only till the various bridges that exist between the two education pathways and lend themselves to be used. Some of the bridges should be noted here finally. The vocational higher school diploma, as it was introduced in Switzerland, combines the dual vocational training with the acquisition of a work-related higher education entrance qualification. These privileges for a technical college study.

In the preparation of a system of parallel education pathways is, e.g., South Africa well advanced. They differentiate between a "discipline based learning track" and a "work-based learning track" (The National Skills Development Handbook 2010/2011, p. 236). "It is then that we realize that although we have reached an advanced level of specialization in a particular field of knowledge, it is the ability to holistically combine and apply all the relevant fields of knowledge that really results in effective solutions." Thus, in their ten-stage national qualification frameworks, they distinguish between a "Specialization Career Path" and a "Management Career Path" (Table 1.1).

Table 1.1 System of parallel education courses for scientific qualified executives and managers

NQF levels	Descriptor	Specialization career path	Management career path
10	High-level occupations and professions	Research professionals	Strategic management
9		Professionals	Senior management
8		Para-professionals	
7	Mid-level occupations	Support professionals technologists	Middle management
6	Occupations	Technicians	Supervisory management
5		Specialized sales	

The modernization of education systems based on architecture of parallel education pathways implies an extensive program of TVET research. Two issues of scientific and educational planning cognitive interest are paramount:

- Do international and national qualification frameworks and classification systems for educational achievements and courses describe the social knowledge and the competences incorporated in them adequately?

The example of European qualification frameworks and ISCET-classification showed that a one-dimensional hierarchy of qualification levels based on competence standards cannot be justified. The interaction between the academization of TVET and the vocationalization of higher education (Grubb and Lazerson 2012; Rauner et al. 2012) is criticized as a consequent effect of increasingly diffusing education system architectures. The importance of this research results from it as well as from an internationally more spread or less impermeability between TVET and higher education.

- Can the TVET–competence diagnostics contribute to the establishment of parallel education systems—with a general TVET pathway?

Large-scale professional Competence diagnostics requires a development of a competence and measurement model for the vocational education. Thereby for the first time an international compatible pedagogical—normative as well as education theoretical reference framework must be developed, coupled with the empirical evidence of content validity and the reliability of competence and measurement model. Since with the concept of professional competence measurement (COMET) the specific quality of occupational knowledge in use and skills—different from the theoretical knowledge—could be proved at all levels of competence development (Rauner et al. 2011), the TVET research is faced with the challenge to use the research results for the development of a dual vocational training courses for all occupational fields.

It is foreseeable that such an ambitious research and development project needs an innovation process embedded in an international education dialog. This means the TVET research as one of three pillars of an innovation project—besides the TVET policy and the TVET practice to be established.

1.4 Quality Assurance

The question about the quality of TVET systems (macro level), training programs (meso level), and training processes (micro level) is the subject of a wide variety of quality development and assessment procedures. International comparative education research is traditionally limited to the description and analysis of the systems with the aim to understand national and regional education systems in their historical genesis and cultural characters. According to this concept, a comparative evaluation research oriented to establish internationally evaluation criteria is banned, because this includes an assessment of national TVET systems. With the international comparative economic research, as was among other things developed by Porter (1990), a paradigm shift took place in the international comparative research, which reaches a first climax with the MIT-study "The Machines changed the World"—international comparative assessment of the automotive industry in Japan, the USA, and Europe (Womack et al. 1990). It can be assumed that these outstanding research projects had a decisive influence on the establishment of the international comparative evaluation research in other research areas and sciences. Latest with PISA-Program, the international comparative education research is also established. A reduction of comparative research on the measurement of outcomes, on the basis of test tasks, which orient to a quasi-world-curriculum (e.g., in mathematics), was an essential precondition for the PISA.

Meanwhile, in the field of TVET research, a method of international comparative competence research for all levels and sectors was established. Lerman gives an overview about the "costs-benefit-quality"-research in Chap. 4. The initial and further training in company is particularly an innovative application field of education economic "Costs-Benefit-Quality"-research. As an education economic paradox applies here: the higher the training quality, the higher the profitability of training.

The education economic calculation, according to which the education quality also rises with an increase of education investments, does not apply to the vocational training in company. The relevant research shows that—conversely—with the increase of training quality, the profitability of the initial and further training in company rises. The relevant research points explanatorily out the concept of learning in the work process. Then "paradigmatical work situations" (Benner 1995) or occupational developmental tasks (Havighurst 1972) as pivotal and crucial point applies for the development of reflected work experience. Here a new research field opens up for the VET research, e.g., competence research and curricular research. The expected research results have a significant innovation potential for the shaping of TVET processes and work processes.

The extension of these research concept and their arrangement as a method of self-evaluation the profitability and quality of TVET lead to a higher level in the quality assurance and quality development of TVET. The analysis of aggregated data on the basis of self-evaluation makes it possible to carry out sector- and country specific analyzes.

Since 2007, the IBB/University of Bremen developed procedure and instruments of large-scale-competence-diagnostics. In the framework of an extensive research networks "International Research Network on Competence Diagnostic (COMET)" this procedure, a "Vocational Education—PISA" in a wide bandwidth of industrial-technical, commercial and personal relevant service occupations, was tested and psychometrically checked (Rauner et al. 2011). It should be emphasized that the development of vocational identity and vocational commitments was included in the modeling of professional competence development. The COMET concept is based on open, criteria-oriented test tasks, and a rating procedure, with which the multiple competence of trainees, students, and professionals can be measured as basis for the evaluation of TVET programs and systems on a high level of reliability and content validity. With the COMET-research concept for measuring and developing professional competence and vocational identity, a powerful instrument is available for the international comparative TVET research, which is also a way to improve the quality of TVET.

Moreover, Aaron Cohen establishes the relationship between commitment-research in the field of business administration and the understanding of vocational identity development in vocational pedagogic with his contribution to commitment-research (Cohen 2007).

1.5 Methods of VET Research

The TVET research is always faced with the difficulty to justify and to develop an original research and development concept corresponding to the subject of research. In this study book, it is expressed that various interrelated research and development fields require a broad spectrum of research and development methods. It concerns establishing methods with a long research tradition to a large part. In the TVET research as a young research tradition, the researchers normally go back to the established methods of adjacent sciences and research traditions, especially the social and education sciences.

Since 1990s, methodological discussion about the subject-related characteristics of TVET research has been started and the development and application of TVET research methods is well advanced (see Chap. 5, Handbook of Technical and Vocational Education and Training Research in detail). It mainly showed that always then, when the research deals with the contents of occupational work and education, new subject-related research and development methods are needed.

When a vocational expert (researcher) observes, a vocational learning process or a work situation in his occupation field, the content of the situation to be observed is usually extensively familiar to him. Intervening demands and impulses enable him to attain a deeper understanding of the observed situation. Here he ignores the rule of empirical social research, whereby the observer should make himself virtually invisible so as not to falsify the observed situation. The professionally competent observer decides on an intervening observation and thus

changes the situation to be explored purposefully. The participant's observation becomes such a quasi-experimental situation. Particularly in the area of vocational scientific research (see Pahl and Volkmar 2010) the subject-related research and development methods are of particular importance. Chapter 10 introduces this complex issue.

1.6 The Book

This study book should open up an access to the questions, methods and results of TVET research for the students of vocational pedagogy, education sciences and the students in vocational teacher training. The change of the world of work and the challenges of innovation in their action fields require teachers, trainers, staff developers, and TVET planners to have a basic understanding of the contents, forms, and structures of TVET at the macro, meso, and micro levels. TVET research makes a significant contribution to the understanding and shaping of TVET processes, education courses and education systems with its research and development projects.

In every chapter of this handbook, the further literature and especially the articles in the "Handbook of Technical and Vocational Education and Training" (Rauner and Maclean 2008) are consistently referred to. The study book thus has two functions. It describes the TVET research in its fundamental research fields with its questions, methods and results—at a glance—so that the reader can acquire a solid know-how, which they can use it for their future TVET praxis. For the students who strive for a career in the TVET research, it provides a broad basis, which makes it possible to acquaint themselves deepening with specific fields of TVET research on the basis of further literature.

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Chapter 2
Vocational Education Research: Research on Vocational Pedagogy, Vocational Discipline and Vocational Didactics

Jörg-Peter Pahl

Abstract The chapter introduces the occupation and vocational education as a subject of research and their research framework, which include the emergence and origins of didactic approaches and concepts of vocational teaching and learning. The author reviews the history of research on vocational disciplines and vocational didactics at universities and the relation between research on occupation and vocational education and its methods in contemporary historical retrospect. Areas, bounds, and working fields of vocational pedagogy, vocational didactics, and vocational disciplines are also analyzed. The author further predicts the development opportunities and prospects for the subjects of vocational didactics and occupation research on vocational education.

2.1 Occupation and Vocational Education as a Subject of Research in Nonacademic and Academic Sectors: Introduction

The concept of vocational education as a specific part of what has been and is being discussed as education has been schematized expressis verbis not until the end of the eighteenth and beginning of the nineteenth century, the term "vocational education" has been used in the word combination of vocation and education (Humboldt 1964). It was meant as "basically each level of the direct education for occupations, especially the training for middle class positions as officer, merchant, master craftsman" (Georg and Kunze 1981, p. 38). In the cause

The article refers to the research situation and its genesis in Germany.

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of time, however, the term was used in constricted form only in connection with vocational education of young people from the lower social strata.

The circumscribed interpretation of the term "vocational education" in the field of nonacademic vocational training and continuing education has been maintained fundamentally until today. Over the past 200 years, from prevocational education in secondary levels I and II to nonacademic vocational training in secondary sector II and academic vocational education in tertiary sector to vocational and academic continuing education in quaternary sector were intended, "a new relationship between general and specialized/vocational education need for research in the area of vocational education" (Buchmann 2002, p. 3).

Consequently, it is highly commended "to work on academic vocational training harder than ever before in the research of vocational and economic-pedagogical training, and to make its theories and previous findings from the research of nonacademic vocational training fruitful for the research in the tertiary sector" (Buchmann 1999, p. 77).

Researches in the context of such a complete vocational education and training system, i.e., the integrative inclusion of the nonacademic as well as the academic subsystem are meaningful and necessary under the aspects of system theory as well as structure, organization, and curriculum, i.e., learning organization and didactic methodology. With such an expanded research approach, historical, current, and future developments are to be analyzed and studied systematically and system-theoretically.

2.2 Emergence and Development of Conceptual Approaches in the Framework of Occupational Research and Vocational Education Research

2.2.1 Emergence of Didactic Approaches and Concepts of Vocational Teaching and Learning

First didactic-methodological approaches and concepts for nonacademic vocational education have already been developed at the turn of the twentieth century by industrial enterprises and educators (Dörpfeld [1903], 1962, 1973; Rein [1893/1908], 1952, p. 34; Kerschensteiner [1912/1965], p. 33). Only until the 1920s, were these conceptual approaches which was known as the "Frankfurt methodology" first established vocational didactics. The conception of the "Frankfurt methodology of specialized training courses in vocational schools" (Botsch et al. 1950)[1] showed characteristic features of a type of didactics in a special curricular,

[1] See also the "Informative Overview (informative Gesamtschau)" of Schmale (1967) in the journal "The German Vocational and Technical School (Die Deutsche Berufs- und Fachschule)."

learning-psychological, and organizational structure. This didactic-methodological perspective is identified as the "most famous and most far-reaching technique-didactic conception" (Ott 2011, p. 135).

In the restoration phase after the Second World War, people oriented themselves largely back to the principles of the Frankfurt methodology, but there was a greater focus on experimental learning and working. Based on the Frankfurt methodology, Möller (1951a, b) developed conceptual approaches for workshop and demonstration lessons for course design, for teaching methodology, and for teaching materials. Glunz (1962) modified the teaching concept "experiment" decisively further by adapting it to the conditions of the workshop and laboratory of vocational schools. Yet, Stein (1958, 1965, 1983) developed a basic form of a systematic technique-didactic approach for vocational learning with the teaching concept "Experimental training course". The change in the employment and social system in the 1960s led to new didactic considerations. The discussion on the didactics of vocational learning received new impetus through the social changes, especially in connection with the so-called "1968-generation of teachers." The focus of the very controversial discussions included a stronger orientation on scientific disciplines and subjects. The basic principle of these specialized science-oriented approaches were, in particular, the didactic simplification, reduction, and later the didactic transformation (Herring 1958; Grüner 1967, 1975, p. 85; Kirschner 1971; Kahlke and Kath 1984), as well as the sequence of steps "Discipline → Material analysis (state of the research, theories, development) → Didactic analysis/reduction (subject systematic, material structures) → structures, contents of vocational education" (Nickolaus 2006, p. 57). However, due to its close relation to scientific discipline, the subject-didactic approach was only conditionally sufficient for educational requirements for a comprehensive and practical vocational education. The same also applies to the interoccupational specialist area or domain-oriented subject didactic approach, which was developed in the mid-1970s. Then Hauptmeier et al. (1975) indicated about it with the realization of complex didactic reduction.

Although the work field and domain-oriented didactic-methodological approach which was developed and has been significantly expanded in the 1990s, takes the work field or domain as well as the related professional work including associated working processes and the educational interests of the individual into consideration, and a relatively broad approach of interoccupational didactics, where a significant transformation and reduction based on the specific needs of each training occupation is required as a general rule. However, not all occupations and certainly not all recognized training occupations could be considered equally and in a didactically appropriate and necessary manner. Therefore, the development of didactics based on occupational field seemed to be didactically reasonable. This

(Footnote 1 continued)
and Wissing [1932/1980a, 1954a/1980b, 1954b/1992], 1968; Wissing et al. [1960/1992]; Botsch [1927/1980]; Geißler [1941/1992]; Botsch et al. 1950, p. 55; Glunz 1962, p. 45.

approach focuses on a particular occupational field and on the related or associated occupations and thus provides a systematically clearly defined field didactics in the sense of Grüner's definition (Grüner 1981, p. 543). As an ideal didactic case, occupation didactics focusing on a particular occupation seems to be meaningful. This desirable vocational didactic approach is, however, practically impossible to realize because of the associated research activities, necessary implementation costs and required, yet currently unavailable resources. Regardless of it, there are already various contributions to the genesis of relevant research on occupational disciplines and vocational didactics (Pahl 2005, p. 27).

The concerned subject and vocational didactic concepts in the field of nonacademic occupations and nonacademic occupational training did not emerge on the basis of a program or as a result of systematic research plan on occupations and occupation fields and/or on vocational training. In addition, past didactic research usually focused on the area of general education, but hardly on the field of vocational training. Accordingly, the relevant research on vocational education and training distinguished itself relatively late, i.e., from the beginning of the 1970s (Rauner 2005, p. 9). Research on the nonacademic occupations conducted by didacticians was barely rudimentary.

2.2.2 Origins of the Research on Occupation and Vocation-Organized Activities Under the Aspect of Education Since the Beginning of the Twentieth Century

2.2.2.1 Genesis of the Research on Occupation and Vocational Training in Nonacademic Sector

At the peak of industrialization in the beginning of the twentieth century, Gilbreth (1911) took initial research approaches of activity and job analysis as tools for the identification and description of the training content. But only with the methodological instruments for the selection and instruction of Frederick Winslow Taylor, has the attempt for a scientifically justified methodology been made. This should be carried out particularly through rational intervention of skills, which are necessary for task fulfilment (Roesler 1913, p. 132). He was concerned about the appropriate methods to bring the knowledge required for the effective execution of planned activities into the brains of the workers (Volpert 1977, p. 32). Although these methods of the engineer Taylor for work organization from a psychological perspective sparked criticism and suggestions for improvement, they still found multifaceted access into the discussion of vocational pedagogy (Seymour 1960). However, their adaptation to identifying the qualification requirements in connection with the development of vocational training and teaching materials was hardly carried out.

It should be noted that similar research approaches—also limited to the non-academic occupations and nonacademic vocational training—in Germany had their roots in the works, which had been started by the German Committee for Technical Education (DATSCH) even before the beginning of the First World War.

Initial analyzes and studies on occupations and concept development of occupational teaching and learning took place firstly and even before the related studies were carried out at universities, in companies, and institutions for vocational training, which are later known as vocational schools. The works DATSCH founded in 1908 can then be referred to as preforms of research on occupations, in general, and occupations, in particular, and as beginnings of scientific observations on occupations and their education. In this context, the occupations existing in the industrial practice have been increasingly described in detail in the form of knowledge and skills to be taught. As instruments, the inspection and survey served especially for selected industrial enterprises.

The works of DATSCH have led to considerations on occupational science and occupational didactics differently compared to the activities of the German Institute for Technical Vocational Training (DINTA) founded in 1928. Parallel to the works of DATSCH which was essentially directed to industrial training, the so-called "Frankfurt methodology"—today it would rather be referred to as subject didactics for vocational schools—was developed at vocational schools by renowned vocational educators as the result of teaching experiences with theoretical considerations and practical teaching proposals. Teachers in vocational schools carried out preforms of the science-oriented studies, as new techniques and working processes emerged, which were neither specified in the up-to-date curricula nor being prepared by the academic colleges.

Although the vocational curricula developed by DATSCH in the 1920s and 1930s in a systematic form had been developed primarily for didactics and methodology of vocational training in company, but worked remarkably well for the structure and organization of vocational schools (Herkner 2003, p. 4).

The systematizing works of DATSCH were carried forward and developed methodically after the Second World War, i.e., from 1953 by the Center for Vocational Training (ABB) and later by the Federal Institute for Research on Vocational Education (BBF) and then the Federal Institute for Vocational Education (BIBB). BIBB's tasks have been defined expressis verbis for research on vocational education in a modified form in the Vocational Education Promotion Act. As major subjects of research, occupation, the content of occupation-related work and work processes under the aspect of education crystallized themselves.

The qualification research by the BIBB characterized by the labor- and social science-oriented methods of the workplace and occupation analysis as key, but it had hardly found any entrance into the curricula research. As a special task area in BBF/BIBB in the tradition of the forms developed by the DATSCH and in the ABB, namely the training content and objectives to identify in close dialog with experts from the social parties, the research field "curricula" had hardly changed methodically. Not until the mid-1990s had the discussions on the further

development of instruments of qualification research for the development of modern means of curricula been taken up again (Becker and Meifort 2004).

Although it was recognized that it was not possible to start back from where they had left off in 1933 in vocational education (Monsheimer 1956, p. 181), the "Frankfurt methodology" formed an important basis for the learning concepts of vocational school again after 1945—as already stated. The generation of teachers in vocational schools analyzed the occupations (Krause 1962) and the new work situation and they worked primarily on teaching methods and media (Monsheimer 1956). During the 1970s and 1980s of the last century, remarkable studies developed from the work of vocational schools or pedagogical papers that have been produced within the framework of the second state examination for teachers at vocational schools, for example, the "didactic simplification," "didactic reduction," and "educational transformation" (Hering 1958; Grüner 1967, p. 85; Kirschner 1971; Kahlke and Kath 1984) and for the dealing of technical problems in the classes of vocational schools (Schad 1977a, b). Initial theory-based studies were also carried out at this time in vocational schools, and this was not known or recognized by a wider public.

Overall, the participation of industrial and academic experts in the curricular work on the development of occupations and occupational fields had gained increased importance of vocational disciplines and vocational didactics since the early 1970s. This statement still applies, because—as Howe (2001) describes—a more secured basis for the curricula development comes into existence with it. An important milestone in the development of non-university research on vocational disciplines was the initiation and implementation of pilot projects in the form of school-based and economic-design-based studies (Bähr and Holz 1995). In their majority, they turned to specialized occupational issues with these projects. In the context of more recent considerations on thematic bundling of these studies—such as that of the BLK program, setting out a framework for studies under the title "New learning concepts within the dual vocational training" (Ploghaus 2001)—has now been strengthened, in order to initiate and push forward a research, which is aimed not only at the specialized area of occupation, but also on the occupation-related work and working processes. All these researches focused mainly just on the nonacademic occupations.

2.2.2.2 The History of Research on Vocational Disciplines and Vocational Didactics at Universities

The research on vocational disciplines at universities has been developed particularly in the context of the training of vocational teachers. The more the program concepts lined up with the goal of occupation-qualifying study, the more intensively turned the research and teaching in the questions of vocational disciplines.

At the Technical Universities of Dresden and Karlsruhe, as well as at the University of Hamburg, for example, vocational teachers have been trained since the 1920s of the last century. Since during that time at the University of Hamburg, for

example, related engineering science could not be resorted to in the industrial-technical subjects, professional understanding began to emerge here, which was clearly characterized by the confrontation with the occupational practice of vocational teachers in their respective occupation fields. Eventually, the concept of "teaching-oriented specialized science" grew as the result of this (Hass 1980, p. 87).

Similar developments can be shown for vocational disciplines that find no equivalent in the established academic system. In the continuous shift of the training of teachers for higher teaching positions in universities in the 1960s, neither a complete approach to teaching and research in vocational subjects was available, nor was this formulated as a task area for newly developed courses. The issue of the related sciences that are not directed sufficiently to the vocational work to be provided was implied.

Although the demand that there should be a research on vocational discipline—complementary to the vocational pedagogy, was and still is not uncontroversial in the discussion on vocational pedagogy, yet by no means new. In the absence of research on vocational discipline, Abel (1963, p. 4) even saw a faulty development of vocational pedagogy, because then it locked itself in front of "vocational discipline as the basis for the (…) vocational training". Hoffmann (1966, p. 534) from the ZIB also place the expression "research on vocational discipline" consciously "in the position of the previous formulation 'research on vocational pedagogy'". Because such—admittedly very initial—considerations have not been taken into account in the subsequent period, vocational pedagogy brought itself "to the chance, to become aware of the discrepancy, which occurred in the vocational issue, between thought and reality, fact and concept" (Müllges 1975, p. 811). Insufficient attention to the actual vocational situation, i.e., the "facts in the workplace" (Abel 1963, p. 3) can in turn lead to a loss of truth of the theoretical education in vocational pedagogy. Grüner (1970, p. 446) urged, therefore, for "research on vocational discipline at all levels" in addition to research on vocational pedagogy in connection with the (further) development of vocational pedagogy in the 1970s of the previous century already. Similarly, Karlwilhelm Stratmann has requested, in the context of curricular considerations for basic vocational education for the evaluation of jobs and there to be indexed activities, "to arrange the research on vocational discipline more differentiated if one wants to skip the close relationship-boundaries between job groups" (Stratmann 1975, p. 341). Whether "the research on vocational discipline" called by him was meant as a specific research program or an independent vocational discipline remains to be seen. Stratmann stated in the same article that the "construct of vocational discipline and vocational pedagogy" (Stratmann 1975, p. 344) of an occupation should be established with the research on curriculum. The combination vocational discipline and vocational pedagogy indicated, however, conceptual uncertainty.

Even today one could agree with Müllges (1975, p. 801), that the "scientific constitution of vocational pedagogy" is still an unfinished task. Therefore, without that this has always been so explicitly expressed, an additional independent vocational discipline that adapts the traditional understanding of vocation to the current and future vocational situations, includes learning and educational issues,

and with which particularly the issue of reference science can be resolved, was demanded (May 1978). In connection with the generation of an independent vocational discipline—as Müllges (1975, p. 810) stated—the fear "that the vocational pedagogy turns out to be an unnecessary discipline" must be dispersed. Since the training of teachers with the study for higher teaching positions at vocational schools at the universities was formed and established gradually in the 1970s of the last century, the issue of reference science turned out to be increasingly significant and important in the next decade. It was evident that the associated research on "vocational disciplines" for university training of teachers as reference points for the didactics of vocational learning was missing. Although Grüner's criticism that subject didactics in many universities was conceptionless, and neither was teaching- nor exam subject was generally justified, it can be shown, however, that since the late 1950s, new approaches and concepts have been developed, in which issues of didactic simplification, didactic reduction, and didactic transformation were analyzed and studied (Grüner 1967). Scientific work on didactic simplification, reduction, and transformation that originated from habilitations (Herring 1959) and dissertations (Möhlenbrock 1979) can certainly be classified as crucial didactic research on vocational learning. It can also be assessed beyond the narrow specialist work and as an interdisciplinary-applied work on complex didactic reduction (Hauptmeier et al. 1975). In addition, the didactic works of Doris Elbers (1973) are worth mentioning. In subsequent years, although didactic-methodological observation priorities were laid holistically, the vocational work was still largely disregarded (Bonz 1980).

At the beginning of the 1980s, Gustav Grüner put a remarkable didactic approach under discussion. He held the opinion that, for the preparation of curricula, "didactics of the training occupation" (Grüner 1981, p. 544), in which not the subject but the occupation becomes the starting point, can be didactically useful and helpful. Without direct reference to these important ideas, but often developed on the basis of them, significant researches of vocational discipline on subject-didactic and vocational didactic approaches for vocational education were carried out and published in the following years. These approaches were based largely on teaching experiences and experiments of vocational educators (Mausolf and Pätzold 1982; Nashan and Ott 1990; Kuhlmeier and Uhe 1992; Pätzold 1993; Bonz 1995; Lipsmeier 1995; Pahl 1998a/2000; Ploghaus 2003).

By the end of the 1990s, various research results and concepts in the field of didactics in vocational teaching and learning have been developed. There were a large number of profound, extensive, but largely insular research results. These, therefore, did not constitute self-contained vocational didactics for long. However, approaches to this could and can been seen in the reflections and researches on the occupation field didactics (Bonz and Ott 1998; Pahl 1998b; Horn 1996). Targeted scientific and systematic researches on the didactics of vocational teaching and learning have been hardly initiated and launched by this time.

Only pilot projects that received scientific guidance provided resources for research on vocational didactics and vocational science at universities. The professional and vocational didactic competence of the researchers was challenged in

particular. More than three decades, pilot projects researches have made a truly significant contribution to a differentiated research landscape according to occupations and occupational fields. It could be mentioned, for example, the research on employment, work, and further education in European automotive handcraft (Rauner et al. 1993) and the development of a European occupational profile "automotive mechatronician" for initial training in terms of the work-process-oriented structure of the teaching content (Rauner and Spöttl 1995). The model project for maintenance training is also based on a vocational science research (Pahl 1998c). The same applies for the task analysis for curriculum development in the automotive sector (Becker et al. 2002) and the publications "Curriculum design I" (Kleiner et al. 2002) and "Curriculum design II" (Reinhold et al. 2003).

The founding of the Association of Higher Education Institutions for industrial and technical training (HGTB) was of great importance for the research on vocational science and vocational didactics in universities and subsequently the founding of the working group of vocational science (GTW), which is incorporated into the association for labor study. The tasks and results are documented in the agreement of the HGTB (Hoppe 1990, p. 377) in the conferences conducted since then, in the Aachen Declaration of the Working Group GTW published after worth (2003), and in various publications over the last decade and a half.

If one analyzes the overall state of the discussion at the end of the twentieth century and the demand for separate "vocational science" (Pahl 1993, p. 53) which was strongly raised in the early 1990s of the last century, then the research on vocational education could be developed especially at the points where vocational discipline had been established.

Broad agreement prevailed since the 1990s, that in general, understanding vocational discipline is understood as "theory of occupations" for university demand. The type of vocational work and the qualified form of work were denoted by the evolving concept of "occupation", through which the consumption of socially produced goods can be participated in. The generation of occupation-related science, i.e., vocational discipline, was therefore estimated as a remote goal of scientific research—albeit similar to its time during the emergence of educational sciences (Dilthey [1988/1961]). Extensive scientific studies not only just in occupation-related field, but also in the field of occupation-related work, i.e., the work organized in vocational manner were therefore required (Rauner 2002a, p. 445). This extended research approach was (and is) absolutely necessary for the generation of a self-contained and generally effective, i.e., scientifically based system of "vocational discipline".

Initial respective research approaches of vocational discipline have already been launched in the late twentieth century. They should aim to "establish a connection between the skills incorporated in vocational work, the development of occupational profiles, and the grounds of contents, aims, and structures of vocational education" (Rauner 2002b, p. 317). Research defined as such is beyond social science-oriented, because this is "limited to the analysis of vocational activities and lacks the subjective dimension of vocational work: the vocational competence and competence development" (Rauner 2002b, p. 318).

Therefore, the research work should be extended to the fields of vocational discipline, vocational psychology, industrial sociology, vocational pedagogy, and curricula (Rauner 2002b, p. 319). With such an interdisciplinary structured qualification research, it was hoped that vocational discipline would manage to take the expected role to professionalize the work, i.e., the training of vocational education teachers (Martin et al. 2000, p. 27; Gerds et al. 1998). The former scientific research approaches, however, focused almost exclusively on the nonacademic area of the research on vocational training. Research on vocation and vocational education for the academic education sector sui generis was hardly considered so far—leaving aside the fact that the academic vocational training for teachers at vocational schools was definitely a research topic.

2.2.3 *Relations Between Research on Occupation and Vocational Education and its Methods in Contemporary Historical Retrospect*

Research and development in the field of occupation and vocational education as interdisciplinary tasks and topics of the dialogue between science and practice was conducted in greater extent since around the early 1980s. The increasing participation of non-university research and the representatives of the conference of vocational education planning "Hochschultagung Berufliche Bildung" have contributed greatly to the further development of research on occupation and vocational training. The same can also be stated for the Vocational Education Congresses organized by BIBB. The vocation-related topics outweighed in the content structuring of these events.

Not least from the results of the cooperation between the representatives of theory and practice, it became successively and, in particular in recent years, clear that systematic research in the field of occupations and vocational education in the vocational disciplines of specific research concepts and methods was needed.

In order to find out adequate research methods, two ways were treaded in the following period: On the one hand, by resorting to elaborated traditional research methods of the established sciences; on the other hand, through methods that had already been applied to studies (e.g., in the context of pilot projects) on occupations and occupational fields. For the first way, barely any clear method was available at that time. In order not to immediately fix too much on a specific research instrument—and in particular, the associated research methods—of those research methods that have already been established or at least very often applied from other disciplines should be sighted at first as many as possible.

In the second way, however, the arsenal of methods used is rather hidden embedded in projects and experiments of vocational pedagogy and vocational disciplines. Although since the early 1990s, the question of specific or explicit research methods of vocational science have already been discussed within

research projects and experiments, selective approaches have only become visible until the end of the twentieth century (Rauner 1998b; Spöttl 2000).

Rauner made an attempt at the methodical classification of studies (l998b, p. 14). Accordingly, a similar approach to method development for research on occupation and vocational training should be based on the following considerations:

- The specific occupation-related objectives, contents, and forms of working and educational processes must be defined at first.
- The analyses of contents and forms of working and educational processes in various occupational fields require contextual research and development methods.
- Research and development tasks, as well as research methods, must be identified and clearly defined.

On retrospection, it shows that during the overall development—to be assessed very positively—of cooperation between occupation research and vocational training research, including their methods, nonacademic occupations, and nonacademic vocational training stood at the center of the researches. The academic occupations and academic training, however, were—as already mentioned—barely subject of respective researches until very recently.

2.3 Current Status of Research on Occupation and Vocational Training in Nonacademic Subjects and Academic Disciplines: Working Fields of Vocational Pedagogy, Vocational Didactics, and Vocational Disciplines

2.3.1 Areas and Tasks of the Current Research on Occupation and Vocational Training and Their Boundaries

Occupations and the knowledge about occupations are a key issue for the research on occupation and vocational training. Today, there is broad consensus that research in vocational subjects and in vocational disciplines (Pahl and Herkner 2010) can and should be built on the existing knowledge about occupation research and on the results of vocational training research. This mainly concerns the research results in the field of

- Vocational training institutions and research on learning place,
- Addressee and target groups,
- Research on curriculum and training organization,
- Teaching and learning research,

- Vocational socialization research,
- International comparative research,
- Further education research, and
- Evaluation research (Arnold and Gonon 2006, p. 186).

Focuses of specific occupation research include:

- Analyses and systematization of tasks, activities, and working materials,
- Status allocation through occupation research,
- Qualification and competence,
- Decision-oriented, i.e., dynamic occupation research,
- Vocational dynamics: occupational transition and vocational change,
- Quantitative occupation research,
- Professionalism and deprofessionalization,
- Vocation in the globalization, and
- Occupation forecasts (Dostal 2005a, b, p. 107).

Initial widely applied literature show already the issues of economics and business administration, health and medicine, labor market policy, and labor law are examined and discussed among others in connection with the subject "vocation."

With a respective comprehensive and interdisciplinary occupation research, a significant contribution to vocational education research can be made (Rauner 2005b, p. 9; Dostal 2005a, b; Euler et al. 2010). Occupation research provides comprehensive, systematically founded, and effective statements for vocational education research. In particular, information and data on job content and required competences of each occupation should be provided. Occupation research is therefore interpreted as a part of vocational education research. In any case, research on occupation and vocational training are in an interdependent relationship because the respective task areas of both overlap partially.

Among others, through the 14 research tasks defined by the German Research Foundation as in 1990 as priority (DFG 1990, p. 67), the field of research on occupation and vocational training covers a variety of topics of vocational pedagogical, vocational didactic and vocational disciplines provenance (DFG 1990, p. 67; Rauner 2005a, p. 105; Sloane 2006, p. 610; Kupka 2006, p. 628; Pahl 2011, p. 714). This does not exclude the possibility, that there might be other independent and specific research fields as well in the long-term.

Viewing the possible research fields and topics of vocational subjects and disciplines as a whole, the question comes up firstly: Which topics belong to which discipline and subject area? There is the issue that vocational didactics of both the vocational pedagogy and vocational disciplines can be classified. Thematic analysis that takes the classification of subjects into account in analytical view should be carried out to define the research areas. The difference between the three research areas can then be seen, that occupation is comprehensively studied in its condition structure and the content of the discipline in vocational discipline research. The research area "vocational pedagogy" focuses on a pedagogy, which

analyzes and studies vocational education and training in particular. The research field "vocational didactics" concentrates on objectives, contents, methods, and media for the training in each specific occupation.

Studies on occupations, occupation classification, and on the understanding of work tasks undertaken out of different motivations, as well as on respective teaching and learning processes in vocational training are important issues. One encounters thematic elements that, on the one hand, focuses more on vocational pedagogy and didactics, and on the other hand, refer to statements that observe the genesis, present and development of vocational training with the work to be performed and the associated subject and specialized areas. This is a very rough localization, because various issues with their elements may show varied and crossed texture. To make the fact more visible and thereby achieving a more precise task assignment, i.e., task definition and to define and work on hitherto neglected areas is an important task of research.

2.3.2 Research on Vocational Pedagogy, Vocational Didactics, and Vocational Disciplines in Narrow and Broad Sense

2.3.2.1 Research on Vocational Pedagogy

Research on vocational pedagogy has a long tradition (Arnold and Gonon 2006, p. 127). At present, on the basis of the previous research orientation, it must be stated that the focus is directed to the debate on educational theory, the associated abandonment of a systematic empirical lining of the statements on occupations partially leads to the result that it is built on descriptive analysis and on their own empirically unsupported settlements. For, the foundation of a respective research approach lacks normative and methodological definitions and categories (Lipsmeier 2005, p. 26). Because of this deficit, respective discoverable vocations, the circumstances, the development of the economy, and the education reality are not always adequately measured. Today, it is deplored as deficit particularly, that although vocational pedagogy contains the word "vocation" in its name, the training occupation and their appropriate individual classification are rarely analyzed and observed in depth (Möller and Paulus 2010, p. 11). In the framework of vocational pedagogy, few studies are conducted with regard to the content to be conveyed and skills to be pursued for each occupation so far. Deficit of vocational pedagogy also lies in the fact that the research is almost exclusively focused just on nonacademic occupations and the academic occupations fade out. Because of the deficits recognized not only in vocational pedagogy, it shows that comprehensive research on vocational training is essential.

The debates in current vocational pedagogy focus especially on educational theoretical topics. If one observes their essential research fields, it can be stated

that major issues in the context of vocational education research are social, education-political, and education-theoretical developments, as well as the systematization of this specific form of educational science. Specifically, it comes to the issues of

- Vocational training theory and organizational theory of vocational training (Pätzold 2006a, p. 136),
- Europeanization and internationalization of vocational education and training (George 2005, p. 186; Münk 2006, p. 547),
- Developments in learning and teaching in vocational schools, training enterprises, and employment system (Straka 2005, p. 390; Achtenhagen 2006, p. 586),
- Concepts of professionalism and the associated teaching and learning concepts under the general social frame conditions of technological transition (Huisinga 2005, p. 350; Achtenhagen 2006, p. 586),
- Systematic of vocational training, vocational education, and training in enterprises (Kell 2006, p. 453) and
- Vocational training, especially under social, internalizing, and educational aspects (Bojanowski et al. 2005, p. 396).

Vocational pedagogy can be seen as a specific educational science, which focuses on the issue of sociality, vocational education policy, vocational education theory, vocation, society, pedagogy, and education, and, therefore, does not explicitly focus on each specific occupation. In addition, it applies widely, "that vocational pedagogy particularly endeavors for industrial-technical training programs" (Pätzold 2006b, p. 155). Respective researches focused almost exclusively on nonacademic occupations and related vocational world.

2.3.2.2 Vocational Didactic Research

Research on occupation and vocational education is determined particularly by the discussion of whether the development of learning concepts is oriented from vocation or subject, i.e., the scientific discipline. Currently, for the area of vocational didactics, it is noted that the categories used for nonacademic and academic vocational training area are not unified.

Nonacademic area mainly includes vocational work, vocational activity, learning field, activity field, subject area, subject, occupation, and occupation field. The concepts, which can be derived from these categories, include subject didactic (Clement 2006, p. 260), technical didactic (Lipsmeier 2006, p. 281), subject and vocational didactic (Petersen 2011, p. 547), vocational and vocational field didactic, as well as work and subject, i.e., specialized area-oriented didactic approaches (Pahl 2008, p. 359). All these constructs have not yet reached the rank of self-contained didactics or didactic models for the nonacademic vocational training.

Academic educational area is dominated by vocational disciplines and scientific disciplines and subjects. It can be seen as a result that in all these didactic approaches and concepts of teaching, learning and studying, vocations, i.e., vocational content and/or subjects and subject content are mainly used as categorical reference.

The definition of occupation/vocation/profession is not easy and is being discussed controversially. Profession and professionalism represent important categories for didactics of teaching, learning, and studying. Profession is understood generally as a unit for classification of areas or disciplines in science, education, teaching, and study. The development and differentiation of the subject canons of science and learning areas reflects the process of the increasing segregation of individual disciplines. Nature and extent of professionalism is determined by the development and specialization in subareas, but also increasingly by the contents if activities beyond subject area, i.e., cross-curricular.

The terms "vocation/profession", "discipline," and "special field of study" are important in university didactics. University didactics can be differentiated into general and domain-specific didactics. It requires "a scientific didactics and becomes discipline-specific university didactics through this focus. Each school didactics has its associated university domain didactics" (Grammes 2009, p. 3).

Today, the term "vocation" (Beruf) combines several interpretation possibilities. In general, it includes function, tasks, and activities of labor-division structures that is almost universal in the employment system as well as other social assignments and responsibility (Dostal 2005a, p. 106). For didactic considerations for vocational teaching and learning, occupation or occupation field can be taken into account. The work and activity field created in the process can and should be taken as the basis for relative vocational didactics. The didactic research should focus on relevant training occupation and vocational field, identify "the commonalities of training occupation allocated to a occupation" (Grüner 1981, p. 543). Due to the large number of training occupations, it seems that an integrated development of specific vocational didactics is not feasible in the foreseeable future—mainly because of the lack of human and material resources. From the perspective of what can be done, it comes back to occupation fields in order to generate relevant vocational field didactics.

As theoretical constructs of vocational teaching, learning, and studying, didactics have the problem in general—even when they are arranged differentially, that they do not or at least not adequately capture the vocational reality. This is a general epistemological issue. During the development of didactic theory of vocational teaching, learning, and studying, there is additional risk that, because of the limitation on a category such as occupation, vocational work, discipline, and subject area, only a reduced and simplified image of what happens in reality in the professional and personal life is presented. Under certain circumstances, the superior educational thought of the connection of vocational training and general education may be lost. It seems reasonable not to start merely from an initial point, i.e., a category in the development of vocational didactics. The categories "vocation" and "discipline", for example, can be combined, so the limitations that

may occur with exclusive focus on a single category can be dissolved with such an approach. To illustrate and describe this approach adequately, vocational and discipline didactics are now referred to in the area of vocational education. It is reflected in the discussions in recent years, that a close relationship has been seen between the terms "vocation" and "discipline" in didactic discourse on vocational teaching and learning (Schütte 2006, p. 140). With a didactic concept of vocational teaching, which also takes the systematic of the discipline—when it is possible and appropriate—into consideration, besides occupation and occupation field. With this connection, the reality is better reflected than with only one basic category as the reference point for didactics.

2.3.2.3 Vocational Discipline Research

The concept of vocational discipline can be interpreted and differentiated in a broad sense and in a narrow sense. For vocational discipline the broad sense as "theory of vocation," i.e., the teaching and research on vocations, the themes, and phenomena that occur in connection with occupations are comprehensively observed, and for example, when the overall necessary vocational knowledge of teachers in the vocational training centers is studied. In the context of vocational education research, vocational discipline in the narrow sense focuses merely on the theory and practice of the subject contents and the related work of each specific occupation.

The necessity, as already demonstrated earlier, to combine vocational work and discipline, i.e., subject area or technique under the aspect of education (Rauner 1987, p. 116; Pahl 1993, p. 52, 1998c, p. 7) as a fundamental approach has been clarified and developed (Becker and Spöttl 2008). A deeper understanding of vocational discipline considerations and of the importance of occupation research for vocational training has been developed in discourse between professional representatives, particularly from industrial-technical disciplines. The vocational discipline research in recent years is marked by the orientation on work processes in company (Jenewein 2005, p. 148) and vocational or job-related action competences (Rauner 2004; Rauner et al. 2007). The orientation of vocational education and qualification on work processes is schematized and discussed, taking the subjective individual interests, experiences, and requirements of the learners and professionals into consideration. Work, professional field, or subject area and vocational training are interdependent in their relationship to the subject of vocational discipline research. On this basis, vocational educators should be empowered during their training to shape vocation-related educational processes and qualifying working processes.

However, whether the learning processes in the employment system "can be very effective for the work force under the current structures and conditions of vocational work, must be doubted despite or better because of the pressure exerted; much more likely would be that they [the employees of generality] are pressed into

a working and living situation that is highly unfavorable for the competence development" (Volpert 2005, p. 298).

Due to these developments, a change of perspective for vocational learning and working processes has stood out. The state of development of vocational discipline in individual domains, i.e., occupations fields varies widely. For many areas, for the preparation of the contents of vocational learning, the necessity to develop a qualification research proves to be meaningful and necessary. The specialized areas may be the subject of an integrative changing relation of vocational training that includes work and specialized area in their concrete shaping as interaction of the technical possibility and social desires.

Currently, the vocational discipline research is mainly about the uncovering of the contents and forms of factors, moments, and forces that shape organized labor in vocational form. The relevant occupation field or specialized area is presented not only as an independent variable, but is also observed in its configurability and in conjunction with the shaping of work and working process, as well as the typical professional working competences. Knowledge on working process and work competences, i.e., vocational qualifications become the key categories of the theoretical and empirical research (Rauner 2004; Rauner et al. 2007; Becker and Spöttl 2008). Relevant approaches of vocational disciplines must be applied comprehensively because of their requirements. For some time, the specific occupation-related objectives, contents, and forms of work and the related work processes are explored particularly in this context (Becker and Spöttl 2008). The issue of reference discipline still has not been solved optimally for many occupations stands in the focus of research. Such research approaches are followed largely unsystematically and incoherently. They are a prerequisite and an option for a more systematic and complex scientific foundation of vocational education research.

Vocational discipline research in each occupation represents a complex, demanding, and time- and resource-consuming task. Due to the number of acknowledged training occupations (currently 344, BIBB 01.08.2011), it is unrealistic to develop an independent research plan or vocational discipline for each occupation. A further designed research and development approach based on the existing structure of the "occupation fields" is more realistic and meaningful. Structural elements of such a vocational field discipline are the occupation field research and teaching. Central task of a vocational field discipline is to investigate the vocational action field of each occupation of an occupation field, as well as the evaluation and shaping possibilities of work-specific working processes and the technology used in (vocational) educational and above all (vocational) didactic aspects. Due to the lack of theoretical foundation and grounding for traditional definition and description of occupation fields and various classification criteria, the construct order of "occupation field" must be critically examined and analyzed.

Previous approaches to vocational field discipline indicate that this may focus, on the one hand, on overarching questions of occupation field, and on the other hand, on the basic areas of vocational discipline. In this respect, one can call vocational field discipline as a precursor or precondition of vocational discipline in the strict sense. The greater the complexity of the evolving vocational field

discipline is in the context of work, technique, and education in occupation field, the more varied is the spectrum of possibilities to respond to the changes in the work and living world, without losing itself in the specific details of a occupation.

Work and business processes provide a specific area of vocational and vocational field discipline research. Fischer (2005, p. 307) correctly states that, with the term "work process knowledge," the "work-oriented change in the vocational training has moved to the foreground." In vocational training, it has been tried "to structure the ways of the acquisition of working process knowledge based on curricula by newer reform approaches" (Fischer 2005, p. 315). However, an explicit definition of knowledge in vocational discipline research is still absent (Röben 2005, p. 253). A reasoned and conceptual distinction between scientific knowledge, book knowledge, theoretical knowledge, practical knowledge, and work process knowledge has not yet been formed (Röben 2005, p. 253). This finding also applies to the discussion on the work process knowledge and business process knowledge. There seems to be no doubt that, with the orientation on work and business processes, a significant step can be made to competence development.

When observing vocational discipline and/or vocational field discipline, one must reflect on the respective work processes from two sides: the process is viewed from the outside, whereby its function and elements are highlighted; from the inside, it is seen from the perspective of the individual who is involved in the vocational work. Due to the current problematic developments in the field of vocational work, it must be noted that the individual employee should be observed with their individual requirements, experience, and requirements in a comprehensive education. An important aspect is the question of "how much can particular job arrangement, i.e., work organization influence individual learning and developing opportunities" (Volpert 2005, p. 294).

The new research approaches and results in interdisciplinary analyzes of and studies on vocational discipline make it clear that, through advanced and multidimensional organizational forms, work tasks and activities in the workplace raise other and/or increase demands on vocational learning and work processes, and thus also on the learners. In some new work forms of the employment system, one can speak "of a 'requirement for excessive requirement' under learning-relevant aspects, while this is more like a 'requirement for (qualitative) lower requirement' in traditional Taylorism working structures" (Volpert 2004, p. 299). Not only learning in training enterprise, i.e., in the workplace, but also schools that provide vocational education at the learning place are affected by this paradigm shift.

2.4 Future Tasks and Perspectives of Occupation Research and Research on Vocational Education

2.4.1 Development Opportunities of Vocational Didactics on the Basis of Vocational Discipline

The further development of vocational (field) discipline will also present an important task for vocational (field) didactics in the context of on vocational education research in the future. During the study on a topic of vocational learning through the analysis of work and domain, i.e., subject area under the aspect of vocational training, teachers in nonacademic and academic vocational training institutions can also contribute to vocational discipline that shapes itself for individual occupations.

Different from the research on vocational discipline, which is still in the early phase, various research results have been produced in the field of didactics of vocational teaching, learning, and studying. It can be tried to push forward a systematic vocational didactic research in nonacademic, as well as in academic vocational education area, which is not limited to the occupation, occupation field, and disciplines, but also focus on occupation-related work and associated work processes.

As vocational didactic research can only be found at the moment relatively rarely and only for some selected topics or occupations, and the outcomes of the research on vocational didactics are only available occasionally, future research should be conducted in particular on the following two levels to a greater extent:

- Expansion of the occupation and vocational training research on as many occupations and occupation fields as possible.
- Research on higher level vocational education theory and the possibility of an overall didactic concept for the nonacademic and academic vocational education.

Although the development of vocational disciplines and the related occupation and vocational education research seems to be a long-term goal under the current conditions and limited resources, yet or just therefore, vocational didactic and vocational discipline research should be conducted and brought forward in the future. Any teacher, whether working in nonacademic or academic area, can contribute to this future project on site with their educational-, teaching-, or study-related analyzes of the discipline or associated vocational work.

Occupation and vocational education research also represents a major work field in the future. If one reflects on the current situation more closely, a variety of didactic approaches to vocational teaching and learning can be recognized, regardless of whatever they are called. Not only their number is very large, they are also shaped extremely differently. The spectrum reaches from self-produced simple and relatively plain concepts to elaborated constructs that are based on very

in-depth scientific discussion. The number of vocational didactics will be even larger in the foreseeable future, if one follows the banal insight, that specific didactics of vocational teaching, learning and should be researched, developed, and applied in all areas as much as possible where vocational training takes place. Therefore, both the area of nonacademic vocational education and training and the area of teaching at academic institutions must be considered. The latter is in the current practice usually not classified to the vocational training system, but declared as (independent) higher education system. Considering under system-theoretical aspects, vocational training also prospers in academic teaching and didactic approaches, vocational didactics has already been developed for academic occupation, which should/must be further shaped in the future. Perspectively, emerged and still existing view constriction of occupational and vocational education-related researches on the nonacademic vocational training and its didactics will be broken up and broadened.

Gustav Grüner has repeatedly pointed out three decades ago that there should be long-term specific didactics in vocational education. Under the perspective that didactic principles and corresponding concepts must be researched in both academic and nonacademic vocational education system, the thesis seems appropriate that the previously presented concepts to didactics of vocational teaching and learning are transferable to the entire area of vocational education, and this extended approach can contribute to the development and creation of a overriding theory of vocational didactics. Occupational and vocational education research must then start from an entire vocational education system, which though consists of two partially independent subsystems (nonacademic and academic vocational training system), indicates an overriding didactics among many specific occupation fields.

2.4.2 Prospects for the Subjects and Disciplines Through Occupation Research and Research on Vocational Education

Viewing the subjects and disciplines, occupation research, and research on vocational training have developed from preforms to a more empirically oriented research on vocational science with a particular task profile in the course of the last 100 years.

Previous vocational scientific work in nonacademic and academic vocational education area has led to the recognition that it is reasonable and necessary to consider specific research approaches in vocational education research. Fundamental work areas and tasks of vocational discipline and vocational didactic research have been identified (Rauner 2002a, b), but it is almost exclusively related to nonacademic subjects and disciplines so far.

Vocational discipline researches should be directed primarily to occupations, vocational work, and work and business processes and their organization possibilities in the future, namely in detail to

- Historical and current forms and future developments of vocational work and work and business processes in the corresponding nonacademic and academic occupations.
- Analyses of qualification requirements in vocation, and together with the requirements for vocational learning or studying for an occupation.
- Analyses of subject areas that are relevant to the vocation-specific work in a occupation field.
- Innovation fields from vocation-related specialized or subject area and work fields.
- Occupation, occupation profiles, and concepts for restructuring the existing occupations.
- Concepts for initial and further education and training of teachers in vocational disciplines.

Focuses of vocational didactic and methodological researches are

- Necessary functions, structures, and forms of nonacademic and academic training of the future,
- Training and learning organization (legal, structural and organizational framework, regulatory instruments, curricula, training regulations/training frame plans, study plans),
- Didactics, methodology, and media of vocational teaching, learning, and studying (e.g., action-oriented and differentiated training, teaching and learning concepts, i.e., learning and studying organization, learning results controls).

If these and other research tasks are tackled in the future, occupation and vocational education research will see a remarkable development, that may have great importance not only for the employment system but also for the social system overall.

2.5 Occupation and Vocational Education Research in the Educational Political Sense: Conclusion

For nonacademic and academic vocational education as well as its vocational subjects and disciplines, both the results of occupation research and research on vocational education are becoming increasingly important. In the sense of the overall concern of a result-oriented research, it could be decided respectively with selected important major topic areas, such as vocational subjects and vocational disciplines, whether they should be worked on separately or together.

The opening question in this study focuses on how occupation and vocational education research has been developed in the past and at the present, and what their future prospects look like. It was based on the assumption that there are various independent and common work and research areas. When assessing the areas of occupation research and research on vocational training, and the related research areas of vocational pedagogy, vocational didactics and vocational discipline, a reasonable and appropriate definition of the relevant research subjects insures well-based analysis and study, for example, of vocational subjects and disciplines, and thus a more realistic perspective on these research subjects.

A comprehensive and systematic occupation and vocational education research can significantly contribute to the development of vocational subjects and disciplines with their results. For each area of vocational education research, i.e., vocational pedagogy and vocational didactics, as well as vocational discipline, specific research fields should be gut-covered. The research fields worked on under various perspectives and their results could also lead to synergy effects for the disciplines associated with vocational education. Overall, it could be assumed that occupation and vocational education research—as can be seen by viewing the historical and current development—will experience growing importance in the future, whose concrete consequences for both the employment system and the social system overall could not be estimated at the present.

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Chapter 3
VET Research in Relation to VET Policy, Planning and Practice in 2013

Anneke Westerhuis

Abstract This contribution focuses on the evolution of relations between VET Research, VET Policy and VET practice which changed since the 1960s, due to changes in stakeholder relations in policy making and in the position and composition of the research community. The gap between education practice and education research is proposed and analysed, which accounts to both the research community and the practice of education. To solve these problems, three aspects could be taken into account: research communities take the lead in identifying and specifying innovation needs; professionals in education and researchers in research projects establish cooperation; boundary crossings between communities are facilitated. Two challenges for brokerage institutes are figured out: the ownership and the position of the brokerage institute in selecting information.

3.1 Introduction

In the 1960s links between national policy and research agendas intensified. It was an era of optimistic expectations about the benefits of research for policy making. In David Apter's famous phrase: '*the application of knowledge by political means—and not responsiveness of government to private wants—becomes a test of good government*' (Apter 1967, p. 433). In the Netherlands, the establishment of the Dutch Scientific Council for Government Policy (WRR) in 1972 is a good example of the need that governments felt for founding decisions on scientific knowledge, for it was welcomed as a break from the tradition of grounding policy decisions on recommendations of Advisory Bodies representing public interests. In the Council's own words: '*this was a period in which advisory councils were used*

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mainly in specific policy domains and to increase the public voice in policy decisions. The WRR was a new kind of institute with a new kind of task' (http://www.wrr.nl/en/home/).

In the field of education, massification of secondary education proved to be an important driver for linking policy and research agendas these days (Coombs 1968). However, the great variety of school types, the average (small) size of schools, and the number of education-related topics called for a *middle ground* for bringing scientific knowledge into the schools. In the Netherlands it took the form of an education infrastructure linking national policy stakeholders, members of the education research community and schools. This infrastructure was inspired by the industry-based RDD model, albeit on a sector (education), rather than on a company scale. Financed from government budgets and based on policy priorities agreed upon by national stakeholders, new policy aims were translated into operational models ready for use in educational practice. A process led by researchers and consultants; the role of schools, i.e. teachers, were to try out and validate the models till perfection. This innovation chain was fostered by academic research in terms of feeding these concepts with academic knowledge. Research results were subsequently made accessible to the schools via an education support structure acting as the intermediary link in the chain. Consultants were responsible for the implementation of the concepts in practice. In knowledge terms, for translating research outcomes into classroom practice. A popular metaphor describing the way research-based knowledge came into the reach of teaching staff was the 'perforated onion'; knowledge from the core trickles through the skins until the outer skin, education practice, is reached (de Bruijn and Westerhuis 2004; Jochems 2012a).

In the 1980s this infrastructure eroded. In this period all over Europe tension grew between the public expectations of education systems and the actual performance of these systems, while the belief in the ability of national governments to bridge this gap was strongly reduced. Government withdrew from a number of public domains; governing education from a national level was no longer seen as an effective strategy (Karsten 2006). Not by accident, school autonomy in terms of education policy making coincided with government initiatives to stimulate mergers of small schools to become large-scale education institutions. Tensions between public expectations of education and the performance of education had to be solved at local level; by local agents. In the Netherlands, the now much larger schools were expected to take the initiative to reform and develop a school-based innovation policy in close communication with local stakeholders. Hence, a substantial part of the government's budget for the innovation of education was taken from the chain structure and added to school budgets; a substantial section of the national innovation budget was reallocated to the schools (de Bruijn and Westerhuis 2003). The almost monopolistic position of the government in defining innovation priorities evaporated; decision making on innovation priorities had to be shared by the schools, their national bodies and local stakeholders. In particular in VET this process had a profound impact on the relations between (VET) research, policy and practice.

However, not only changes in governance relations had their impact on relations between research, policy and practice. In particular, the last decades saw knowledge turning into one of the most powerful economic drivers. A by many unforeseen consequence of 'the knowledge economy' is loss of status of people working in traditional intellectual professions and the loss of authority that came with this position. In the eye of policy and practice, researchers are no longer members of a 'high priesthood' (McNiff 2002) who know all and know best. Almost by definition the knowledge economy assesses knowledge in terms of value for production; it is valued from its capacity to improve; the production of knowledge is under an industrial regime in its subservience to improvement and efficiency, and hence critique (Wilde 2001; Drucker 1969). Instead of replacing managers and businessmen as the new society elite (Bell 1974), knowledge workers have lost their aureole of exclusiveness; knowledge production turned into a service offered by a mass of knowledge workers. The research community saw itself transformed from a small exclusive university-based network into an industry with open boundaries (Gibbons et al. 1994). Not only in terms of employees, but also in terms of the definition of knowledge (see for instance Lyotards rhetoric question: '*who decides what knowledge is?*' (Lyotard 1984, p. 9).

Not only in the Netherlands, but also in other countries the chain broke, for more or less the same reasons. In Germany for instance, a decreasing lack of consensus between the stakeholders in VET resulted in a scattered landscape with stakeholders pursuing (and financing) their own research priorities (Lauer-Ernst and Hanf 2008). As we have seen, in the Netherlands growing tensions between (conflicting) public expectations and the actual performance of education systems were laid on the plate of individual VET schools. In Germany, due to growing complexity of relations between the National State, *Bundesländer* and the Social Partners, VET policy making reached a deadlock. Another similarity is the growing number of organisations commissioning educational research and a growing number of institutes offering research services. However, whereas in the Netherlands educational research is commissioned by schools and the infrastructure transforms into a market place, in Germany the metaphor of an Arms Race intending to break the deadlock seems more to the point: '*Much educational research— some of it highly significant for policy— is now conducted outside of the universities and of government. Not only do consultants in the private sector play an enhanced role, but also think tanks, political parties, trade unions and voluntary organisations appear to have grown influence*' (Lawn and Rees 2007, p. 53).

In summary, relations between VET Research, VET Policy and VET practice changed because of changes in stakeholder relations in policy making and because of changes in the position and composition of the research community. The concept of a chain between policy, research and practice became obsolete not for one, but for various reasons:

- growing numbers of organisations regarding themselves to be stakeholder (policy agent) in VET;

- growing numbers of organisations and bodies having the means for commissioning research;
- growing numbers of agencies offering research services to schools and stakeholders;
- changes in the appreciation of knowledge from an authority in its own right into a service under a market regime and to be performed by many and for many.

This brings us to the interesting question whether it will be possible to find new ways to organise VET Researchs as a public body of knowledge; public in the meaning accessible for educational practice; to non-economic metaphors for describing relations between VET Research and VET Policy. This is the subject of this article.

3.2 What is the Problem?

Despite the much wider availability of research services, of research-based knowledge and professional support for school teachers, the idea of a gap between education practice and education research is widespread. Numerous publications and workshops are dedicated to this subject. The American National Research Council sees *a sharp divide between education research and the practice of education in schools* (National Research Council 2002, p. 14). Other authors use qualifications like 'crises' (Badley 2001), 'black hole' (Miller 1999) and 'credibility gap' (Levin and O'Donnel 1999), the need for bridging the research–practice gap (Hirschkorn and Geelan 2008). The OECD voices its concern in a more optimistic phrase by referring to new challenges for educational research (OECD 2003), but all in all the relation between research and practice is qualified to be in crises. So, what is the problem?

According to Jochems, public attention for 'the gap' in the Netherlands grew in substance after 2003 induced by reports from two government-oriented advisory bodies: the Education Council and the Advisory Council for Science and Technology Policy (Jochems 2012b, p. 411), leading to an avalanche of new publications on this subject, most of them written by researchers and published in periodicals and book series read in the research community (To name a few: de Bruijn and Westerhuis 2003; van der Sluis 2004; Broekkamp and van Hout-Wolters 2007; van Braak and Vanderlinde 2012). This *unilateral* response feeds the idea that the gap is foremost felt by the education research community. Even more so because of the reasons given for this estrangement. Broekkamp and van Hout-Wolters for instance identify four core problems, three of them related to the inability of practice to utilise research outcomes: (1) outcomes are either 'open doors' or too specific for daily classroom practice, (2) while *potential* applications of outcomes are ignored and (3) competences and support are lacking for transferring outcomes into behaviour and skills (2007).

Jochems' focus point is the academic education research community. The introduction in 1983 of new funding conditions for financing research in education has stimulated researchers to look for appreciation within the (international) research community (high scores for publications in peer reviewed journals, preference for manageable research designs, sensitivity to trendy topics), appreciation from the community of practice coming second. Another profound change can be found in the composition of the education research community. Earlier generations of education researchers started their working life as classroom teachers before joining the academic community, while new generations started their academic studies directly after leaving secondary education. Together with the fragmentation of the community in numerous sub-specialisms the result is a redefinition of research questions (in academic rather than practical terms) and inability (and need!) to define outcomes into the language of the teaching community (2012a). In other words, this academic community started as a community for and from teachers.

A striking illustration can be found in the career of one of the founding fathers of education research in the Netherlands, Leon van Gelder:

Box1: Career and mission of Dr. Leon van Gelder, founder of the education research discipline in the Netherlands

After having combined a teaching job in primary education in the slums of Amsterdam with a part time academic study directly before World War II, Leon van Gelder dedicated his working life to the innovation of education. First of all by founding the Pedagogical Centre of the Dutch Teacher Union; a national centre of learning for teachers.

In 1964 he was appointed as one of the first professors in the newly defined academic discipline of education research. On this occasion he defined to be the aim of this new field of multidisciplinary educational to be '*helpful to educational practice, to solve its problems and to innovate both the structure and content of education'* (Creemers 1981, p. V).

It is relevant to notice that being helpful to educational practice did not mean that the program for education research ought to be based on an inventory of educational problems as defined by teachers. For van Gelder educational research should be in the service of the innovation of society. Education research should help schools to implement integrated innovative educational concepts (Postma and Wardekker 1981).

In conclusion: the RDD concept mentioned earlier, could also be successful because researchers and teachers were united in defining the overarching aim of education research in the innovation of education as a social field and also because researchers understood the problems of teachers from their own teaching experience and were able to communicate their findings in the language of teachers.

What is lacking in this analysis, though, is awareness of the changes in the world outside the academic community. The RDD concept was a success because of consensus about the (policy) aims of education between all parties, a limited number of well-organised stakeholders and funding from one budgetary source (government). Not only the academic world has changed. It is not enough to look for a new mission to be shared by researchers and practitioners. Jochems' suggestion to take innovation of education as guiding principle for both the life-long professional development of teachers and the education research agenda ignores these changes (Jochems 2012b). Innovation as defined by whom? Who should be in- and excluded in the process of defining research aims? On what grounds? Are research programmes open for researchers outside academia? Are we sure practitioners are willing to have their classroom problems clustered around research questions? And are we sure researchers are willing to have their research questions clustered around the problems as defined by the education community? Who will validate this programme? This question in particular is relevant for VET, as despite the growing numbers of participants, VET is still in the limelight of the education research community's interest (Commissie Nationaal Plan Toekomst Onderwijswetenschappen 2011). Foremost, how to define education research these days? Education is not only object of study for the traditional education-pedagogical discipline, but also for academic disciplines like sociology, neuroscience, psychology, law or economics. As we have seen, innovation was the basic principle of the RDD concept, but there is little ground for the assumption that its integrating spell can be revived.

Is the conclusion therefore that the gap between education practice and education research is first of all a problem for the academic research community? The urge to be of more relevance for educational practice is most certainly felt in the education research community (van Braak and Vanderlinde 2012). For Furlong and Lawn the raison d'être of educational science is even at stake when this gap is not closed '*if they are to survive, the disciplines of education need to make their case as important contributors to applied work. It will, in our view, be increasingly difficult to sustain an argument that their contribution is only in terms of 'pure' research*' (Furlong and Lawn 2010, p. 185).

However, from a wider perspective this gap is also a problem for the practice of education. The sub-division of education research into specialised fields of research and the rise of education-related sub-specialisms in other disciplines are not only side effects of a process of internationalisation and the rise of funding arrangements on a temporary basis.

Box 2: factors having an impact on early school leaving
In 2008 the Netherlands Institute for Social Research/SCP, a government agency conducting research into social aspects of government policies came up with a list of factors having an impact on early school leaving, identified in research reports (Herweijer 2008, pp. 171–180).

Factors found in international research:

- The structure of the education systems: generally speaking, the student's home setting has a bigger influence on the risk of school dropout in stratified systems, e.g., systems where students are placed in different streams in the first phase of secondary education.
- The education attainment level of parents: countries where the vast majority of parents have a secondary or higher education background, score better than countries where lots of parents have a low education level.
- The achievement level of 15 year-olds: the percentage of dropouts tends to be higher in countries where large numbers of students perform weakly.
- The physical equipping of schools: high (government) spending per student in secondary education generally correlates with a lower school dropout rate.
- The level of education: the risk of dropout at the lowest level of secondary education and VET is roughly three times the average.

Factors found in national research:

- Risk for students receiving learning support: learning support is found to be a risk factor for dropout in the early years of the lower levels of secondary education programmes in particular.
- A poorly developed career perspective in the final phase of secondary education.
- The open admissions system in the lower levels of VET helps to keep down the dropout rate in the short term, but in later stages the risk of dropout is much greater among this group of students than among those who entered by virtue of their secondary education qualification.
- The backgrounds of students: boys drop out of school more often than girls; pupils from single-parent families will drop out more often than children from families with two parents; there are marked differences between students from low and high income groups and students from families whose parents are not in paid employment are at greater risk.
- High dropout rates among ethnic minorities: the dropout rate among non-Western ethnic minority secondary school students is roughly twice that of indigenous students.
- Degree of urbanisation: the dropout rates in the largest cities in the Netherlands are twice as high as in smaller municipalities. At district level, the dropout rate among students from disadvantaged neighbourhoods is twice as high as among students from other neighbourhoods.
- Dropout and educational quality: schools with high dropout rates do less well in meeting the standards in relation to quality assurance, teaching content, the didactic quality of teachers, the learning climate and the support provided to students with special requirements.

- Differences between VET schools: differences are related to the training level offered and the backgrounds of the students. Characteristics at school level, such as the size of the establishment or the concentration of non-Western ethnic minority students, do not explain differences in the dropout risk between individual schools.

The box illustrates the effect of researching an aspect of education from various angles. In this case of research into one of the most persistent problems in Dutch VET, early school leaving. It brings us the insight that—in particular—persistent problems are multidimensional not only to be solved by schools, but also teachers for that matter.

Thanks to the massification, education is now an important social field faced with all kinds of social problems but also an instrument for economic development from an individual and society point of view. Small wonder this field is attractive for all kinds of academic disciplines, leaving all stakeholders, not only teachers, with the problem how to weigh the various perspectives.

What at first looked like a contrast, a gap between education practice and education research notwithstanding the availability of research services, research-based knowledge and professional support for school teachers, is by a closer look no contrast at all. It is the diagnosis that fails. There is no gap because the traditional educational research community drifted away from the education community, also in terms of personal relations; the gap first of all is the outcome of what I would like to call *the scale factor*. On the one hand education is nowadays an object of research for many academic disciplines, advisory bodies, etc. On the other, research findings have to find their way in a still expanding sector with a diverse employment structure. More findings have to find their way into a large and diversified sector.

3.3 And What is the Solution?

A blind spot of many researchers is the belief that they have the key for making findings relevant for practitioners. Practitioners, if only better addressed, are waiting for research outcomes of the projects run by researchers. In other words, it is mainly a question of language and willingness on the side of individual researchers to overcome this gap (Van Braak and Vanderlinde 2012). This assumption can be questioned on several grounds:

- Problems in education can be multidimensional, as we have seen in the example of early school leaving; in many cases a researcher or research project might be helpful in solving an aspect of the puzzle, but not the whole puzzle;

- Who is to be addressed by researchers? The most favourite target group is teachers, while—in particular in Dutch VET—a lot of new specialist staff and management positions have been created with new responsibilities and mandates;
- Dynamics of research and education are non-compatible, as changes in education programmes and the organisation of education are most of the time planned in the summer; the window of opportunity for implementing research findings is rather small;
- Researchers are likely to forget differences between the knowledge position of people working in education and people researching education; while researchers are dedicated to bring their new insights to the fore, people working in education might have questions that can be perfectly answered from outcomes of previous research;
- In many cases it is not enough to inform about new findings; knowing about findings should not be mixed up with having a real impact on, for instance, classroom behaviour. Either because it is not realistic to assume new routines to be developed from reading only, or because findings might contrast with the intuitions (Blik et al. 2012) or the interests of practitioners (Funnekotter 2012);
- Not only researchers bring knowledge into the practice of education. Apart from attending seminars, conferences and workshops, teachers (and other professionals in education) subject their experiences to peer assessments and participate in school-based evaluation projects. In other words, they become familiar with research methodologies or even apply these methodologies (Gibbons et al. 1994).

The answer to the question raised in this article ('*will it be possible to find new ways to organise VET research as a public body—in terms of accessible for educational practice—of knowledge?*') should take into account that developments in education are assessed from subjective points of view. Apart from the fact that it is a day's job to unite all stakeholders (For VET: national Government, national industry, local industry, Secondary Education, Higher Education, the Student Union, Associations of Parents, Local Communities, Teacher Unions, the Association of VET colleges, local authorities, etc.) on a collective research agenda, the overarching policy aims of education are conflicting in themselves. From a system point of view, Dutch VET should be (i) accessible for great numbers of students and (ii) effective in terms of educational productivity and (iii) should deliver students with the highest level of competences in terms of diploma level. It is not hard to imagine that stakeholders hold different views (positional observations) on the relative importance of each of these three aims, and hence on priorities in addressing and framing educational topics in research programmes.

For this reason, Laur-Ernst and Hanf's suggestion that the research community should take the lead in identifying and specifying innovation needs, as well as in generating and collaboratively shaping innovations, their testing and evaluation is

not very helpful. Research does not have the authority anymore to operate as an 'anticipatory initiator' involved in generating and supporting innovation (2008). Nostalgia for the days when the research community still held authority can also be traced in Humes' idea that governments should take responsibility for providing '*high quality research-based evidence and advice to Ministers and officials to inform policy development* (Humes 2007, p. 74).

Secondly, any answer should take into account that the education and the research communities cannot be bound on complementarity of roles. As we have seen, both communities have grown in scale and complexity. Other ways of bringing the communities together are needed.

Is it a good way to bring researchers and people working in education together on an individual bases? A much promoted solution is cooperation (co-creation) between professionals in education and researchers in research projects, starting with co-deciding on the research questions and ending with co-deciding on the interpretation of the data (Elström 2008; Den Boer et al. 2011). However, these types of solutions might fill the gap from a social point of view, it is not a satisfactory answer to the question for reasons of effectiveness and—by definition—the limited scope of a single research project. An answer to this question should be based on a concept of a public body of knowledge, not on personal relations between researchers and people working in educational practice.

Wenger (1999) stresses the importance of boundary crossings between communities. The concept of boundary crossing is coined by Engeström et al. 1995 in the meaning of identifying ways of cooperation, despite differences in concepts, traditions, perspectives and values, between professionals from different backgrounds; for instance from the world of industry, science and education. Boundary crossing is facilitated by so-called boundary crosser or brokers. In the words of Wenger: '*Some people act as brokers between communities. They can introduce elements of one practice into another. Although we all do some brokering, my experience is that certain individuals seem to thrive on being brokers: they love to create connections and engage in 'import–export', and so would rather stay at the boundaries of many practices than move to the core of any one practice*.' (Wenger 2000, p. 235).

Brokers define their mission in organising border trafficking between communities or groups. For instance by their participation in a variety of networks, by maintaining personal relations with different kinds of professionals, by attending meetings, as well as disseminating their knowledge and sharing their contacts on both sides of the border. In terms of the chain from previous days, brokers personify the middle ground between the world of education and the world of research. Given the complexity of both worlds though, brokers cannot have a complete overview of what is going on across the border. There is a serious risk of selectiveness and patchiness in the information collected by brokers.

This risk can be faced however, if the concept of brokerage is redefined at institutional level. In promoting the example of cooperation between research and

industry to be followed in education, f.i. VET, it is often forgotten that, unlike the industry, education cannot be adapted to the newest research findings as if older findings have already been implemented. Partly, because schools and national bodies do not define research priorities on a comprehensive and progressive research agenda and partly because relevant knowledge might come from many sources (ref. Box 2). Most school-based innovation projects start with a short, and hence patchy review of research findings relevant for the object and aims of this innovation project, although many projects tend to skip this phase and plunge into the deep, constructing new programmes or tools directly because of lacking resources and documentalist skills (Scholtes et al. 2008).

A brokerage institute should collect a wide body of knowledge containing a wide variety of research findings in an optimum of completeness and recency. This institutional brokerage model is based on two dynamics:

- The dynamics of the demand side: responsive to queries from people working in education. For instance, the time frame of school-based projects. Queries might refer to qualitative data, reviews, experts, networks, etc.;
- The dynamics of the supply side: flagging up new findings from various (international) sources to mediate these findings for a wide and varied audience.

Both types of services call for an accumulation of documentation, data and contacts necessary for quick responses from the demand side, as well as an accumulation of experience in how to address a varied non-scientific audience. In other words, in an institutional form brokerage might benefit from the concentration of experiences in what works and what does not in terms of the bones as well as the soft tissue.

Brokerage cannot flourish in a market model; from a market point of view knowledge is transferable, object for purchase and selling in terms of exclusive use for the organisation having commissioned research, or in terms of 'hided' in courses and training exclusively available for clients. Besides, a market model is sub-optimal as many schools projects might have the same type of questions (although not at the same time), while answers are only available for the ones that commissioned the research; there is no platform for collecting and distributing findings.

The very heart of institutional brokerage is knowledge stored in databases, in people, in search routines,in networks, in the research community and the education sector. In terms of storing a brokerage institute collects working knowledge, rather than knowledge workers (Brown et al. 2011).

Second, in terms of activity fields, institutional brokerage provides a boundary space between research and education. By creating institutional space (inter-life) between research and teaching and learning, there is room for evaluation and rethinking ways to store, define and organise data—from a provider and a demand point of view—as well as for rethinking effective (personal and non-personal) ways to transfer information to practitioners.

Box 3: education and research; for always worlds apart?
Recently prof. Dr. Herman Van de Werfhorst, a well-known Dutch sociologist from the University of Amsterdam, pleaded on the opinion page of a national newspaper for more instead of less national testing in primary education. His argument: only standardised tests are able to look beyond a pupil's background. In this, he rejected the claim of primary education teachers that belongs to their professional capacity to assess the potentials of their pupils: '*this is evidently not true*'. (NRC Handelsblad 2013, p. 18).
From an academic researcher's perspective Van de Werfhorst is absolutely right. The point is however, that a position opposite teachers (unjustified) beliefs is not very helpful in getting findings accepted, and far more important, for the implementation of a cycle of tests as a formative feedback system used by teachers to evaluate their pupils' learning progress. As much as testing might enhance the career prospects of young people, teachers are and will be needed to guide them through the education system.
The lesson from this example is that, fruitful interaction between education and research cannot stop by sending research findings into the open, assuming they will find their way in the practice. Of course, a brokerage institute has neither the power, nor the means to get findings accepted by practitioners. A brokerage institute does have the position to provide a platform for an exchange of opinions and to facilitate the debate on the relevance of beliefs and facts, though.

3.4 Risks and Challenges

Creating a boundary space is not without risks. The final section of this paper is dedicated to two challenges for brokerage institutes: (1) the question of ownership: who owns this space? and (2) the position of the brokerage institute in selecting information.

3.4.1 The Question of Ownership: Who Owns This Space?

Given its position, a brokerage institute is neither exclusively embedded in the hemisphere of education, nor in the hemisphere of research or the hemisphere of policy making. In 'The Idea of Justice' Amartya Sen stresses the importance of public reasoning and the need for an agent to '*invoke a wide variety of viewpoints and outlooks, based on divers experiences from far and near, rather than*

remaining content with encounters—actual or counterfactual—with others living in the same cultural and social milieu, and with the same kind of experiences, prejudices and convictions about what is reasonable and what not, and even beliefs about what is feasible and what is not' (Sen 2009, p. 45).

A brokerage institute might bask in the light of these words, in full awareness that it has, at the same time, to allow for the interests of organisations and people involved. Indeed, not an easy position! In fact a position that can only survive with active support of the organisations and people involved. In other words, the question is not is '*who owns this space?*,' but '*who allows for this space?*.'

3.4.2 The Position of the Brokerage Institute in Selecting Information

A vital condition for a brokerage institute is trust. Trust in terms of its agenda (what is on it and what is not) and trust in terms of the information selected to be transmitted. Should a brokerage institute be answerable for the quality of this information or should it rely on the quality and assessment procedures of its suppliers? This question is more relevant as a brokerage institute defies as its mission to re-contextualise research findings in language understandable for non-researchers, or to transfer findings from academic research as well as working knowledge from practice.

Analogous to the reasoning suggested by Clarke and Westerhuis on conditions for establishing mutual trust in the process of building a European Qualifications Framework (EQF), an important condition for a brokerage institute is to build trust in the integrity of the ways in which information is 'digested' and transferred (Clarke and Westerhuis 2011). Condition sine qua non is a careful, transparent and inclusive process-design of a brokerage institute's working processes, both at institutional and operational levels. Trust has to be built; it will largely depend on the way these building processes evaluate whether a brokerage institute will gain a metaphorical license to operate as an informing or as a reforming agent.

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Chapter 4
Occupational Research: Implications for the Development of Research Methods

Felix Rauner

Abstract In the area of vocational scientific research, subject-related research and development methods are of particular importance. There exists an urgent need for research and development methods in order to implement highly demanding pedagogical paradigms and concepts. This contribution aimed to outline areas of occupational research, including qualification research, curriculum development, specialist didactics, development of occupations, VET and corporate organisational development, man-machine interaction, industrial culture and transfer of technology. It also discusses occupational research methods and strategies, analyses the characteristics of the central research object of occupational research and the main challenges for the vocational sciences.

This chapter aims to outline areas of occupational research and to discuss issues of occupational research methods and strategies. In project applications and research reports in this area, one can find many clues with regard to the practice of methods. Quite frequently, the description of the 'methodology' refers to the standard methods of empirical social research. What is striking, however, is that these descriptions are often little more than lip service, whereas the methodology actually in use is quite different and sometimes surprisingly creative.[1] A core topic that has moved into the focus of occupational research is work process knowledge

[1] For instance, B. E. F. Moritz describes, in a study on the design traditions in the Japanese, American and German machine tool industry, how he proceeded in an in-depth case study in Japan: 'Moreover, in the intensive case studies I always strove not only to record concrete problems of development and organisation, but also to discuss constructive solutions with some particularly familiar interlocutors—and even to take part in a development process over a longer period of time […]. My own professional background and experience as an engineer proved to be a great advantage' (Moritz 1996, p. 36–40 [original in German]). In the description of the methodology, participant observations and semi-structured expert interviews are mentioned. The quality of the *participation* in *development* is not interpreted in terms of methodology.

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(Fischer 2000; Pahl and Rauner 1998). This issue was widely debated in occupational research, labour studies and vocational pedagogy in the 1990s after Wilfried Kruse had pointed out the strategic relevance of this type of knowledge for a shaping-oriented vocational education already in the 1980s (cf. Kruse 1986).

The scientific elaboration of the concept of work process knowledge through the efforts of Martin Fischer (2000) and the European research network 'work process knowledge' (Boreham et al. 2001), as well as the initiatives to utilise this concept in curriculum development (Rauner and Spöttl 1995) stimulated the scientific interest in the methodological status of research on work process knowledge (Rauner 1998) and in the development and testing of appropriate research and development methods for the empirical identification of work process knowledge. At the same time there was an increase in the demand for VET practitioners for concepts of a didactic transformation of work process knowledge into vocational curricula (Bremer and Jagla 2000; Rauner 2000).

4.1 The Current Relevance of Occupational Research

The large number of newly established or reorganised occupations that were established with the participation of the curriculum research institutionalised at the Federal Institute for Vocational Education and Training (BIBB) draws attention to two problems.

- Qualification research, which was established in the 1970s with a rapidly increasing number of research projects (Grünewald 1979), did not succeed in contributing to a new quality of qualifications development and the development of vocational curricula. The question of the relationship of qualification research and curriculum research needs to be discussed anew (Rauner 2000).
- The development of occupations and vocational curricula is embedded in a legally regulated and highly elaborate procedure that is controlled by the experts of the VET stakeholder organisations (Pätzold 1999). The experts are nominated by the employer organisations and trade unions. They represent an interest-based expertise for the occupations and occupational areas in question. On this basis occupational profiles and vocational curricula are developed. This method of a 'VET dialogue' is characteristic of the development procedures (cf. Schmidt 1995). The question whether these 'regulatory procedures', in which the BIBB is involved through moderation and in certain cases also through accompanying research, ultimately had the consequence that the procedural rules became a quasi-methodological framework that impedes rather than promotes the advancement of research and development methods in curriculum development might reasonably be answered in the affirmative (Stratmann 1975). What is certain is that the quality of the development of occupational profiles and the corresponding curricula according to this procedure depend strongly on the technical and pedagogical competence of the experts and not so much on an

elaborate methodological toolbox. Under these circumstances quality is a question of the persons involved and not a question of the methods applied. This leads to an urgent need for occupational qualification research as a basis for the development of occupations.

Only a few years after the reorganisation of the industrial occupations in electrical engineering and metalworks, a project which had been labelled as a reform of the century, had been completed in 1987, a debate started about the need for yet another 'reorganisation' of these occupations. The evaluation study on this question by the BIBB and the ITB (cf. Dreschner et al. 1995) shows that the established form of qualifications and curriculum development does not guarantee that elaborate development procedures do not lead to unsatisfactory results. The necessity to develop occupations and vocational curricula on the basis of *occupational studies* was first pointed out by Stratmann in 1975. He complains about the lack of 'information from labour studies or *occupational research* [emphasis added] about the labour market prospects or the technological conditions of the different occupations' (Stratmann 1975, p. 33 [original in German]). In his analysis of curriculum development, especially with regard to basic training, Stratmann also criticises the method of coverage analysis, which aims to determine the degree to which curricula for basic training can cover the different occupations within one occupational field. 'The nominal identity of learning objectives gives no information about the equality, in terms of the subject matter of the learning contents. Here, *occupational studies* [emphasis F.R.] have to be applied in a much more differentiated way if the narrow borders of kinship between occupations are to be crossed' (ibid., 341 [original in German]). The mere fact that a professional ability is termed 'drilling' or 'sawing' does not say anything about the quality of these activities in the occupation-specific work contexts and about the underpinning competences. This fundamental observation by Stratmann has largely been ignored in the VET research to this day.

The relevance of a qualification research based on occupational studies is also a consequence of the need to develop professional work and vocational curricula under the increasing pressure of international competition on quality. Innovation and maximal flexibility of enterprises are the supreme economic criteria against which the development of occupations and curricula has to be measured. In this regard, Horst Kern and Charles Sabel critically observe that the established German tradition of vocationalism and the corresponding vocational education increasingly becomes an impediment to innovation, threatening the competitiveness of German enterprises (Kern and Sabel 1994). Although the authors give no evidence to support their thesis, the latter is at least a serious indicator of a question that requires clarification.

The discussion in VET policy and VET planning about the need for reform in dual vocational education, especially with regard to the various conceptions of modern vocationalism and the development of vocational curricula, is still characterised by a deficit in occupational research as well as relevant research and development methods. This is also true of the numerous international cooperation

projects in the area of vocational education, which are supported by Germany with funds from the federal government, the Länder governments and several non-profit institutions.

A similar deficit of vocational–pedagogical and occupational research has been identified in the course of the KMK[2] initiative for the development of vocational concept according to the concept of learning fields (Lipsmeier and Pätzold 2000). The aims of this initiative of the KMK go far beyond the existing practice in VET schools, especially when the curriculum to be developed on the basis of learning fields is interpreted as a way of implementing the mandate that the KMK formulated for vocational schools: 'to enable the apprentices to take part in shaping the world of work and the society in consideration of ecological and social aspects' (KMK 1991 [original in German]). Here too, an urgent need exists for research and development methods to implement these highly demanding pedagogical paradigms and concepts (cf. Heidegger et al. 1997).

Therefore, there can be no doubt about the conclusion on the relevance of occupational research. The elaborate programme of VET planning activities with an increasing number of occupations that have to be regulated anew faces an inadequate methodological inventory for research and development. Where new methods are developed and tested (cf. Bremer and Jagla 2000; Röben 2000; Rauner 2000; Spöttl 2000), they are applied only in single projects because the quality of occupational development and curriculum development is judged mostly by the degree of compliance with formalised coordination procedures. As the strict compliance with established coordination procedures among the social partners, the federal ministries in charge and the Länder governments does not by itself guarantee a new quality of VET planning, the risks for occupational and curriculum development tend to increase with the extent of the (re-)regulation. The exploitation of the innovative potentials inherent in the 'human resources' therefore requires scientifically validated research and development methods.

Another aspect of elucidating the need for occupational research refers to the education and training of VET pedagogues. The innovative quality of the VET system is based above all in the professionalism of vocational pedagogues. This professionalism is grounded, as far as VET schools are concerned, in a scientific education of VET teachers that centres around studying a vocational discipline. The development of vocational disciplines within the canon of academic subjects depends on advanced occupational research and teaching. It is above all through supporting young researchers that the reproductive and innovative capacity of the sciences is safeguarded. Here the vocational disciplines, the occupational sciences, have a considerable need to catch up (Gerds et al. 1999). Although occupational

[2] Standing Conference of the Ministers of Education and Cultural Affairs of the Länder in the Federal Republic of Germany.

research has improved recently in some vocational disciplines and at some universities,[3] additional efforts are required for a sustainable establishment of vocational disciplines in higher education.

The opinion widely held by pedagogues, labour market researchers and industrial sociologists that competent professional activity is in the first place a matter of formal competences has led to highly influential doctrines and paradigms, above all the theory of formal education and the concept of key qualifications. The idea that context-free theoretical knowledge, general problem solving competence and intellectual capacity would guarantee the highest professional flexibility has fuelled the manifold research efforts to produce evidence of a despecialisation of professional knowledge and a corresponding deprofessionalisation of the organisation of 'skilled' work. Findings in learning research seem to support this idea (cf. Anderson 1996; Ziegler 1996). Given the acceleration of technological innovation and the related argument that the contents of specialist knowledge not only become obsolete at increasing speed but even block new experiences, it is no surprise that a research oriented towards the development of occupations and professional knowledge may look antiquated. What then is the point of a research strand that is concerned with specialist issues in vocational education?

Jochen Gerstenmaier, representing pedagogical psychology and thus keeping some distance from the specialist disciplines, points at the state of research in learning and expertise research and demonstrates "the relevance of domain-specific knowledge for knowledge acquisition and performance" in the most impressive way. The conclusion drawn from his analysis is the following:

> Accordingly postulates like the doctrine that success in thinking and learning is tied to formal strategies of thought can no longer be maintained and promise competences in orthodox versions of key qualifications. Ideas like this are not compatible with the findings of modern pedagogical and psychological research (Gerstenmaier 1999, p. 67 [original in German]).

Anticipating the counter-argument that the erosion of professional work and the new flexibility leave no other option but to count on formal competences, he continues:

> Even in societies that are characterised by an increasing discontinuity of professional careers with multiple career patterns, there is a necessity of educational processes that link skill with the prudently organised domain-specific knowledge (ibid.).

So, if the specialist knowledge continues to be the basis on which professional skill must build,[4] this is a challenge for the investigation of contents and forms of professional work processes and vocational learning processes. This challenge is confirmed through expertise and learning research.

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[3] In Germany, the conferences held by the HGTB (the working group of university institutes for VET in technology and engineering) are an important indicator (cf. Bannwitz and Rauner 1993; Pahl and Rauner 1998; Eicker et al. 2001; Pahl et al. 2000).

[4] See also Hacker's (1996) study on the 'knowledge to guide action'.

The research interest in the occupational sciences aims primarily at the knowledge that is incorporated in the practice of professional work. This means that the research perspective is subject oriented. But this perspective also implies the analysis of the objective conditions and contents that constitute professional work. Accordingly, technology is analysed not just as a phenomenon and a result of social processes or under technical aspects, but above all under the perspective of the technological facts that determine the work process knowledge.

It is a matter of dispute in the methodological discussion whether and to what extent the research topic must be taken into account methodologically, and whether and to what extent researchers have to be familiar with the domain of knowledge they are about to investigate, and with the constitutive objective and subjective factors and conditions of the domain. The theses on the development of research methods in the occupational sciences discussed at the 9th HGTB conference in Dresden are based on methodological foundations concerned with the range of concepts and instruments from related disciplines and research traditions (cf. Rauner 1998).

4.2 Research and Development Areas in the Occupational Sciences

As a result of the discussion concerning the subject matter of the occupational sciences, four interlinked areas for teaching and research have been identified (cf. Bannwitz and Rauner 1993):

(1) genesis and evolution of the contents and forms of occupation-based skilled work, the qualification requirements and the related occupations and occupational areas;
(2) the contents of vocational education as a dimension of the analysis, design and evaluation of domain-specific processes of education, qualification and socialisation;
(3) analysis and design of skilled work that is conducive to learning: its methods, tools and organisation as well as the requirements associated with skilled work;
(4) finally, the objects of skilled work. In the industrial and technical disciplines the object is the domain-specific technical equipment, which has to be operated, maintained and repaired and which must be designed with a view to a man–machine interaction that is conducive to learning.

Accordingly, the occupational sciences are concerned with the contents and forms of skilled work as represented by the various occupations and occupational fields. These contents and forms are investigated with regard to their relationship to the object of work and the qualification and education processes interacting with the latter.

From the point of view of the sociology of science, disciplines are characterised in the first place by the fact that they successfully made their way into research and teaching at universities. As VET teachers in Germany were educated at universities—albeit occasionally—already in the early twentieth century and finally were obliged in the second half of the century to study a vocational discipline and vocational pedagogy in order to be admitted to teach at a VET school, the question of the nature of vocational disciplines as university subjects is settled from a historical point of view (cf. KMK 1975, 1995).[5]

Apart from the occupational sciences, there are several other sciences that investigate the relationship of work, education and qualification as a topic of research and teaching:

- Vocational pedagogy, from the perspective of education and qualification;
- Labour studies, under the primary aspect of analysis and design of work processes, e.g. as an issue of individual workload;
- The sociology of industry and work addresses the evolution of work and its subjective dimension as a phenomenon of social life;
- Finally, the specialist disciplines related to the objects of work (e.g. engineering) investigate the inner logic of their topics (see the detailed account by Dybowski et al. 1993).

If the areas of occupational research are further differentiated according to the practice of research, the following research fields can be identified.

4.2.1 Qualification Research and Curriculum Development

Qualification research on the basis of more or less elaborate methods has a long tradition in vocational education. It was as early as in the 1920s that the DATSCH (the German committee for technical schooling) conducted work-analytical studies on the development of industrial occupations. The methods of these analyses of work were developed by REFA[6] and served the introduction of methods for scientific management, employee appraisal and wage differentiation (cf. Riedel 1957; Nutzhorn 1964). The work analyses were concerned with the survey and evaluation of corporate work processes, especially the highly diversified manual tasks in the industrial production process. These analytical approaches lost their importance only when the ABB (unit for company-based vocational education and

[5] With regard to the development of vocational disciplines see also Bannwitz and Rauner (1993) and Martin et al. (2000).

[6] Today's 'Verband für Arbeitsstudien e.V.' (labour studies association) was founded in 1924 as 'Reichsausschuß für Arbeitszeitermittlung' (REFA), i.e. 'Reich committee for work measurement'. The organisation was renamed 'Reichsausschuß für Arbeitsstudien' in 1936 and 'Verband für Arbeitsstudien' in 1951 (cf. Methodenlehre des Arbeitsstudiums 1972).

training) was replaced by the Federal Institute for VET Research (BBF), which had been established with the Vocational Training Act of 1969. The reorganisation of the occupations in electrical engineering in 1972, in which the BBF was involved, was still largely shaped by this tradition of work analyses. The qualification requirements were identified according to a list of elementary tasks, complex tasks and areas of activity. The high diversification of manual elementary tasks in metalworks ultimately led to an extensive amount of basic metalworks training within the training curricula for industrial training occupations. The change of professional tasks in the area of electrical engineering did not justify this. A closer inspection of the work analysis techniques developed by DATSCH and ABB, which still represent the state of the art in curriculum research, shows that the inventory of analytical items is largely corresponding to the (basic) skills laid down in the training regulations. This means that the analyses reproduce the practice of industrial training and hardly go any further (Heidegger et al. 1991).

When occupational fields and basic vocational training were established at the beginning of the 1970s, the concept of coverage analysis (Schmiel 1971) was introduced. If the analysis of the curricula of related occupations identifies a high degree of likeness at the level of elementary skills and knowledge, then this is regarded as a justification for assigning an occupation to an occupational field and for its integration into a common basic vocational training. The more detailed the decontextualised formulations of basic skills and knowledge are, the more this method supports the establishment of a basic vocational training and the incorporation of large arrays of occupations into occupational fields (cf Stratmann 1975, p. 341).

After the enactment of the Vocational Training Act (BBiG) of 1969, coordination procedures for qualifications and curriculum development were established and laid down in a memorandum of understanding in 1972 (Benner 1996; Pätzold 1999; Gravert and Hüster 2001). These obligatory coordination procedures strengthen the interest-based bargaining processes between the social partners, which form the basis for the development of the training regulations. These coordination and bargaining procedures, which are regulated in detail, tend to displace qualification research, which also aims at the development of vocational curricula. Balancing the interests and spheres of influence of the VET stakeholders thus becomes a method of qualification research, as it were. It is above all the experts of the responsible social partner organisations who, with the assistance of the BIBB, reach a consensus on the development of occupations and the contents and objectives of vocational training. The densely regulated procedures and the clear responsibilities leave little room for a qualifications research that would live up to scientific standards. Therefore, it is understandable that qualification research evolved in the 1970s as a sociological discipline and apart from curriculum research, which was the only way for qualification research to attain a remarkable scientific level. For the same reason it did not succeed in exploring the foundations of curriculum design in full. The paradox is that the very reasons for the success of sociological qualification research ultimately brought about its marginalisation (Grünewald 1979; Rauner 2000).

Two concepts of qualification research that were developed for the design of vocational curricula and gained some international relevance in the meantime can be attributed to occupational research.

- The DACUM procedure for the identification and analysis of professional work tasks (being a first step towards the development of vocational curricula) was developed in the 1970s in Canada and the United States.[7] Nowadays, this procedure is applied above all in the context of development aid. In a first step, 'expert workers' identify, in a two-day workshop, the professional activities (units) that characterise an 'occupation' or a similar position (job). These units are then broken down into sub-activities (tasks). When it finally comes to the weighting of the units, experts from the areas of VET practice, VET management and VET research are interviewed.
- While the DACUM method, following the tradition of behaviourism, takes the decontextualised tasks as the starting point for curriculum development, an alternative approach is taken with the identification of 'paradigmatic work situations'. This approach is about the contextual identification of professional activities, which ultimately leads to case descriptions. These case descriptions have to meet two criteria. First, they must be characteristic for the occupation in question, and second, they have to fit in with the curriculum, which follows the concept of competence development from novice to expert (Dreyfus and Dreyfus 1987). According to this concept, professional activities or work situations have a paradigmatic quality when they represent a turning point in competence development in the sense of a new and expanded view of the work context (Benner 1997). Here the identification of professional activities and situation directly leads to the vocational curriculum. The case descriptions, which are arranged according to the logic of development, constitute the curriculum.

Elements from both methods are applied in a concept of occupational-scientific qualification research that was developed at the ITB (Bremer et al. 2000). In order to develop a curriculum with four learning areas that features successive competence levels in accordance with the novice–expert model by Dreyfus (Rauner 1995; Rauner and Spöttl 1995), the characteristic work tasks are identified with the help of expert worker workshops as in the DACUM procedure. These activities are assigned to the four areas of learning. The procedure follows the concept of identifying tasks that support competence development.

Following the last intensive discussion in curriculum theory in the 1970s and the transitory establishment of high-level qualification research, it was not until the recent years that occupational research managed to give new input, in terms of content as well as methodology, to qualification research and curriculum design.

[7] Cf. Glendenning (1995) as well as the advanced 'Design A Curriculum' (DACUM) procedure developed by Norton (1997) at the National Center for Research in Vocational Training (NCRVT), which was established at the Ohio State University until 1988. For a critical appraisal of curriculum development in the United States see Finch and Crunkilton (1979).

Conclusion

The objective of occupational-scientific qualification research is above all to identify the characteristic work tasks of an occupation and the related qualification requirements, and to investigate the didactical relevance of these tasks for the development of competence. The question as to what implications the research and development objectives may have for the methods of qualification research is a matter for the methodological debates in the occupational sciences (cf. Bremer et al. 2000). The assumption is that the didactical and pedagogical concepts that structure the analysis of the empirical foundations of a curriculum must be represented in the methodological basis of qualification research. A particularly instructive example would be the identification of paradigmatic work situations, which at the same time constitute, as case descriptions, the stages of a curriculum based on the logic of development.

4.2.2 Curriculum Development and Specialist Didactics

The development of vocational curricula has always been a mission of specialist didactics and occupational research. However, the academic discourse is dominated by contributions from the fields of curriculum theory and general didactics. This is understandable to some extent because the interest in the development of a specific vocational curriculum is usually limited to the specialists in question—who often may be very few, given the large number of 'small' occupations.

Therefore, curriculum development and specialist didactics have been and continue to be a topic for the general debate in vocational pedagogy (Elbers 1974; Reetz and Seyd 1995). The dual organisation of vocational education, which classifies VET schools as part of the general school system, intensifies this trend. From the point of view of educational science, paying too much attention to the contents of teaching in the development of VET curricula raises suspicions with regard to materialist didactics or utilitarianism. On the other hand, education obviously cannot do without contents. This is the unsolved problem of the relationship of objectives and contents in education. Weniger, for instance, emphasises the primacy of educational objectives, a conception according to which the syllabus is a carrier of objectives and 'representations of intellectual possession'.

> This intellectual possession, which outlines the syllabus, is not meant in a material sense; instead, the contents listed in the syllabus are but a means to express the intellectual powers and contents that matter (Weniger 1952, p. 63 [original in German]).

Robinson, on the other hand, represents the content-oriented position of a pedagogy oriented towards the school when he refers to 'up-to-date qualification requirements'. The reasoning in vocational pedagogy, embedded into this discourse on aims and contents, is hardly different from general pedagogy. Independent discourses did rarely emerge in specialist didactics, which is due to the

dominance of general vocational pedagogy on the one hand and the relatively poor linkage with the relevant scientific disciplines on the other. The situation has changed only little since Gustav Grüner investigated this (Grüner 1974).

There are two events which mark a fundamental change of perspective for curriculum research and development.

- By developing and successfully testing a curriculum for kindergarten teachers that is oriented towards the development of professional competence, Gruschka achieves the goal of overcoming the tension between objectives and contents. 'Education in the medium of occupations' is the formula that has been challenging curriculum development and specialist didactics since then (Gruschka 1985).
- The KMK agreement on VET schools of 1991, which acknowledges the pedagogical principle of the capacity to take part in shaping the world of work (Rauner 1988), ultimately leads to the decision to develop vocational curricula in the form of learning fields (KMK 2000). The latter have to be formulated with reference to corporate work and business processes. The professional work process knowledge is thus recognised in curriculum development as the crucial element of professional competence.

The fundamental paradigm shift that occurs with the reorientation towards shaping-oriented vocational education has far-reaching consequences for curriculum development and specialist didactics at the three levels of curriculum research:

- the level of pedagogical principles and objectives,
- the level of analysis and construction of VET curricula and
- the level of design and evaluation of vocational learning processes.

At the level of objectives, occupational research has the task to specify the principle of shaping-oriented VET with regard to occupations and vocational disciplines. The prerequisite is that the relationships of historicity and prospectivity, critique and shaping, and qualification and competence, which are typical of the concept of shaping-oriented VET (cf. Heidegger 1997), are clarified by occupational research. The specific contents and forms of skilled work can be experienced as shapable when skilled work is viewed and analysed as a result of historical evolution and as a process with manifold ramifications. The research on the genesis of technology offers instructive research methods and findings that make it possible to address, in an occupation-specific way, the didactical question: Why is this technology or this organisation of work the way it is and not otherwise? Situated—and not merely situative—learning encompasses the aspect of the historical evolution of work and technology, and the related processes of qualification and education. Prospectivity requires the ability to identify design options and to anticipate and evaluate alternative development paths. The didactical question here is: Is it possible to do it another way? This is the only way to escape the danger of a permanent backwardness of curricula that is inherent in the ideas of Robinson.

A particularly relevant issue is the technological evolution in the area of information and communication technology, which leads to increasingly open systems and systems architectures. Occupational research needs to analyse the application and implementation of new technologies as a process that requires a new quality of professional shaping competence, including participative organisational development. These reflections show that occupational and occupation-specific research is confronted with highly diverse problems when it comes to the development of leeway in skilled work.

At the level of agency a shaping-oriented and work process-oriented vocational education supports project-based learning. The concept of learning and work tasks presupposes an occupational-scientific qualification research, a curriculum that refers to the professional work tasks, and the identification and formulation of learning and work tasks that systematically fit in with a training that aims at competence development. The self-evaluation toolbox for learning and work tasks developed by Howe et al. (2000) shows how the interplay of vocational-pedagogical and professional expertise and theory in the design and evaluation of vocational learning processes can lead to a new quality.

The shift to shaping-oriented vocational education and its implementation by learning fields and curricula as well as shaping-oriented learning and work tasks requires a research that succeeds in decoding the work process knowledge. From this point of view, occupational research is of fundamental importance, while psychological teaching and learning research has only limited relevance. The fact that the important question whether someone has learned the right or the wrong things can be investigated by occupational science but not answered by the theory of learning (Fischer 1999, p. 89) is reason enough.

Conclusion

The question as to what quality a specific body of knowledge has with regard to a professional problem is a material question about the right knowledge or the degree of its adequacy for the specific problem, and not a question of the theory of learning, e.g. concerning ‘inert’ or false knowledge. Gottfried Adolph’s studies on the concept of electrical voltage showed that there is virtually no schoolbook that would present an adequate concept of voltage, and analysed the consequences of this shortcoming with regard to intellectual and practical barriers in dealing with electrical voltage (Adolph 1984). Here, we find the crucial issues for occupation-specific and domain-specific learning research. The latter, however, requires a high level of technical, specialist didactical and pedagogical competence at the same time. Accordingly, the analysis and above all the development of vocational curricula depends especially on interdisciplinary research and development. The reason is that the task is not only to consider, from a historical and prospective view, the interplay of work, technology and education, but also to transfer the research findings from work and technology research, socialisation research,

learning research and especially occupational research, whose research questions and findings—and, to some extent, their methods as well—must take into account the particulars of specific occupations or occupational fields.

4.2.3 Development of Occupations

The development of occupations, broadly speaking, is a topic for quite a number of research disciplines.

- Socio-historical occupations research addresses the development of occupations as a specific phenomenon of social evolution in a historical perspective.
- Sociological occupations research is concerned, e.g. with the question of de-professionalisation as an aspect of the change of the world of work.
- Labour market research is concerned, inter alia, with forecasting the development of occupations and occupational fields.
- The sociology of occupations and vocational pedagogy investigate, for instance, the relevance of professional work and the related vocational education for the development of occupational identity.

Occupational research addresses questions like the following:

- How do occupations and occupational fields evolve due to the change of work and technology?
- What are the constitutive features of an occupation?
- What are the effects of occupation-based skilled work on the processes and structures of organisation and innovation?
- Which potential for identification do specific occupations have for apprentices and employees?
- What differences in terms of content exist between occupational profiles and actual jobs?
- Is it possible to bundle occupations into core occupations, and should occupations be diversified into specialisations?
- How to make an appropriate choice of the descriptors for an occupation and the corresponding occupational profile so as to avoid a rapid erosion, above all in dynamically changing economic sectors?
- Finally, historical occupations research is underdeveloped (cf. Howe et al. 2000).

There is a deep controversy in the scientific community about the future of professional work. From a socio-historical perspective, the erosion of occupation-based work in the process of progressive rationalisation seems to represent a law of history. Findings from the fields of sociology of occupations and labour studies seem to back this thesis with empirical data. On the other hand, the reform debates in VET policy in the 1990s clearly favoured occupation-based work and a corresponding practice of VET over alternative models aiming at a flexibilisation of work and education. This reform discussion is supported by the concept of open

and dynamic core occupations (Heidegger and Rauner 1997; KMK 1997; BMBF 1997) and a critical analysis by Sennett, who pointed at the social and individual risks associated with a flexibilisation of skilled work (Sennett 1998). The weaknesses of analytical occupations research are above all due to the fact that this research strand refers predominantly to a tradition of industrial work that has become incompatible with the emergence of new concepts of corporate organisation (cf. Kern and Sabel 1994), which were accompanied by alternative concepts of modern vocationalism. As analytical research deals with the future development of occupations at best in its conclusions, the VET dialogue and the development of occupations are in need of a development-oriented VET research. The latter needs to consider the specific options in the various occupational fields, sectors and areas of expertise in which the programme of a modern vocationalism has to be implemented. This research is as yet underdeveloped because VET planning takes place on the basis of densely regulated coordination procedures between the social partners and the ministries in charge. This dense regulation and the associated extensive development activities of the experts involved seem to render a development-oriented occupations research unnecessary. However, the occupational studies carried out or commissioned by the BIBB on the preparation and evaluation of curriculum development projects show that a development-oriented VET research and the interest-based VET dialogue presuppose each other.

Development-oriented occupations research requires research and development concepts and methods from the occupational sciences. The example of the EU project 'Car Mechatronic'[8] shows that the development of occupations, depending on the branch or sector, can be analysed and organised only in the context of international technical and economic developments. What is particularly relevant is the tension between globalisation and localisation.[9] The testing of the European occupational profile of car mechatronic in seven European countries confirms on the one hand that the development of international occupations is reasonable (provided that international economic sectors exist), and on the other hand that it is possible to implement these occupations in a differentiated way that does justice to the particulars of industrial culture in the different countries and regions.

The methodological consequences for an advanced occupations and curriculum research result from the function that this research has for the development of occupations, which is especially concerned with the boundaries and overlaps between occupations and occupational fields, and with the identification of training contents in scope and depth.

What is of interest for the occupational sciences is above all the aspect of the horizontal and vertical division of tasks. With regard to the horizontal division it needs to be investigated how the differentiation of occupation-based skilled work

[8] The LEONARDO DA VINCI project 'Car Mechatronic' was a follow-up to the FORCE sector study 'Car Service Sector'.

[9] Cooke et al. have presented their results on this topic in a book aptly titled *Towards Global Localisation* (Cooke and Morgan 1992).

influences organisational learning. Given that there are reverse tendencies in the development of occupations, e.g. the revision of professional specialisations through the establishment of core occupations, but also the definition of new specialist occupations, there is an urgent need for occupational research.

It is at least since the broad reception of the MIT study on lean production (Womack et al. 1991) that two principles are recognised for the organisation of the vertical division of labour:

- the reduction of the number of hierarchy levels in the enterprise and
- the relocation of responsibilities into the sphere of value-adding work.

Both principles, which have since become an undisputed part of the body of knowledge in business administration and organisation studies, have far-reaching implications for the organisation of skilled work and for the education of skilled workers and engineers. The range of tasks and responsibilities is increasing for the workers, which leads to a greater proximity of skilled work and engineering. What does this mean for the professional activities and work contents of skilled workers, technicians and engineers? How is it possible to draw the necessary distinctions in VET as well as the organisation of work, and at the same time to guarantee the vertical permeability of professional career pathways? Is it possible to maintain the traditional polarity between a context-related training of skilled workers with a view to work process knowledge on the one hand and an engineering education largely oriented towards academic and decontextualised knowledge on the other? What is required here is occupational research on the work of engineers and on the education of engineers in relation to the qualification of skilled workers and technicians.

A methodological specialty of development-oriented research results from its embeddedness in the interest-based process of developing occupations. The 'best practice' concept, which has found some acceptance in international comparative research, is arguably the most appropriate here. The identification of 'best' and, if applicable, 'bad practice' can only be the result of a discourse which involves the experts representing the communities of practice and is supported by scientific analysis and research. However, there can be no scientific judgement as to who will best represent the community of practice in question. 'Best' or 'bad practice' depends on standards that can only be identified by discourse. The question, '"best practice" for whom and to what end?' cannot be answered scientifically. But without scientific monitoring the answers to these questions are unsatisfactory all the same (cf. Rauner and Spöttl 1995).

Occupational research faces similar problems when it comes to giving reasons for the boundaries of occupations and occupational fields, and when the constitutive features of occupational fields are at stake. The complexity of research and development tasks is increased by the internationalisation of the technological and economic development. This suggests that new forms of international comparative VET research need to be developed (Heidegger 1995).

Conclusion

Occupations and occupational fields are deeply rooted in the diverse industrial cultures. The occupational character of work is appraised differently in different industrial–cultural contexts. Unlike academic professions, the non-academic occupations to this day do not emerge from development processes that reach beyond the national boundaries. Therefore, the formulation of criteria for the development of occupations and occupational fields, the implementation of corresponding research activities on the description of occupational profiles, and the identification of characteristic professional activities all belong to the core research areas for occupational research. In the future, the pressure of internationationalised economic processses and higher demands with regard to the mobility of workers (e.g. within the EU) will increase the importance of problems related to the internationalisation of occupational development. The response of occupations research will have to be a European one.

4.2.4 VET and Corporate Organisational Development

The relationship of vocational education and organisational development in the enterprise is a topic for business studies and organisational psychology. These disciplines largely ignore the aspect of VET from the subjective point of view, or reduce VET to the dimension of 'human resources development'. In VET research, the context of VET and corporate organisational development came into the focus only in the 1990s. A broad ITB-BIBB project in the first half of the 1990s investigated this relationship for six research areas (Dybowski et al. 1995). One of these research areas addressed the interaction of organisational development, technical design and qualification. Paul Oehlke, summarising the debates on the subject matter, shows that this topic, which is crucial for professional innovations, cannot be clarified without interdisciplinary research:

> In the crisis-ridden context of a toughening international competetion on innovation, the individual and organisational ability to learn is gaining a new importance. The manifold concepts of lifelong learning and the learning enterprise are building to some extent on Swedish, Dutch and German experiences concerning the interdependence between work structures that are conducive to learning and the individual shaping capacity. In order to achieve an innovative interaction of the two in an outline of tasks, work and organisation that is oriented towards participation, qualification and development, the experience of the employees is utilised (Oehlke 1995, p. 105 ff. [original in German]).

Ever since their beginnings, humanisation research as well as work and technology research has considerably expanded the practice of interdisciplinary research. The methodological problems, however, remained unsettled for the most part.

The example of a large number of 'CIM[10] ruins' shows that techno-centric innovation strategies—with a monodisciplinary foundation in engineering—are just as risky as exclusively organisational concepts of innovation that disregard or underestimate the technological potentials.

The same applies all the more to the qualification of employees. It must therefore be emphasised with regard to occupational research that, given the conditions of accelerated technological innovation and the high plasticity of information technology, it is ever more important to investigate and shape the relationship between human competence and the implementation of open technologies in processes of corporate organisational development. What is crucial for corporate innovation is not simply a technical competence that serves as the basis for understanding new technologies, but a competence that aims at the transformation of the new potentials for specific innovations in the enterprise. For instance, it is not the ability to operate computer-aided tools and machines that count in the first place, but the ability to design the increasingly open technical systems in a user-friendly way—with the participation of the users—and to introduce technological innovations in such a way as to integrate them into the organisational learning process of the enterprise. 'Operator competence' loses relevance as a subject matter for qualification as the tutorial quality of user interfaces and software tools is improved.

Corporate organisational development is confronted with the integration of media, computer and network technology into one systemic technology. The new quality of this integrated technology is expressed by solutions for constructive, productive and maintenance work processes. The systemic character of technology in highly automatised processes has far-reaching effects on the processes of corporate organisational development. The traditional model of automatisation, the deserted factory, follows the idea that human labour can be substituted by artificial intelligence—by knowledge-based systemic technology—to a large extent.

In the course of the ESPRIT project 'Human Centered CIM Systems', a consortium of English, Danish and German companies with engineers, ergonomists and VET researchers developed an alternative model for CIM already at the beginning of the latest boom in automatisation in the early 1980s. This model involved the realisation of a computer-based and integrated IT infrastructure to support

- creativity in the process of design and development,
- flexibility and participation in the organisation process and
- quality, effectiveness and productivity in the manufacturing process (Corbett et al. 1991).

In this concept, communication technology becomes an IT infrastructure for communication between the actors, whose abilities are to be supported and extended. An accompanying research project showed in which way

- the level of objectives with its model of Human Centred Systems,

[10] CIM = Computer Integrated Manufacturing.

- the process level with the concept of participative and interdisciplinary development and
- the level of activity with its aspiration to challenge and technically support human creativity, intelligence and responsibility

correspond to and condition each other. By now there are numerous research findings on all three levels. However, there is a great need for research concerning the interdependence of the levels. The role of occupational research is to mediate among the research strands of engineering, labour studies and sociology. The reason is that occupational research has a scientific orientation on the one hand, which means it has a certain affinity to engineering, while on the other hand it also has a focus on corporate innovation processes and thus a domain-specific perspective. This means that there is also a proximity to labour studies (CIM-Vorstudie 1993). As the occupational sciences carry out their research activities with the aim to identify potentials of qualification and education with a view to qualification and work processes, occupational research needs to cooperate with vocational pedagogy. The methodological complementarities as well as the cooperation and division of tasks in the interdisciplinary research and development process need to be clarified in detail before a competitive interdisciplinary research can be established in this field.

Conclusion

The relationship of vocational education and corporate organisational development was explored as a new area of research in the above-mentioned BIBB-ITB project. The consequence for VET research is an even stronger orientation towards interdisciplinary research and development, which needs to involve not only the vocational disciplines and vocational pedagogy, but also the social sciences as far as the latter are concerned with enterprises (Dybowski et al. 1995). Technological innovations in the process of corporate organisational development usually comprise human resources development as well. Conversely, the existing qualification profiles in a company constitute a potential for technological innovation. This interactive relationship leads to a variety of research and development tasks for the occupational sciences.

4.2.5 Man–Machine Interaction

The term ‘man–machine interaction’ marks a paradigm shift in the design of technology. Traditional machines, from the steam engine to the modern CNC machine tool, were developed and built according to rules of technology. Users and operators were instructed how to operate the machines.

Computer technology, more specifically software technology, for the first time offers a technology which 'queries' and which offers the users guidance for further action in the shape of explanations and demonstrations, the amount of which is adequate and can be adjusted by the user or even by the computer if the latter is set up accordingly. When it comes to the design of computer-aided technology, which is associated with an exponential increase of options thanks to the unprecedented plasticity of the software, the interactive quality of this technology is of the utmost importance.

Interactivity has become a model for technical design. The programme of interactivity goes far beyond the design of technology and constantly induces new forms of participation in corporate and social processes.

In the domain of tools, machines and systems to be installed, programmed, operated and maintained by skilled workers and technicians, it is also true that the man–machine interaction takes place at a high technological level. Issues related to the ergonomical design of software are less reflected and investigated, though. In work and technology research, three interrelated projects on computer-aided experience-based work carried out a comprehensive analysis on work experience in computer-aided manufacturing and formulated criteria for the design of computer-based work systems (Martin 1995).

As this research deals with the question of how work experience can be saved under the conditions of computer-based work systems and transformed into work processes, the research and development area in question is of crucial importance for the occupational sciences. Moreover, it is reasonable to think that this research should be extended beyond manufacturing technology.

Another aspect of man–machine interaction refers to the distribution of 'intelligence' between man and machine. Spectacular examples are expert systems and, from a methodological point of view, participative forms of 'software engineering'. Although the first attempt at a fast introduction of expert systems failed, the efforts to realise artificial intelligence are continued and even intensified. The interdisciplinary practice of fundamental research, which takes place as a dialogue of philosophers, cognitive scientists and neurophysiologists, aims to clarify whether a distinction between artificial and human intelligence can be justified, and if so, what qualitative difference exists between the two. In the development of the man–machine interaction, the anticipated divergent answers already lead to alternative options: Models of 'artificial instead of human intelligence' or 'expert systems with the quality of tools for professionals' compete with each other. A preliminary answer was given by the ITB project TUBI[11] (Fischer et al. 1995). It remains a task for occupational research to address this topic in all relevant

[11] TUBI is the acronym for 'Technische Unterstützung in der betrieblichen Instandhaltung' (technical support for inhouse maintenance). In a follow-up project a test version of an alternative expert system for maintenance work was developed, and a specific participative design concept instead of 'knowledge engineering' was tested successfully. This confirmed once more the performance of partipative 'software engineering'. In the process of developing the alternative maintenance tool, the skilled workers took part as co-developers of their own tools.

occupational domains under the aspect of a technology design that is conducive to learning.

The relevant aspect from the point of view of the occupational sciences is the improvement of the adaptivity of computer-based work systems and their adaptability to the prior knowledge of individual users. A specific aspect of this research area is the improvement of the tutorial quality of computer-based work systems (Schreier 1998).

According to Schreier, the tutorial quality of computer-aided diagnostic systems consists in

- open standardised user interfaces,
- intelligible explanatory components,
- support for different qualification levels,
- systems software that supports learning, and
- user orientation through embeddedness in the process of systems design (ibid. p. 293).

Conclusion

In technical and industrial VET, learning in the work process relatively often touches the man–machine interaction and thus leads to the question how functions and tasks have to be organised in the interplay of machine functions and human labour. One issue that needs to be clarified is the problem of the interaction between artificial and human intelligence. From the perspective of the occupational sciences, the epistemic interest is focussing on a design of the man–machine interaction that is conducive to learning. Whenever the specific aspects of the occupation or the domain are relevant for design, competence in the occupational sciences is needed (cf. Eicker et al. 2001).

4.2.6 Industrial Culture and Transfer of Technology

It is above all three topics—and three related research questions—that are studied by industrial culture research.[12]

(1) 'Culture and Production' is associated with the question of the industrial-cultural determinants which influence the design and application of technical artefacts. An international project investigated the relevance of the industrial-cultural determinants that led to diverse development trends in the machine

[12] This research strand was first developed within the 'International Research Network on Culture and Production' (CAPIRN) between 1989 and 1995 and in a second step within a successive research network 'Culture of Manufacturing' with a stronger focus on engineering (Rasmussen and Rauner 1996).

tool industry in Japan, the United States, Germany and other countries with an advanced machine tool sector, which ultimately had considerable effects on the international market (Ruth 1995; Laske 1995; Rasmussen and Rauner 1996; Ito 1997). Different traditions of skilled work and engineering have a remarkable influence on the development, the application and also on the marketing of machine tools. The occupational studies on the work of engineers by Moritz give evidence of the competing national design traditions in the machine tool industry. The exploration of the design behaviour of engineers beyond the concept of participant observation shows that domain-specific and occupation-specific methods of qualitative experiments and the various forms of expert interviews should be tried further.

(2) 'Culture of Manufacturing', a research programme formulated by Ito, is less analytical and much more oriented towards design: How can technical artefacts be adapted to the different industrial-cultural contexts so as to meet the needs of the users and to trigger innovations in the sense of a dynamic equilibrium of assimilation and accommodation? At a more concrete level, computer science has already developed detailed methods of software localisation. Software for the international market needs to be transformed into the users' languages and to be adapted to the cultural particulars associated with them. Whenever the users are skilled workers, technicians and engineers, there is a need for occupational research and development as well as for the development of suitable methods.

(3) Finally, the concept of industrial culture was employed for research on the transfer of technology. For example, Salari (2000), using the case of steel production, studies show VET traditions and models of planning and organisation are transported in the transfer of technology. The consequences of transfer projects in which the implicit transfer processes and their effects are strong were shown in a study by Liu (1997) on VET in the context of a German–Chinese automotive joint venture in China. Only a reconstruction of the recruitment, employment and training in selected characteristic areas of activity as well as a detailed content analysis of the curricula and the organisation of training makes it possible to answer the failure of a spectacular transfer of training project. At the example of two Iranian steel plants—one Soviet and one Italian transfer of technology project—Salari investigates the effects that organisational models shaped by industrial culture have in the design and implementation process. The hypothesis of a subconscious transfer of organisational models was confirmed. Moreover, in the context of technocentric development methods the human resources development appears as a quantity that is dependent on the technology to be transferred. Transfer methods that are suggested by industrial culture research assign a high priority to vocational education and corporate human resources development.

Conclusion

From the point of view of the occupational sciences, the transfer of technology in the context of development aid as well as in the course of the internationalisation of technical and economical development leads to the question how relevant occupational work and professional qualification are as quantities of transfer. The studies cited above, which follow an occupational-scientific approach, achieved a remarkable depth of knowledge about the industrial–cultural determination of technological, organisational and qualificatory processes and products. The studies by Moritz and Salari are also interesting from a methodological point of view because the authors' domain-specific competence clearly influences their choice of methods.

4.3 Research Methods

The attempt to give an overview of relevant research areas shows that the establishment of occupational research in the field of industrial and technical disciplines has led to a multitude of research activities and projects, and that these activities are still far from constituting a consistent research strand. It becomes clear that the central research object of occupational research consists in the occupation-specific and domain-specific relationships and interactions between

- the contents and forms of occupation-based skilled work,
- the objectives, tools and methods of work (in the industrial and technical occupations this relates to the development, installation and introduction as well as maintenance of technical appliances and systems) and
- the qualificatory, educational and learning processes taking place in and directed towards professional work.

For instance, the development of standards for laboratory equipment for the automatisation of process and production technology needs to take into account the state of the art in automatisation technology and its application in production processes as well as the target users in the laboratory—and thus the qualification requirements in the relevant occupations and the other conditions for didactical activities in this laboratory.

One thing that the (industrial and technical) occupational sciences have in common with engineering and natural sciences is the diversification into disciplines and occupational domains, and the analysis of technical phenomena according to the criteria of scientific rationality.

Labour studies and occupational sciences share their central research object, human labour, but it is not ergonomics and workload that the occupational sciences are addressing, but the contents of work, the qualification requirements that result from the occupational organisation of work, and the development of

competence in the work process. Accordingly, the industrial and technical disciplines can be regarded as specialised labour studies. In the occupational sciences, the analysis and shaping of work situations is a result of the epistemic interest in the relationship of work, learning and education.

The commonality between the occupational sciences and educational sciences or pedagogy consists in the epistemic interest in the analysis and design of learning, qualification and education. In contrast to general pedagogy, the occupational sciences and their specialist didactics are focussing not only on occupation-specific questions of education for a profession, but also on learning in the process of professional work.

This means that the development and application of methods of occupational research can draw on the entire range of methods from engineering, natural sciences, labour studies, social sciences and educational sciences. For each specific research problem in occupational research, the relationship among the topic, the epistemic interest and the appropriate methods—which have to be modified in accordance with the research problem—must be clarified. The specific character of occupational research and development results from the contents of specialised professional work and the technology which has to be understood and mastered. For example, computer-based work systems have highly different functions in manufacturing, in a chemical laboratory or in telecommunication. The development of the objective and subjective knowledge incorporated in the practice of skilled work is a core research task of the specific occupational sciences. The understanding of the natural and technical facts and laws that determine the conditions of professional activity is fundamentally different from the understanding of the subjective dimension of work. Therefore, it is characteristic of occupational research that it always has to deal with the relationship and interaction between the conditions and laws of the real world (e.g. technology and the associated 'techno-logic') and the social world (e.g. technology as a manifestation of societal ends and the appropriation of these ends in the process of education).

This is also true when it comes to the investigation and impartation of technical competence. The theoretical (objectified) knowledge about a new car model as well as the knowledge about the handling, the functioning and the software structure of a computer-assisted automotive diagnostics system constitutes a necessary but not a sufficient condition for competent professional activity. Another crucial factor for the qualification of car service professionals is the decoding of the subjective (practical) knowledge which is relevant for the practice of diagnostical work. The two types of knowledge (theoretical and practical knowledge) constitute professional competence, and their investigation requires research methods from the natural as well as the social sciences. But above all, it is necessary to develop research traditions with a focus on the different occupational fields and to promote the required specialist competence.

Therefore, the main challenges for the occupational sciences are not in the first place methodological questions in the strict sense. They rather consist

- in the selection of the adequate method(s) for the research problem and the research object,
- in the decision on the extent to which the researcher has to be specialised in the occupational domain covered by the research project and
- (in many cases) in the design of the interdisciplinary research arrangement.

It has been pointed out in the methodological discussion that the scientific methods of experiment and observation have been increasingly diversified in the social sciences and humanities. These disciplines have developed their own specific methods that are adjusted to their particular research objects. Gerhard Kleinig puts forward the criticism that the adjustment of methods to their research objects may neutralise their epistemic potential (Kleinig 1995, p. 13). One reason for the 'harmlessness of the humanities and social sciences', he claims, is the segmentation and partiality of their methods. Of course, this criticism also touches the efforts to develop the methodological profile of occupational research. Possibly a widespread misconception is at work here. The strength of the experimental and observational research in the natural sciences is of course not simply rooted in these universal methods alone, but above all in the fact that, e.g. physicists study physical phenomena and biologists study biological phenomena. A similar principle is hardly established in the social sciences. The methodology is dominating. The research topics, on the other hand, tend to be interchangeable.

In the course of a study on the maintenance work of skilled workers in electrical engineering and metalworks, the querying behaviour of interviewers with different professional backgrounds was also surveyed. The outcome was that even in situations where interviewers have the same epistemic interest and use the same interview guide, the information gained depends highly on the professional background of the interviewer. Whereas interviewers with little or no affinity to the domain they investigated asked mostly paraphrasing and context-related follow-up questions (and were unable to make subject-specific queries), interviewers who shared the interviewees' professional background preferred subject-specific and context-related queries and did not ask any paraphrasing questions (cf. Rauner 2001).

Accordingly, this difference in the behaviour of interviewers should not simply be regarded as a problematic deviation in the conversation, but utilised for the development of the method of subject interviews.

Depending on the research topic, occupational research requires a greater or lesser extent of professional competence in the relevant occupation or domain on the part of the researcher. The widespread attitude in the social sciences that was expressed by Agar (1980) in the metaphor of the 'professional stranger' is not applicable in the occupational sciences. According to Agar, only a researcher, who has a sufficient distance to the research object, especially by not being a member of the same community of practice as the test persons in his study, is in a position to collect empirical data with the required degree of objectivity. It is only the detached observation and the thick description of a situation which guarantee that the researcher himself is not too much involved in the reality he is about to

explore. The metaphor of the professional stranger is a lucid description of this position. From the perspective of empirical social research this attitude is reasonable because it makes a rule what has been taught by practice in the social sciences. The conditioning factors in terms of content, e.g. in the analysis and shaping of work, technology and education escape the view of empirical social research for the most part.

In occupational research, distance and proximity are not an insoluble contradiction. It is the methodological approach to this polarity that counts. When there is no distance between the researcher and the research object, the standards of objectivity—a fundamental criterion of social research—are compromised. On the other hand, an increase in distance reduces the researcher's opportunities for differentiated insights into the contents and structures of the phenomena to be investigated. Closeness allows for differentiation if it is embedded into an overview of the whole research setting, which can be achieved only via reflective distance. We might thus overcome the supposed contradiction by saying that proximity and distance are two essential features of occupational research that presuppose each other and at the same time refer to opposites. The reflected distance of the researcher makes it possible to formulate specific questions that can be answered only from close-up. Deep insights require subject-specific competence and proximity to the research object. The quality of the findings also improved by the capacity of abstraction. The latter, however, requires the ability to distance oneself from the research setting. In the practice of occupational research, this dialectical relationship of distance and closeness needs to be transformed into appropriate research strategies and arrangements (see also Flick et al. 1995, p. 155).

When it comes to the implementation of, e.g. action-oriented subject interviews and qualitative experiments, it is necessary to constitute and capture two realities at the same time, namely the one of the outsider and the one of the insider. This also points at the different dimensions of the relationship of work and subject that have to be investigated.

This arrangement makes it possible to study the two realities—the perspectives of the stranger to the profession on the one hand and of the insider on the other—in connection.

The specific research objects of the occupational sciences require an object-oriented diversification of the basic methods and research strategies for the various vocational disciplines and occupational domains. The action-oriented and participative qualitative research methods in occupational research have led to interesting results, e.g. in qualification research, curriculum development and in the analysis of the man–machine interaction. It became clear that the special character of occupational research results from the need to consider the occupation-specific and domain-specific contents of the research object. Occupational research is an effort that is diversified according to occupations and occupational domains, and depends on an advanced professionalism on the one hand and a cooperation with adjacent disciplines like labour studies, engineering, vocational pedagogy and the sociology of industry and work, on the other. Interdisciplinarity, however, requires

that the disciplines involved explain what research problems they can address, what specific contributions they can make and with what methods. Once more we end up with this conclusion: All research disciplines are about questions of subject matter, and each discipline has to make its own decisions.

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Chapter 5
TVET System Research

Thomas Deissinger

Abstract Research on TVET systems now comes up with various theoretical approaches. Apart from methodological issues, such as 'typologies', comparative criteria are crucial theoretical components by which existing TVET systems can be analysed. It is against this background—and not just by looking at the institutional and/or organisational pattern typical of a given TVET system—that underlying factors, such as the evaluation given to TVET, the different cultural imprints, the meaning of TVET and the political attention states dedicate to the field of post-compulsory education in general, should be taken into account. Differences between the German-speaking countries and the Anglo-Saxon world are hereby obvious and a good example for depicting cultural and pedagogical diversity in the field of TVET. The article focusses on various methodological perspectives for the purpose of understanding, among others, these differences.

5.1 Introduction

Technical and Vocational Education and Training (TVET) is normally organised in *three different basic modes*: firstly, full-time in a vocational school, college or higher education institution with neither practical training nor employment contract; secondly, as more or less formal skill formation in a company workplace setting, i.e. in some form of contractual employment as a trainee or employee; thirdly, as an acknowledged TVET programme, which uses part-time school-based and company-based modes of learning, sometimes known as 'dual system' or 'alternating TVET' (Deissinger 2010). In most cases, learners in the latter case also are in some kind of contractual employment which can be an apprenticeship contract.

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However, it is mostly the apprenticeship system which offers opportunities for vocational learning within an 'occupational' context (Deissinger 1998).

TVET systems and pathways are more than 'constructions' based on political motivations or economic interests, i.e. they have to be looked at as 'historical entities', and they even bear the potential—though this is contended by some authors—of revealing a 'national character' which corresponds with overarching or organising principles that are not necessarily shared by other countries (Allemann-Ghionda 2004, pp. 23, 51; Deissinger 1998). An important overarching issue, besides institutionalization, seems to be the social and economic understanding of various vocational pathways (Harris and Deissinger 2003), but also the evaluation given to TVET in general, which becomes clearly manifest when we look at the challenges imposed by the European Qualifications Framework. It is understood that countries which differ in terms of their TVET systems and underlying traditions, especially with respect to the relationship between full-time TVET and company-based training, also differ in terms of their capacity to adapt to the European TVET policy agenda, above all when it comes to National Qualifications Frameworks (Young 2003). Both issues will be picked up in the following.

This is especially true for the dual system which, in some countries at least, functions as a more or less traditional apprenticeship training system. Examples for this subtype are Germany, Switzerland, Austria, Denmark or the Netherlands. Even in Anglo-Saxon countries, such as Australia or the United Kingdom, apprenticeships, mostly with the additional label 'modern' or 'new', have been reinvented in the last two decades (Unwin 1999; Dolphin and Lanning 2011; Steedman 2010), welling up from reform ambitions to establish alternative routes into employment, besides non-formal on-the-job training, traditional school-based TVET programmes or higher education courses that can be too general to serve specific labour market expectations. Hence, in the field of TVET, we encounter a variety of 'system solutions', which are different because they follow a 'national' of 'cultural logic', which means that their manifestations 'rest on historical foundations' which have to be understood, among others, by looking at 'macro-social processes on the one hand and concrete political and institutional contexts on the other' (Busemeyer and Nikolai 2010, p. 504). A good example is the German dual system, which can only be understood with respect to the history of the late nineteenth century (Deissinger 1994), but also against the background of a specific 'division of labour' between the relevant stakeholders operating in the social market economy context of post-war Germany (Greinert 1994).

Against the background of cultural imprints which have left their traces in the structures and the underlying 'mentalities' in a given TVET system, it is also *the meaning of TVET* which can differ manifestly between countries, even if they belong to a common cultural sphere, such as Europe. According to Kell (2006) TVET (or VET) can mean…

- a specific pedagogical objective, which has to be realised against existing tensions between 'education' and 'work' or 'occupation' respectively,

- a descriptive term, which stands for individual learning arrangements and processes linked to the pedagogical objective mentioned beforehand,
- a product of such processes, which in some cases can be understood as possessing a holistic quality of competences,
- an overarching term for the organisation of technical and/or vocational learning in the typical strata of modern education systems, i.e. (i) as pre-vocational education at level secondary education I, (ii) as initial vocational education and/or training at level secondary education II, including workplace learning and/or apprenticeships as well as vocationally orientated courses in the higher education sector and (iii) as continuing and adult education.

The terminology and the essential characteristics of the various institutional settings in which TVET can take place normally differ although the term (T)VET has meanwhile entered the international debate, especially on the level of European VET policy, but also in the area of supporting developing and threshold countries to establish well-working TVET systems.

5.2 System Perspectives

Despite their cultural character, TVET systems normally are looked at in *institutional terms*, i.e. differences and similarities are associated with structure, institutional responsibilities, communication mechanisms between stakeholders, the role of government and companies or the specific kind of steering innovations and change within the TVET system (Deissinger 2009; Kell and Fingerle 1990; Rahn 2009). Hereby, the focus on 'learning sites' is a most relevant one, especially if one considers the wide range of research dealing with workplace learning—hereby indicating that learning in a real workplace setting in a company is seen, both economically and pedagogically, as a favourable setting of TVET. On the other side, there has always been criticism among scholars concerning the 'hidden curriculum', which seems to steer workplace learning alongside the specific reproduction interests of firms, whereas school-based TVET, being more closely linked to a manifest pedagogical understanding of learning has traditionally been the 'favourite' of TVET researchers, and—in particular in the German context—vocational education theory (Blankertz 1982; Blättner 1965).

In contrast, TVET in the UK or England respectively has traditionally been associated with workplace learning within the context of a 'market model' (Greinert 1988), which by no means implies that TVET is only carried out in companies and that it follows a more or less strong determination by purely economic considerations about the benefits of training measures. Two reservations have to be made: Firstly, the UK's 'outcomes-based' approach to TVET (Jessup 1991) has led to more state involvement than ever before in the history of TVET in this country through a 'very tightly regulated assessment and accreditation system that communicates (…) what is expected of the TVET system' (Hayward 2005, p. 78).

Secondly, participation in school-based forms of learning in TVET has increased in recent years, partly due to dissatisfaction with both the quality of in-company training and the marginal role, the volatile quality and the lack of career relevance of apprenticeships in many branches of industry (Ryan et al. 2006).

Looking at TVET as a 'system' implies to differentiate between 'structure' and 'function' of the system architecture. Although it seems problematic to use the notion of a well-organised entity for existing social systems in general, or for education systems in particular (including the non-systemic character of the so-called dual system in Germany), it makes sense to stick to the term 'system' for pragmatic, but also for scholarly reasons: System theory helps us to understand the relationship between sub-systems in a given society, their interaction, their specific working principles and the way they establish a 'difference' between themselves and their environment (Luhmann and Schorr 1979). When looking at TVET as a system, the various levels on which it operates become relevant as well: TVET systems are not solely depictable on the 'macro level' (normally associated with institutions, structural features and responsibilities of the various stakeholders), but also need to be understood in their specific pedagogical and/or didactical quality. Kell even differentiates between four system levels, i.e. 'macro-', 'exo-', 'meso-'and 'microsystem'. In the case of TVET, 'macro' and 'micro' represent the structural framework and the learning processes, while 'exo' indicates that there are strong determining systems 'around' the TVET system, in particular the employment system and the education system, and 'meso' stands for the institutions in which technical and/or vocational learning takes place, such as schools or companies (Kell 2006, 460 ff.). It is evident that the links and the interdependence between these system levels render a given system a distinctive and unmistakable shape and quality in relation to other sub-systems.

Another most relevant perspective is looking at *pathways and working mechanisms* which determine the *transition from school* via *TVET into the employment sector.* A helpful description, which can be specified along the lines of how countries deal with the borders and boundaries between the various sub-systems as a major factor for transition within the education system, comes from 'threshold theory' which contributes to understanding the complex relationships between the sphere where competencies (skills and knowledge) are created (e.g. a school or an apprenticeship) and the sphere of application of these competences (e.g. a workplace or an occupation). This model makes a distinction between 'threshold one' and 'threshold two', each of which stands for specific problems of integration and progression respectively (Mertens and Parmentier 1982; Zabeck 1979). While 'threshold one' represents transition from general school education (e.g. a middle school in Germany or a comprehensive school in the UK) to TVET (e.g. an apprenticeship in the German dual system or a course in a TAFE college in Australia), 'threshold two' marks the borderline between TVET and employment. The problem for any international comparison arises clearly when suggesting that this model is a universal one. The current 'landscape' of traditional and innovative TVET pathways alone feeds doubts that we no longer can trust in a general analytical framework applicable to various national and cultural contexts.

The difficulty becomes especially apparent if one tries to understand the complex mechanisms linking up the education system with employment. The first reservation which has to be made refers to the different functioning of labour markets: While Germany, e.g. is still very strongly characterised by its 'occupation-structured' labour markets, which in substantial areas (machinery, crafts, commercial services) are interlinked with training occupations in the apprenticeship system, the UK or Australia have more 'open' unstructured labour markets, which also applies to the US with its strong tradition of both 'internal' and 'unstructured' labour markets (Doeringer and Piore 1971). This means that transition into employment and subsequent career pathways are more or less independent from formal qualifications and therefore rather result from membership to a company or the specific demands of a given workplace.

5.3 Comparative Perspectives

One of the most interesting issues in comparative TVET research is the function, and with it, the value given to *workplace learning* as an institutionalised setting of initial skill formation. In Europe, most countries have rather weak apprenticeship systems, which can be described as the traditional model of training for work and life in a company (Zabeck 2009, 414 ff.).

In contrast with countries such as Germany or Switzerland, Anglo-Saxon countries, such as England or Australia, try to cope with 'historical deficits' (Deissinger 2008a) and direct their political ambitions towards a systematic revival of the *apprenticeship system* (Ryan 2001). The schemes have become known as 'modern apprenticeships' (England) and 'apprenticeships and traineeships' (Australia). In both cases, training follows the overarching principles of CBT (competence-based education and training). Whereas in Germany, apprenticeships in the dual system can be described as a 'mass education system', countries like Australia and England suffer from the fact that they represent only one type of vocational learning among many, especially informal or weakly formalised tracks into employment/they are part of an 'open training market' where full-time and part-time and alternating models exist. Recent apprenticeship innovation policy has led to some kind of formalisation, e.g. through 'training packages' (Australia), or 'National Vocational Qualifications' (England and Wales). On the other hand, user choice, covering school-based and part-time apprenticeships and traineeships as well as formal training, makes it possible to run an apprenticeship in various modes, e.g. completely on-the-job or off-the-job or with an external training provider (Harris 2001).

Therefore, in contrast with the German type of dual training (Deissinger 2010), apprenticeships in the Anglo-Saxon world are organised in a much more open, volatile way, while weak process regulation obviously corresponds with the 'competence-based' approach in the area of skill formation and certification (Winch and Hyland 2007; Smith 2010). What matters here is demonstrated

competence in the performance of work tasks and no substantial educational attainments. In this context, learning on the job in a more or less formalised manner, is still the dominant way of acquiring skills outside the system of further education (a term used in the UK) or TAFE (Technical and Further Education), as it is called in Australia. Skills, in most cases, remain job-specific as they are not based on generally accepted initial training programmes (Winch and Hyland 2007; Ryan 2001; Raggatt 1988; Misko 1999; Hellwig 2008). The following quotation underlines the differences between Germany and the UK in terms of their respective 'apprenticeship cultures' (Deissinger 2008a):

> A striking difference from Germany is the absence of minimum training periods, such as a three-year programme for bakers. Similarly, apprentices need not take part-time technical education, unless they are MA participants functioning under an NTO framework that requires it – and even then no general education is required. Indeed, „off-the-job" training in a company training centre or with an external commercial provider is often enough to meet NTO requirements, despite concerns about its quality and relevance (…). The absence of process regulation reflects Britain's „competence-based" approach to skill certification. What matters in principle for NVQ certification is demonstrated competence in the performance of work tasks, and that alone. Educational attainments should indeed form part of that assessment if they are needed for competence, but are otherwise to be discarded as superfluous (…) (Ryan 2001, 136 f.).

When looking beyond apprenticeships, the German full-time TVET system is a good example for the multifunctional and multi-institutional character TVET can take. This also means that vocational schools basically serve *three functions* which may be intertwined depending on the course and the institution setting (Deissinger and Ruf 2006):

- *Vocational preparation* (mostly 1–2 years) which means enabling young people to go for an apprenticeship by improving their stakes on the training market
- *Further education* (mostly 2–3 years) which means leading young people to achieve a higher school qualification level (including, e.g., the university entrance qualification)
- *Vocational training* (mostly 2–3 years) which means leading young people to achieve a portable labour-market relevant occupational qualification outside the dual system.

In this chapter, I will focus on two research projects that help us to understand the peculiarity of how sub-systems of TVET function and also the difficulties, when it comes to changing institutional settings, objectives or curricular patterns of already existing TVET institutions (Deissinger 2007; Deissinger et al. 2011; Deissinger 2012).

The *first one* refers to the *different values societies associate with workplace learning as against classroom instruction in TVET*. Whereas countries such as France, Italy or the UK have a well established school (or college) based TVET system and find it hard to attract companies to train young people on a quality-minded base themselves (Ott and Deissinger 2010; Raggatt 1991), German-speaking countries do have strong apprenticeship systems which have survived the

time of intensified industrialisation in the nineteenth century. Against this background, in the German debate on TVET, there has always been an understanding that company-based and school-based training represent different pedagogical logics based on diverging paradigms of learning, while at the same time, vocational schools find themselves in a tension field between skill formation and progression to higher education as pedagogical objectives and legitimising patterns (Rahn 2009, p. 306). Whereas TVET in schools has been associated with a more or less unambiguous pedagogical intention and therefore not with a purely functional understanding of competence, apprenticeship training (and with it the vocational part-time school) is supposed to occur within an economic environment where normally a strong bias on non-educational purposes prevails. However, even for the curricula in the part-time vocational school a didactical understanding is crucial which puts the contents of the occupation besides additional general education on a regular and mandatory basis—quite different from the liberal attitude which characterises apprenticeships in England or Australia (Ryan 2001; Dolphin and Lanning 2011; Winch and Hyland 2007; Deissinger 2009).

Switzerland and Germany have similar TVET systems, although in terms of progression to higher education, the Swiss system, since the 1990 s, has proved to be more open and flexible than the German one since the introduction of the vocational baccalaureate (Gonon 2001). In contrast, Austria has a well developed apprenticeship system, while full-time TVET plays a major role in technical and commercial occupations. In the case of Austria and Germany, it also becomes visible that apprenticeships, though not exclusively, have their roots in the craft sector—in Germany, some 25 % of apprentices are trained in these firms.

When it comes to the UK or France respectively, apprenticeships seem to exist besides full-time TVET, and their relevance for skill formation indeed is strong on the political agenda, but not in reality: Both countries have been struggling for decades to put their apprenticeship systems back on their feet, but without visible success, even in a country like the UK where companies have traditionally exerted major influence in TVET policy. Both countries now seem dominated by strong state control although differences with respect to legitimising the role of the state still are quite remarkable. In Germany, in contrast, full-time TVET plays a minor role against the background of an over-mighty dual system (Deissinger et al. 2011), both loved and supported by the state, employers and trade unions alike.

Although there is no doubt that Germany's high level of educational participation in post-compulsory secondary education in the TVET system is mainly due to the apprenticeship system, both the latter and the full-time vocational schools face challenges which have both a national and an international dimension. Starting in the 1990s, besides globalisation and the changing nature of industrial work organisation (Baethge et al. 1998), Germany's reunification and a slackening economy put strain on the national budget, on the labour market and on the education and training system (Deissinger and Hellwig 2004). Against this background, modernisation issues emerged which stretch from revising existing training schemes and the introduction of 'learning fields' in vocational part-time schools (Bader and Sloane 2000) to the reform of curricula of full-time vocational

schools and thus also touch the relationship between full-time and part-time TVET. The state of Baden-Württemberg, which, like the other 15 German federal states, has its own education system, is a good example for illustrating that full-time TVET in schools is seen as a 'second-class approach', when it comes to labour market relevant occupational qualifications. On the other hand, vocational full-time schools certainly fulfil an important and unchallenged function as links between general and higher education. This ambivalence caused the government of the federal state of Baden-Württemberg to widen the practical elements in the curriculum of schools such as the vocational college (Berufskolleg). The 'system character' of the German TVET architecture was in so far challenged as vocational full-time schools should become more functional in terms of labour-market relevant qualifications.

Results from a research project into the benefits of practice firms (Übungsfirmen) in vocational full-time schools are revealing in terms of the difficulties of changing the TVET system. The research project was carried out between 2003 and 2005 and looked into the pedagogical and economic functionality of practice firms in the federal state's commercial vocational colleges (Deissinger and Ruf 2006; Deissinger 2007). This problem required a broad research design which included the internal and the external perspective as well as presumed differences between the two principal stages of training in the vocational college respectively. Research was based both on qualitative (structured interviews) and quantitative methods (questionnaire). Some 1,000 students in vocational colleges and nearly 700 companies from different branches were requested to answer the questionnaires which, in the first case, focussed the didactical benefits of practise firms, such as their impact on student motivation and the perception of competence while working and learning. The company questionnaire was clearly on the acceptance issue, with its 'system relevance' on the macro level, both with respect to admission of graduates from vocational colleges to a chamber examination (which is the regular final stage of an apprenticeship) and the relevance of the assistant qualification for a subsequent apprenticeship or full employment (Deissinger and Ruf 2006, 60 ff.)

The research project looked, among others, at three aspects related to the '*internal functionality*' of practise firms (Deissinger and Zabeck 2008):

- the degree of learning motivation of students in comparison to 'normal' lessons
- students' perceptions of the teacher-student relationship in the practise firm
- the self-perception of students in regard to their competence development, especially with respect to social and communication skills.

The study suggested that the practice firm concept seems to feature both positive traits and problem aspects. While students reported a higher degree of motivation than in the classroom, the function of the practice firm in terms of simulating the world of work as realistically as possible obviously received ambivalent ratings from students.

The more politically relevant issue, however, was the question whether practice firms help to make school-based TVET more relevant to the world of work and therefore the assistant qualification more attractive to employers. This '*external functionality*' (Deissinger and Zabeck 2008) had to be matched against the preponderance of the dual system. In this respect, employers still showed their reluctance or at least ambivalence towards full-time TVET: While big industrial companies mostly refuse the assistant qualification, smaller and especially craft firms seem more prepared to accept school-based qualifications, above all when it comes to hiring a young person for a commercial function. On the other hand, a clear majority of firms see, even if they concede that practice firms could be reasonable alternatives to classroom teaching, the 'socialisation function' of an apprenticeship as more relevant and valuable for skill formation and job preparation. It also became clear through the project that companies generally are reluctant to accept the first year of the vocational college (BK I) as a real substitute for the first year of an apprenticeship.

It seems that the function of vocational colleges is currently considered to become even more strongly linked for entry into higher education rather than to the purpose of delivering labour market qualifications. Within the scope of the above-mentioned research project, it becomes clear that the 'academic aspirations' of students with an intermediate secondary school leaving certificate are best satisfied by vocational colleges. Another very important motive of students for the attendance of a vocational college seems enhancing their own prospects of successfully entering apprenticeship training afterwards (Deissinger and Ruf 2006, p. 169). Most graduates of this vocational full-time school aspire to take up subsequent vocational training in a company, i.e. through the dual system. This means that students realise that the vocational college does not stand for the achievement of a portable labour-market relevant occupational qualification outside the dual system (ibid., 168 f.).

One consequence underlines these tendencies: In Baden-Württemberg, the state government has meanwhile adopted a 'realistic' attitude when it comes to the issue of portable qualifications through a vocational college course. Since 2008, the assistant qualification has ceased to be the regular qualification at the end of the 2-year course. In contrast, the polytechnic/university of applied sciences (Fachhochschule) entrance qualification can be achieved by all students without attending additional classes or taking additional subjects. This political step also reveals that cooperation agreements between industry and the state work only when companies can benefit from it. For this purpose, in a number of vocational colleges in Baden-Württemberg, curricula have been aligned with 3 established dual system occupations in the commercial sector (Noack 2011). In the face of a dooming quantitative skills gap at the intermediate level in Germany, companies could become more interested in young people who already have pursued some steps in the vocational school system before applying for an apprenticeship.

The *second example* from research is associated with an European perspective by looking at structures and functions of so-called 'hybrid qualifications' (HQ). In this context, the issue of permeability, as a typical European one, focusses the

structural links between different educational sub-systems in a given country. Especially, permeability between vocational and general education has emerged as a major focus of European education and training policies and one of the objectives of the EQF. Permeability and progression in this context mean that vocational qualifications should also bear an educational value as such and should, both formally and informally, enable graduates to proceed to higher education. Some countries in Europe, including the UK, France, Austria and Switzerland, have developed structures of 'hybridity', although this does not necessarily mean that the political intention to establish a more diversified and multifunctional TVET system coincides with the traditional pattern of TVET in the various countries (Deissinger et al. 2011). Hereby, 'hybrid qualifications' have a 'hub function' as they prepare for qualified entrance into working life (in the sense of TVET) and open access to higher education.[1]

In the European context, which includes new approaches to assessment such as RPL (recognition of prior learning) or APL (accreditation of prior learning), *four issues* may be identified as especially relevant for a tradition-based TVET system such as the German one, where apprenticeships have been the long-standing successful mode of integrating young people into skilled employment. Nevertheless, spin-off activities are currently on the way for establishing a German Qualifications Framework (DQR), the first draft of which was published in February 2009. With it, came a number of issues onto the educational agenda which have a strong 'innovative', though at the same time, 'controversial' character and once again touch the 'system issue', both on the micro and the macro level:

- The transfer of an European understanding of competence determining the EQF has to be transformed onto a national semantic level, i.e. there is need to come to terms with the specific national tradition and use of 'competence', which, for e.g. in Germany can be described as 'holistic' rather than 'functional' (Westerhuis 2011). Besides, a 'competence matrix' has to be established featuring vertical differentiation in reference levels and horizontal differentiation with respect to various competence dimensions.
- The second issue refers to the description of the matrix units which result from the eight levels and three competence dimensions (knowledge, skills, competences) making up the basic structure of the EQF, while the German framework has now been presented with four competence dimensions (technical competence, methodical competence, social competence, personal competence).
- The third issue deals with existing 'qualifications' (certificates) within the national matrix. This means that qualifications (which are normally strongly input-steered as they are based on training times, curricula, examination modes etc.)

[1] 'Hybridity' was the topic of a recently completed EU Leonardo Project entitled 'Hybrid Qualifications—Increasing the value of VET in the context of Lifelong Learning' (2009–2011), in which the author participated. Partners in this project were: Alison Fuller (University of Southampton, UK), Josef Aff (Vienna University of Business and Economics, Austria) and Christian H. Jorgensen (University of Roskilde, Denmark)—see also Deissinger et al. 2013.

have to be translated into notions of competence, which have to be aligned with the various levels of the DQR.
- The fourth issue certainly is the most demanding one: Competences that are not normally bundled as qualifications have, in a strong European understanding, to be linked with the levels and range of matrix units that make up the framework. This issue, however, only seems solvable once the unique positioning of existing qualifications is being questioned and/or relations are being established between the 'regular' and the 'irregular' system of entitlements (including, of course, further training and, above all, the field of informal and non-formal learning).

It becomes clear that the European issue of 'progression' is closely linked with the specific internal structures of national TVET systems, which we also have referred to when discussing the different values of full-time school-based TVET and apprenticeships. Apprenticeship countries seem further away from these 'modern' issues and policy objectives than countries with either a strong focus on generalised, school-based vocational learning or those where TVET is obviously more located within higher education. The unique positioning of apprenticeships in Germany, on the one hand, has traditionally provoked criticism with respect to the organisation of vocational training and general education 'according to separate criteria and systems of assessment' including 'limited possibilities for progression between them' (Young 2003, p. 228; Baethge 2007). On the other hand, it may be argued that academic and (non-academic) vocational pathways, in the German case, are well rooted within disjunct, but interdependent sub-systems and that their mutual interaction obviously contributes to stabilising the 'vocational track', and with it the TVET system as such, in a stronger way than in other countries (Deissinger 1998).

5.4 Methodological Perspectives

There are a number of approaches in comparative research which help us to understand differences and similarities between national education and/or TVET systems by classifying types or models. In the field of *comparative political science*, the study of education systems is closely linked to the 'character' of the (welfare) state by looking at 'how, why, and to what effect different governments pursued particular courses of action or inaction' (Heidenheimer et al. 1990, p. 3). Research here primarily concentrates on finding out what distinguishes 'education regimes' and whether there are 'clusters' or 'families of nations' which help us to understand the basic mechanisms and impacts of state regulation and interference through variables such as public spending, the distribution of funds between different educational sub-systems or the relationship between social and educational spending (Busemeyer and Nikolai 2010). Hereby, comparative policy research also refers to indicators that are used in the traditional TVET literature, such as aspects of division of labour between state and private stake-holders, the kind of

organisation of TVET, especially vocational training, curricular variations between types of schools or segregation of educational tracks (ibid., 499), but also the 'deep connection between education and democracy' (Busemeyer and Trampusch 2011, p. 418)—which certainly has relevance for vocational education, too, if, e.g. one looks at the involvement of non-state stakeholders in the dual system of Germany and the way training regulations come into existence (Deissinger 1996). Clustering shows that three 'groups of countries' can be identified: Nordic countries, English-speaking countries and Mediterranean countries. Germany and Austria, hereby, can be assigned to form a specific sub-cluster among Northern European countries with low shares of private spending in general and tertiary education, a high share of citizens with at least an upper secondary qualification, and 'a strong emphasis on vocational training' (ibid., 501). It also becomes clear that Northern European countries, including France, Belgium and the Netherlands, are much more heterogeneous compared with the Mediterranean cluster: Here we find strong substantial similarities, e.g. with respect to the level of upper secondary education which ranks 'well below the OECD average' (ibid., 502). Criticising existing concepts as too broad, Busemeyer and Trampusch pick up the line of arguments of this stream of comparative policy analysis by referring to the issue of skill formation, in particular. Their terminology distinguishes—drawing from the concept of 'varieties of capitalism'—between 'varieties of skill formation' (Busemeyer and Trampusch 2011, 424 ff., 2012, 8 ff.), namely 'collective skill formation' (German speaking countries), 'liberal skill formation' (e.g. UK, US), 'statist (state-run) skill formation' (e.g. Sweden, France), and 'segmentalist skill formation regimes' (Japan as a prominent case), using two dimensions (or criteria) of variation 'that are helpful in describing the variety of skill regimes': i.e. the 'degree of firm involvement' and the 'degree of public commitment to vocational training' (ibid., 12 ff.).

Other methodological concepts in TVET also argue on the basis of 'regulation' or 'steering' mechanisms as crucial comparative criteria, which sometimes can lead to reductionist views, above all with respect to the function of the state (Greinert 1988, 2008; Deissinger and Frommberger 2010; Deissinger 1995). Greinert's distinction of three basic models of TVET (market, school-based, dual) places the focus on institutional responsibilities, cooperative structures and the role of the state in shaping a TVET system (Greinert 1988). This modelling of the 'character' of TVET systems looks at initial training in the first place and does neither fully pay tribute to the complex relationships between different sub-systems of TVET within a specific national context nor to the curricular and didactical dimension of vocational learning.

Therefore, one can maintain that many concepts that exist in comparative TVET system research primarily focus either the institutional (especially state or government) dimension or they focus on the basic relationship between state and markets. From a pedagogical perspective, this present state of the methodological debate is far away from being satisfactory since didactical issues and the underlying cultural imprints of what learning and teaching in TVET means in the various countries run danger of being forgotten or neglected.

It is obvious that a better understanding of this important dimension of TVET requires wider concepts with new criteria and/or dimensions for comparative research. It has to be greeted that the curricular dimension of TVET has recently been picked up by Frommberger, starting off with a comparison of Germany, England and the Netherlands (Frommberger 2004). Frommberger (2012) points to three broad trends in curriculum development across Europe (which could also be used as criteria when it comes to researching the micro level of TVET), namely 'the structure of the curriculum' (including the range and intensity of modular approaches), 'the steering logic underlying the curriculum' (in particular the paradigm change from 'inputs' to 'outcomes'), and 'the pedagogic-didactic approach embodied in the curriculum' (which implies the issue of commitment to learner-centred training and instruction). In a similar formal way, both the concept of 'qualification styles' (Deissinger 1995) and the notion of 'learning cultures' (Harris and Deissinger 2003) try to remedy the fact that comparative research is too much focussed on institutions.

'*Learning cultures*' or '*apprenticeship cultures*' imply the notion that comparative criteria should be defined, that direct our view to differences not just to the organisation and institutional settings of TVET, but also to the didactical and curricular steering, the relevance of TVET for career and life perspectives of young people and the estimation for education and training beyond higher secondary education in schools and tertiary education. However, the primary purpose of comparative studies, in most cases, is to refer to the 'system dimension' without asking for the 'backgrounds'. The latter methodological extension may be called a 'multi-level' approach (Schriewer 1987). The concept of 'learning cultures' represents such an approach since it offers a methodology composed of five dimensions which widen the research perspective to cultural and societal issues. In the following, these criteria will be illustrated by focussing Germany and Australia as two countries with different cultural imprints and realisation patterns of TVET (Harris and Deissinger 2003; Deissinger 2008b):

- *Strength of, and respect for, vocational education*: This dimension refers to the value given to TVET in a specific national context, including learning in the workplace, within or without an apprenticeship. It is obvious that the selection mechanisms of general education and the range of opportunities of young people to proceed to higher education have an impact on this facet of a TVET system. In the UK and Australia, vocational tracks have traditionally been regarded much lower in value than alternatives in general and higher education, partly due to the structural weaknesses of work-based learning, but also due to a mental and institutional divide between education and training. In Germany, as already mentioned, neither the institutional extension of full-time vocational education nor the critical educational movement, with its basic criticism of the 'Berufsprinzip' (occupational principle) during the 1960s and 1970s (Deissinger 1998, 25 ff.) succeeded in really weakening the dual system. Apprenticeships are still culturally and economically stronger than in most other countries in and outside Europe.

- *Knowledge and understanding of vocational pathways*: The dual system with its 'recognised skilled occupations' still takes up more than half of all 16–19 year olds. Unlike in most other European countries, with the exception of Austria and Switzerland, apprenticeships in Germany exist in nearly all branches of the economy, including the professions and parts of the civil service. Small- and medium-sized companies are significant contributors to training opportunities. Apprentices can undertake formalised training independent of their educational background (and even grammar school leavers find occupational training attractive). In Australia, vocational pathways are poorly understood, except in families with an apprenticeship experience. The introduction of traineeships, introduced to encourage early school leavers to enter the workforce and obtain skilled training, and of New Apprenticeships in the late 1990s (Harris 2001), though for the purpose of flexibility, has tended to make understandings of apprenticeship even less clear.
- *Financing of VET*: In Germany, training takes place following the mechanisms of 'a suppliers' market' (Greinert 1994, p. 80), which resembles the more liberal market regimes of the UK or Australia. However, once a training contract has been signed, this means that companies are fully responsible for the quality of the training process. At the same time, one can observe a creeping 'pluralisation' of TVET alternatives outside the dual system, with the 'transition system' as one of the central political building sites of the country. It is also interesting that Australia has been strong in terms of its welfare tradition, initiated as a result of and reinforced by the specific character and size of the country (Münk et al. 2008). Nowadays, employers can receive government funding for training on a large scale. Here, a clear parallel to the UK becomes apparent (Dolphin and Lanning 2011) as 'new' forms of apprenticeship training are linked to a strong financial steering function of the state while 'traditional' apprenticeships have always been a matter of employers.
- *Prime focus of apprenticeships*: The German apprenticeship system may be described as a 'system of training rather than a system of employment', with wages (training allowances) 'that are far lower than adult rates and apprentice rates in Australia' (NCVER 2001, p. 39). Training allowances are the result of collective bargaining without loading too much burden on employers. As the apprenticeship system is seen to be neither part of the school or education system nor a normal sphere of work, the 'system reference' here clearly refers to high quality training and recruitment for intermediate functions in commerce, industry and the craft sector. In Australia, the historical function of apprenticeship has been to train artisans, and this includes both the traditional crafts and the more contemporary trade occupations. Recent changes in the system, also using CBT and 'training packages', have underlined the general approach to training and have helped rise the numbers of apprentices (Smith 2010).
- *Quality assurance of in-company training*: In Germany, apprentices enter a special training contract which is subject to the 1969/2005 Vocational Training Act (Deissinger 1996). As a compromise, the Act did not instal a new training system including the vocational school, but mainly 'consolidated much previous

practise under one Act' (Raggatt 1988, p. 175). The contribution of the Vocational Training Act to systematising and standardising the course of training can be seen in the indenture, the degree to which skill requirements of trainers have become formalised and to the quality-mindedness which characterises both school-based and company-based vocational training. In Australia, critical observers maintain that, with the implementation of training packages in the 1990s, quality assurance has been removed from the VET system. CBT, as mentioned above, which follows a different philosophy', in contrast to the German 'occupational' concept, seems to be responsible for a training organisation which still is mainly 'employer-led' (Harris 2001).

5.5 Concluding Remarks

For a clearer and deeper understanding of how TVET systems work, both in social, economic and pedagogical terms, it seems necessary to combine various approaches from various disciplines (education science, political science, economics, history) that deal with classifying and distinguishing these entities. Also, at least from the German perspective, which focuses TVET manifestly, it also seems sensible to widen the cultural perspective to issues of learning and teaching, without losing track of a more institutional perspective, which is typical for economists or political scientists. One of the research gaps, on the one hand, certainly is looking more closely to the way curricula are made, including the underlying pedagogical and didactical understanding. Teacher training, on the other hand, also appears as a scholarly field in which more comparative research is needed, including the culturally determined differences of its social value and status, as well as the national peculiarities of educational thinking and underlying traditions still waiting for an in-depth analysis.

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Chapter 6
Relations Between TVET System and Employment

Seung Il Na

Abstract The TVET system differs among nations in terms of its roles and operational methods. However, overall, not only does the system allow individuals to enter the labor market with improved vocational capacities but it also maintains job creation, promotes one's career development or even helps individuals to land in a better job. In other words, the TVET system is closely interconnected to employment. In particular, to respond to rapidly changing technology, re-training of employees or training to boost their capacities have recently been increasing. In accordance with, the TVET system has recently been carried out in the field, reflecting the increasing number of the system users, rapid changes in the industries, etc., and education training institutes have been emphasized autonomy and cooperation with industries. Secondary vocational education was, in detail, comprised of two systems: school-centered system that followed the nationally established curriculum, where students experienced the world of labor and field-centered system, and where students learned technical job skills in the field through apprenticeship. Yet, in recent days, even the school-centered system has been transformed into the dual system, carrying out the field work through practical applications in the field. Advanced vocational education has been changing from academic-based TVET of the past to a combination of field work and academics, reflecting the demands of the workplace. For those returning to school from their work for re-training, education tailored to the industrial needs has been carried out, and, in order to increase accessibility and participation of these learners, various support has been provided, such as hourly classes, distance learning, tuition fee subsidies, and recognition of advanced learning. To respond to the demands of the various learners and social changes, research on accurate prediction for the TVET demands in the relationship

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between the TVET system and employment, appropriate and timely placement of trained human resources, and re-establishment of the TVET system to increase adaptability to the field is further required.

6.1 The Role of the TVET System for Employment

Technical and vocational education and training (TVET) is concerned with the acquisition of knowledge and skills for the world of work. TVET that deals with both theoretical and practical contents is provided by various entities including schools, training institutes or companies (UNESCO 2005). TVET is called by various terms, like vocational education, technical education, technical–vocational education (TVE), occupational education (OE), vocational education and training (VET), career and technical education (CTE), workforce education (WE), and workplace education (WE) (Hollander and Mar 2009).

The role of TVET can be defined at individual and national levels. First, at the individual level, it upgrades one's ability, which is the most important factor for the labor selection, and has a critical role in deciding one's current job status (Duncan and Hodge 1963; Mincer 1974; Spence 1973). In addition, after the individual enters into the labor market, TVET helps to enhance his/her capabilities, raises pay levels, and eventually move onto a better job (Kaufman and Julie 2006). In other words, TVET encourages individuals to enhance and prove their job competencies and employabilities.

Second, at the national level, many countries have increasingly emphasised TVET as they tried to secure and supply necessary talents to the labor market. For example, Australia is trying to secure skilled workforce in the electricity, electronics or metal engineering sectors; Portugal and Spain are looking for mid-level engineers; and Austria is in need of absorbing young workforce as its labor market is aging (Grubb 2006).

TVET consists of vocational *education* on the one hand and vocational *training* on the other, and the details differ by country. The former can be further divided into technical and vocational education while the latter encompasses labor market training and employer-provided training (Gasskov 2000; Grubb 2006).

First, technical and vocational education is provided by schools, such as secondary and post-secondary level schools. It is a prime example of secondary-level schools that include comprehensive high schools and vocational high schools of the United States, specialized vocational high schools and Meister high schools of Korea, vocational high schools of Japan, and secondary vocational education under the dual system in European countries. It is also a prime example of post-secondary level schools that include community colleges or junior colleges of the USA and Canada, further education colleges of Britain, Fachhochschule of Germany, Technical and Further Education (TAFE) of Australia, IUTs of France and hogescholen of the Netherlands.

Second, labor market training is provided by training institutes, instead of schools, for job seekers, the unemployed or workers so that they can acquire and/or enhance their work capabilities and skills within a short period of time. Training agencies include public vocational training institutes, private vocational training institutes, poly-tech colleges, university-affiliated training institutes, and other lifelong education institutes.

Besides, individuals as well as the government are playing a role in narrowing the gap between supply and demand. The supply–demand mismatch of the labor market may cause over education, under education, over qualification, or under qualification to the supply side, and over skilling, under skilling, skills obsolescence, crowding out, or bumping out to the demand side (CEDEFOP 2010). To deal with the supply and demand balance, TEVT can be utilized so that individuals polish their skills to effectively land in a job and the government presents standard skill sets to prevent over/under supply.

Finally, employer-provided training is provided by companies for their employees in order to train new joiners or foster-skilled and capable employees. Companies use many different forms of the training, including on-the-job training, training provided by affiliates or institutes specializing in TVET.

6.2 Conceptual Framework on the Relations Between TVET System and Employment

Prior to examining the relations between TVET system and employment, the concept of employment needs to be defined. While the scope of traditional employment is limited to regular jobs or businesses, a new concept refers to a temporary state or the current manifestation of long-term employability (Schmid 2008). In other words, whereas employment used to mean only entry or re-entry into the labor market, it now includes job opportunities, flexible entry into and exit from the labor market according to one's expertise and discontinuous paths for career experiences. Accordingly, employment in this chapter refers to not only entry into the labor market, but also changes in status in the already-entered labor market.

Based on the extended concept of employment discussed above, the relations between TVET and employment can be examined in two different perspectives (Fig. 6.1).

The first perspective, the transition from the TVET system to work, applies to those who try to enter into the labor market by completing TVET while they are not employed. Technical and vocational education and labor market training belong to the system. This includes secondary level, post-secondary level, and vocational training to help students get a job (Stone 1992), and all activities that students conduct to prepare themselves to enter into the labor market after finishing school education (Smith and Rojewski 1993). TVET promotes students'

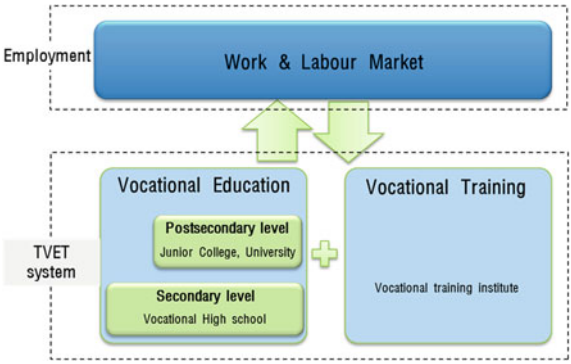

Fig. 6.1 Conceptual framework on the relations between TVET system and employment

transition to work as they can acquire skills required by industries, and certificates or licenses to prove their abilities in the course of the VET. Details of TVET system to work transition will be discussed in Sect. 6.3.

The second perspective, the transition from employment into the TVET system, refers to those who come back to the TVET system in order to maintain or improve their job competencies while they are employed or temporarily unemployed to train themselves. Various types of training, including technical and vocational education, labor market training and employer-provided training, constitute this system. The system helps individuals to maintain or improve their skills and competencies while they are employed, and to promote their transition to another company or different jobs (Jeong et al. 2011; Yoon and Park 2010). In addition, employers may regard it as investment to enhance their employees' work abilities and thus improve their businesses. As such, the transition from work to TVET usually includes those who participate in employer-provided TVET, those who enroll in higher education full-time or part-time and those who enroll in other vocational training (Gasskov 2000). The work-to-TVET transition helps individuals improve their employment quality, like pay, job transition or re-employment. Details of this transition will be discussed in Sect. 6.4.

6.3 Transition from the TVET System to Work

The TVET System to Work Transition is a course through which participants acquire job skills at schools or training centers to smoothly transit to work. Transitions from TVET to work include those from secondary, post-secondary or training centers to work.

6.3.1 Transition from Secondary School

Traditionally, the transition from TVET to work aimed to nurture skilled workers for the industry from secondary schools. Accordingly, secondary school TVET has focused on industry-oriented training rather than general or academic-purpose education.

The secondary school TVET is divided into school-based vocational education and work-based vocational education (Grubb 2006; Hoerner and Wehrley 1995). In the school-based vocational education, students experience and learn work-related skills through school-provided courses. On the other hand, in the work-based education, participants experience and learn job skills through apprenticeship. These days, the work-based vocational education includes a dual system which combines both school-based and hands-on education (Grubb 2006; Gasskov 2000).

6.3.1.1 Transition from School-Based TVET to Work

The school-based vocational education is provided, for example, by comprehensive high schools and vocational high schools in the USA, specialised high schools and Meister high schools in Korea and vocational high schools in Japan.

When a school provides TVET through regular curriculum, students can acquire both theoretical knowledge and hands-on skills which are commonly required by industries. In addition, students have wide opportunities to choose their career paths (Lee 2005a, b).

However, skills that the school TVET teach students are inevitably different to some extent from the skills required by the industry (Gasskov 2000). As schools provide education and training for general purposes rather than specific skills, students may learn diverse skills but cannot be fully prepared for a certain industry or company (Katarina and Gerard 2002).

To address this problem, work-based curriculums are necessary, and this may be more effective when it is provided for small groups and demands from the labor market is clearly defined. Such customised education and training is possible only when the recipient groups are small enough to select and offer a customized curriculum, tailored to individual students (Browning and Heinsen 2007). In addition, if the labor market defines clear demands for the workforce, the TVET curriculum may be established to meet the demands and ultimately to supply a well-prepared workforce (Spence 1974; Shin and Son 2008).

However, when vocational high schools grow larger and more students participate in each curriculum, the institutes can only offer the standard curriculum for each student. In this case, school-based TVET may end up providing minimum knowledge and skills required by industries, rather than fully prepare students for work (Hujer et al. 2006). Consequently, students need additional vocational education to develop their skills to enter into the labor market.

Teachers also have hard time educating students not to fall behind the pace of technology and industry development. Furthermore, facility and equipment costs are obstacles for schools to provide industry-specific education (Gasskov 2000).

To deal with such problems and to serve each individual better, school-based TVET adopts various methods, like modularization and internship programs. Modularization divides each course into modules that are assessed and certified one by one, which gives students the opportunity to combine modules in accordance with their career paths. This can foster multitalented students who are able to perform various works required in the post-industrial era, and thus prevent training only common skills. Many countries have developed standard job skill sets, such as NOS of the UK, CNCP of Spain, and NCS of Korea, in order to modularise education programs and to enhance field-oriented education, and are trying to reform education programs by using the standards (INCUAL 2011). In addition, career education of secondary schools has adopted and operated module-based standard programs so that students become certified when they complete the programs and pass exams.

Furthermore, school-based TVET includes supervised occupational experience, internship, and mentoring programs. They are designed to improve and specialize students' skills enough to meet the demands of industries, and utilised as opportunities to provide students with real-world opportunities (Bailey et al. 1998; Hoerner and Wehrley 1995).

6.3.1.2 Transition from Work-Based TVET to Work

Work-based TVET refers to learning experiences and activities that are performed in the actual or virtual work fields and has been provided mostly by apprenticeship (Hoerner and Wehrley 1995). These days, the apprenticeship is based on the dual system that combines vocational education by vocational schools and field training, not provided solely by master artisans in the actual work field.

Work-based TVET based on the dual system is actively operated in Europe, e.g., in Germany, Denmark, Norway, and Sweden. In the German system, students take one theory class per week while they experience the actual work on the other 4 days of the week. The Danish system also includes both school-based learning and industry-based training, and usually two-thirds of the semesters are spent at the actual workplace. Sweden began to adopt apprenticeship programmes in earnest, including mandating 15-week field training, from 2011 in order to address problems, such as shortage of skilled workers, irrelevant school-based TVET and inexperienced TVET teachers. In Norwegian system, school education and apprenticeship training is 2 + 2 (the former figure: school education period, the latter figure: field training period) in principle. However, when students have hard times handling the education load, they can complete training courses in the field before moving onto the theory courses at school. Thus, there are various alternative models, like 0 + 4, 1 + 3, 2 + 2, 3 + 1, and 3 + 0.

The dual system combines school-based education and work-based training experiences, thus directly applying school education to the field. Accordingly, employers can nurture and secure the necessary workforce while students can acquire practical skills and job opportunities (OECD 2000; Grubb 2006). In countries where the dual system is actively run, 80 % of the participants get a job where they are trained (Quintini and Manfredi 2009). In this case, details of the in-company training, like workplace, training period and compensations, are based on contracts between employers and students. The dual system is basically led by employers, as employers can autonomously determine training venues and contents (Gasskov 2000).

However, some countries with a dual system, notably Denmark, Germany, and Austria, have experienced decreases in the number of places available for company-based training within the apprenticeship programmes. One of the primary reasons is the long-term investment in apprenticeship may put pressures on employers (Payne 2002). In particular, as the global financial crisis hit the manufacturing industry hard, many employers find it a burden to develop new human resources through apprenticeship programmes.

In addition, if companies fail in quality management, the apprenticeship program may end up with opportunities for companies to use apprentices as cheap workers, and the actual scope of transferred skills may be narrow or applicable to a specific company only. Thus, it is required by law to sign a contract between participants and employers to define mutual rights and obligations, to supervise and evaluate training courses, and to assess the level of transferred skills in order to guarantee the quality of work training and ultimately students' entry into the labor market (Hollander and Mar 2009).

6.3.2 Transition from Post-secondary TVET to Work

Post-secondary TVET is implemented and operated to provide vocational education after secondary level TVET, and focuses on developing a highly-educated and specialized workforce. These days, it emphasizes the importance of high-level TVET to help participants adapt themselves to the rapidly changing technology and society and advances the target levels of capabilities acquired by the system (CEDEFOP 2011). The United States has expanded TVET from secondary education institutions to community colleges and increased support for relevant education opportunities. Germany also has expanded the dual system from secondary school to post-secondary schools, and Australia has worked on reforming national TVET led by TAFE (Lee 2003).

Although the goals and details of post-secondary TVET differ from one country to the next, they can be divided into mainly two types (Lee 2005a, b). First, some countries developed various programs accommodating different needs and demands of different classes so that the system serves not only as vocational training but also as a community of lifelong learning institutions. In particular,

community colleges of the USA and Canada were initially established to offer 2-year foundation courses for students to complete bachelor's degrees, and accordingly mainly comprised academic courses and transfer-preparatory programmes. Second, some countries offer post-secondary TVET for purely vocational education purposes. In European countries like Finland and Germany, the system primarily focuses on higher or advanced vocational education to "foster specialised filed workers in connection with the labor market." Most of the courses do not provide any liberal arts courses at all, or minimise such education, to fully prepare students for after-graduation jobs (OECD 2005).

In terms of the forms of post-secondary TVET institutes, community colleges of the USA, junior colleges of Canada and further education colleges of the UK offer both general and vocational education altogether while Fachhochschule of Germany, TAFE of Australia, IUTs of France and hogescholen of the Netherlands concentrate on tertiary vocational education (Grubb 2006). This, however, does not rule out the possibility that graduates of these institutions may have access to further studies in "academic" higher education.

Recently, universities began to enhance their vocational education, departing from their traditional role of academic research only. As a result, some curricula of universities overlapped with those of colleges, like nursing programmes provided by both community colleges and universities in the USA. In addition, some universities in the Netherlands and France have traditionally offered professional curricula (Huisman and Kaiser 2001). This does not necessarily mean a downgrade version from university education but a change in the direction of the education into supporting students' career development (Grubb 2006).

However, despite such efforts, university education is still oriented to academic purposes, not to practical skills (OECD 2010). That is, university education is too academic and intellectual, disregarding job training or career education (Baethge et al. 2007; Mayer 2003). To be the best in an area, it is necessary to not only to know "why" a certain phenomenon takes place, but also to know "how" to analyze and interpret the phenomenon. This is why field-associated university education has become spotlighted (Rauner 2011). To closely connect education and work, Rauner (1999) suggested a dual track that associates university education and apprenticeship, an integrated track that integrate and grant bachelor's degree and certification within a university program, and an accelerated track that allows students to apply for the bachelor's degree after accumulating field experiences.

Post-secondary TVET also encourages participants to work by operating courses accommodating the voice of industries (OECD 2010). For example, the USA operates a customised training system in that community colleges reflect employers' demands as much as possible. In the UK and Australia, further education colleges and equivalent institutions offer national license or certificate "prep courses," and students' pass records are one of the primary criteria for school performance evaluation. In Germany, post-secondary TVET is also based on the dual system where students take academic courses and work-based training in

parallel. All the programmes are designed to help participants acquire specialised knowledge and skills required by actual work fields.

6.3.3 Transition from Vocational TVET to Work

TVET institutes are agencies that transfer purely work-related skills required by industries (Grubb 2006). Participants are mostly those who prepare to get a specific job after finishing only general education, not formal vocational training, or those who want to acquire additional work skills while working for related fields. The education is naturally oriented to pure job-related skills, without general education provided by regular schools. As the institutes focus on up-to-date technologies, it is necessary to immediately understand the rapidly changing society (Katarina and Gerard 2002).

Examples of the institutes are public vocational training centers, private vocational training centers, poly-tech colleges, university-affiliated education centers, and life-long education centers. They are operated by either the government or the private sector. In the first case, government or public agencies operate training programs and supervise the quality. In Canada, the Canadian Labour Force Development oversees vocational training policies and operating instructions, and in the United States, the state job training coordinating council is in charge of the programs. When governments operate the programmes, they can develop the necessary skills of the workforce in accordance with well-defined training standards. However, they are mostly too strict to train workers within a short period of time (Gasskov 2002).

On the other hand, private institutes may immediately respond to demands for certain job skills as they can flexibly organize and change training programmes (Grubb 2006). They are not much subject to government control or standards, but they are able to provide customised training programs so that they can promptly improve recipients' skills. However, private programs mostly target to improve the work skills of those who already have jobs, failing to focus on young job seekers (Gasskov 2002).

In the case of Korea, diverse education programs are provided by public vocational training centers, Korea Polytechnics, vocational schools and other private institutes. In the USA, there are vocational programs provided by the federal government for disadvantaged people, and other programs run by state governments in pursuit of regional development. In France, vocational training programmes are operated by public, quasi-public, non-governmental and non-for-profit organisations, like Groupe d'éetablissements (GRETA) under the Ministry of Education, Centre National d'Enseignement à Distance (CNED), the vocational training and agricultural promotion center under the Ministry of Agriculture, the Chamber of Commerce and Agriculture and other industry/business organizations.

6.4 Transition from Work to the TVET System

Everyone needs to be re-educated continuously in order to maintain his/her knowledge and skills relevant in the rapidly changing society regardless of one's education level or capabilities (Department for Education and Employment 1995). Such re-education can be conducted by re-entering into post-secondary schools, completing courses from public or private vocational training institutions or taking employer-provided re-education courses at work.

6.4.1 Re-entry into School

Backed by development of cutting-edge technology and continuous education demands, continuing VET for workers has been highlighted. Accordingly, adults who completed formal education re-enter post-secondary education institutions to maintain their employment, change career paths or prepare for post-retirement life (CEDEFOP 2011).

Indeed, as of 2000, 56 % of the students in the US post-secondary education institutes were aged 25–40, over 50 % in the UK were aged 25 or over, and over 40 % in the Australia were aged 30 or over, demonstrating that community colleges (or equivalent) make a significant contribution to lifelong learning in these countries (Lee 2003). The ratios of early-20s students in those colleges have decreased while those of students over 25 have increased.

As such, demands for TVET for the purpose of career improvement or re-employment have increased. Post-secondary TVET institutes have tried to accommodate their demands by offering non-degree courses or adult courses. In other words, they are no longer the final stage of the formal education but have become continuing education institutions (Grubb and Sweet 2005).

Re-entry into school is mostly done through community colleges. While some may leave their work to get re-educated, most people juggle learning and working (OECD 2010). Post-secondary vocational education institutes provide re-education courses, like diploma/certificate/license courses, career courses and adult courses in the USA, and extended major courses and on-demand courses in Korea. FE colleges in the UK offer government-led courses (HND and HNC), government job courses (GNVQ, NVQ) and private professional prep courses, and TAFE in Australia operate short-term training programmes.

Companies have allied with vocational training agencies to improve necessary work skills of their employees (Hanson 2008). For example, some companies come into agreements with post-secondary institutions to designate a certain department as a contract course, or to operate customised programmes so that their employees can acquire necessary training and skills. Besides, some companies establish in-house colleges so that their employees can study and work in parallel;

the education programmes are oriented to skills necessary to the companies so that education providers and recipients can mutually benefit (Jeong 2008).

Governments also support re-education to foster and secure workforce (OECD 2010). The prime example is found in Finland where the Ministry of Education provides adult students with various support, like learning costs, accommodations, and student loan guarantees so that they can actively participate in re-education. In particular, the Ministry provides adult education allowances for workers and even job seekers who enter into universities in order to promote re-education (OECD 2010).

Post-secondary programmes for re-education are more flexibly operated than regular curricula (Park and Oh 2001). In the USA, many community colleges allow extended periods for the education completion, and some colleges provide module-based semesters by further dividing each semester. School in Britain provide full-time, part-time, and virtual courses. Australian schools offer wide choices of time frames depending on majors, and recognise credit exchanges or advance learning credits.

As such, TVET by re-entering schools can not only provide individuals with opportunities to improve their capabilities and acquire degrees, but also solidify their positions at work or enhance possibilities to get a new job (Shavit and Müller 2000). In addition, employers can improve business performance and profitability and secure up-to-date technologies that they cannot acquire by in-house education (CEDEFOP 2011).

6.4.2 Re-entry into Vocational Training Institutions

Employees and job seekers re-enter vocational training institutes to prepare themselves for changes in technology, secure or improve work-related skills within a short period of time (Grubb 2006). The training is regarded as investment in human resources to improve job suitability or employment opportunities, and the training types, like general or specialized, affect the complementary characteristics. In other words, if recipients' previous education or training was general-purposed, the training will be significantly complementary; but if their previous education or training was specialised, the training will have less complementary effects (Na et al. 2001; Ryan 1996).

Some workers voluntarily participate in vocational training programs to improve their capabilities. As for employers, when their companies are not able to train their employees, they commission the training job to specialized institutions (Hujer et al. 2006).

Governments also operate supporting policies to encourage re-employment or job training. The Korean government provides subsidies from the national budget by the Ministry of Employment and Labor, Regional Ministry of Labor and affiliated organizations as well as from the private job capability development funds that comes from the employment insurance fund (Baek and Kim 2003;

Lee et al. 2004). The UK government provides monetary support including Career Development Loan, Learner Support Funds, and Individual Learning Accounts.

6.4.3 Employer-Provided Training

Employer-provided training refers to initial and continuing training programmes provided by companies for their employees, and mostly consists of field experiences and OJT (Gasskov 2000). Such training is necessary as knowledge and skills acquired from TVET become depreciated and thus less effective over time (Ellwood 1982; Corcoran 1982; Lee et al. 2002).

Employer-provided re-education includes education at in-house training centers, cyber education and on-the-job training. It helps employees to maintain and solidify their job status, rather than merely increase their salary. In particular, as the training is mainly led by employers and regarded as investment in specialized and practice-oriented technologies, the training results minimally affect pay raises (Acemoglu and Pischke 1999). The education brings about a positive impact not only on individuals, but on the entire labor market, like expansion of the labor pool and reduction of the periods of unemployment (Hanson 2008).

6.5 Trends and Future Directions in the Research of the Relations Between TVET System and Employment

Recent studies on the relations between TVET and employment can be examined from two perspectives: the transition from the TVET system to work and the transition from work to the TVET system, as described above.

Recent studies on the TVET system to work transition have dealt with the following five issues. First, when companies hire TVET-certified workers, their majors or specialities may not match the job positions. Previous studies on this issue have focused on the causes of the mismatch. In addition, they have proved that employees who work in areas or positions related to their vocational qualification receive better wages than those whose job positions are less closely linked to their qualifications (Rumberger and Thomas 1993; Kane and Rouse 1995; Van de Werfhorst 2001; Heijke et al. 2003; Robst 2007).

The second issue is over-education. As discrimination against technicians or manual workers as well as education-oriented employment practices have been identified globally, over-education has drawn attention by many researchers. Recent studies have pointed out that many companies are looking for highly educated employees and try to confirm applicants' capabilities by their educational background whenever they have the opportunity (Ryan 2001; Kim and Shin 2006).

As a result, most TVET-certified workers are poorly paid, and their employment status is not stable (Maurin and Postel-Vinay 2005). Such over-education is also attributable to the applicant requirements that are too high. Recently, many companies are trying to hire new employees equipped with core competency that is not usually expected from new comers. As job seekers can succeed when they secure core competency and capabilities, they tend to be unnecessarily over-educated.

The third issue is the applicability of learning outcomes to the actual work on site. In particular, school-based TVET programs provide general education that can be commonly applied to all industries. In addition, they cannot accommodate rapidly changing technologies or field demands, and thus participants have hard times finding a job after competing in the programmes (Browning and Heinsen 2007; Hujer et al. 2006). To address the problems, many studies are conducted on field-oriented education. Many countries have standardised jobs necessary for each industry and established occupational standards. They also provide education courses and define licenses or certificates based on the standards.

The fourth issue is that companies tend to select over-educated resumes, regardless of work skills. Accordingly, those who have accumulated necessary skills through field or job education cannot land a job because most companies do not have objective methods to evaluate job or work but emphasize less relevant qualifications, like language and GPAs. Accordingly, TVET-certified job skills cannot guarantee employment. In this regard, it is necessary to establish a system where job seekers are evaluated and hired by field-oriented capabilities.

The fifth issue is how to evaluate the effectiveness of TVET programs. Relations between TVET programmes and applicability can be assessed in terms of how many participants find employment after graduation. However, the quality of employment should also be considered. To measure the quality, many studies have tried to take into account different variables, like pay and employment status (e.g., Rumberger and Daymont 1984, 1999; Grubb 1997). In addition, latitudinal and longitudinal comparative analyses need to be carried out, including employment rates and status of TVET participants and those of participants in general education (Ryan 1998; Kang et al. 2000).

Recent issues with regard to the work to TVET system transition are as follows. The first issue is the re-definition of the roles of VET institutions. They are becoming more important as institutions of continuing education and lifelong learning, and try to expand their roles due to decreases in the number of school-aged children. In the UK and Australia, targets of post-secondary vocational education institutes already include those who are currently working. In addition, many studies are conducted on various education courses and learning methods (Grubb 2006; Lee 2005a, b).

The second issue is associating field experiences, certificates or trainings with degrees. Already, many countries, notably EU, have established systems, like EQF, to enhance such association. To this end, it is critical to define and implement a national certification system that equally recognises filed workers'

certification, degree and experiences in order to facilitate re-education of field workers and promote practical education in universities (Serban 2011; CEDEFOP 2010).

The third issue is about who pays the training expenses. Re-education for workers (who are currently employed) can be divided into company-specific education and generally applicable education (Hanson 2008). As the company-specific education is only applicable to the company, it can not only improve employees' skills but also potentially prevent employees from leaving the company. However, as most education is not solely company-specific or generally applicable, companies face decision-making problems about educational investments (Acemoglu and Pischke 1998). In addition, employees whose capabilities are improved by education sometimes move to other companies that provide better treatments or compensations. Accordingly, recent studies are dealing with the distribution of the expenses and benefits of education.

6.6 Conclusion

Although TVET systems differ by countries, they can mainly be divided into vocational education and vocational training. Vocational education consists of secondary and post-secondary vocational schools while vocational training consists of labor market training and employer-provided training. Although the forms are widely different, all the programs have a common goal of providing field-oriented education and training to facilitate education-job association or to improve necessary skills.

Relations between TVET system and employment are constituted by the TVET system to work transition, i.e., to move to work by completing TVET programmes, and the work to TVET system transition, which means to maintain employment or move to a better job by completing TVET programmes. The first of these transitions emphasises the autonomy of education and training institutions as well as their cooperation with enterprises in order to swiftly respond to rapidly changing trends of technology and industry. In the second transition, participants enroll in the programmes full-time or part-time to improve their job-related skills while they are employed. Education and training institutions also try to accommodate different demands of participants by providing wide choices of programmes and enrolment options.

Future studies need to identify the workforce types that TVET programs aim to supply so that TVET-certified talents can be allocated to the right jobs and positions. Also, studies are needed about how to re-establish TVET systems to make them more relevant and applicable to actual business fields, and to better serve demands of TVET participants. In addition, empirical studies based on accurate data need to be conducted about the influence of TVET on the employment process.

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Chapter 7
TVET Planning and Development

Jeroen Onstenk

Abstract There are changes in society and labour market demands made to TVET and in the TVET system itself. To deal with both types of challenges, the aim for TVET planning and development is to anticipate how employment will evolve and to determine how to give individuals a knowledge base that will enable them to adapt to the changing demands and benefit from the mobility. Major research areas connected to relevant problem areas in the TVET planning and development process can be constituted by analysis of labour market developments and changes in learning contents, new insights into the development of skills, competences and expertise, integration of learning places in school and workplace, professional development of VET teachers and trainers and VET and organisational development in organisations.

7.1 New Challenges for TVET Planning and Development

Technical and vocational education and training are important because a country cannot achieve economic and social development without a skilled, productive labour force that can meet the changing requirements of its environment (OECD 2010). It is also important because it can offer better educational choices and pathways for disadvantaged youth. TVET planning and development is, therefore, an important field of research. It is a complicated topic because of the great variety of occupations, economic sectors and changing economic and labour market contexts. Another complicating factor is the complexity of TVET educational system characteristics and the great number of stakeholders with different interests.

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As a general observation, it could be stated that relevant concepts, approaches and research issues since the 1990s have been changing in response to changes in societal and labour market demands made to TVET as well as in the TVET system itself. Interestingly, comparable changes seem to occur across the globe in very different economical and societal systems.

These changes could be summarised as a multi-level transformation process of manpower demand driven, reactive and reproduction-oriented VET planning and curriculum design towards more open, dynamic, shaping and career-oriented approaches of organisational as well as professional development in flexible VET systems (Nijhof et al. 2002; OECD 2010). This transformation is prompted by changes in technology and organisation of work, resulting in growing demands on work-content-related knowledge and competences as well as work process knowledge, key qualifications or core skills (Boreham et al. 2002; Zhao et al. 2011). Also, TVET systems have to respond to changes in the economic structure, i.e. the rise of employment in services compared to industry or the development of new inter-relationships between industry and agriculture.

But there are also important changes in the development of the educational system itself. The number of students as well as the length of time they stay in some sort of education have grown considerably during the last twenty years. Further growth is to be expected, especially in rising economies in Asia and South America. In many countries, general and vocational education are still separate educational pathways with different esteem. But a typical educational career in many countries now includes both general and intermediate or higher vocational education. The number of students in VET on all levels is growing, maybe with some exception of countries where vocational education traditionally had a strong position, like the dual system in the German-speaking countries. There is, also, in many countries a growth in hybrid qualifications, that is vocational qualifications giving right of entrance to higher education (Deissinger et al. 2013).

Changes in TVET respond to both types of challenges. They include the establishment of new apprenticeships across the globe from Europe to Australia (Rauner and Smith 2010) or sub-Saharan Africa (Atchoarena and Delluc 2001) as well as the rise of school-based vocational trajectories and new TVET pedagogies and training concepts (Onstenk 2001). Also new pathways from vocational to higher education are opened (De Bruijn 2006). TVET is now expected to prepare students for occupational life in the broadest sense, sometimes referred to as employability, rather than preparing them only (or even primarily) for the immediate demands of the labour market at a given point. Also, in many countries, institutional policies have shifted focus from input to outcomes, through new financing and certification mechanisms, involving social partners more in governance, granting more autonomy to educational institutions as well as promoting private providers and company-based training. Policies concentrate on establishing new forms and new structures of regulation providing incentives to employers and individuals for increasing investment in training, and to providers to better match skill needs (Atchoarena and Delluc 2001).

The aim for TVET planning and development, then, becomes, on the one hand, to anticipate how employment will evolve and, on the other, to determine how to give individuals a knowledge base that will enable them to adapt to changing demands and benefit from mobility (Kirsch 2005). This takes the form, for example, of designing frames of reference for VET based on cutting edge, innovative practise rather than on the routine demands typically made by companies. But also research is looking for ways to improve versatility of skilled workers by broadening qualifications and providing them with core competences (Onstenk and Brown 2002).

This transformation process is going on in most developed countries, but gets specific characteristics depending on the presence of an elaborated specific VET system. In countries with no well-established system of vocational education, like the Anglo-Saxon, Southern European or many 'third world' countries, in the strictest sense, there is no or only very limited TVET planning and development on a system level. Nevertheless, questions with regard to the role of education in (re)producing a qualified labour force, or to the relationship between professional and organisational development are becoming more important in all countries as a result of the rediscovery of human capital and competences as an economic asset in the global competitive economy. Increasingly, countries are recognising that good initial vocational education and training, but also secondary and higher vocational education give a major contribution to economic competitiveness (OECD 2010). Many countries recognise the need for change from a low skill to a high skill economy (Brown et al. 2000).

Major research areas are connected to relevant problem areas in the TVET planning and development process:

Analysis of labour market developments and changes in curriculum contents;

- New insights into the development of skills, competences and expertise;
- Integration of learning places in school and workplace;
- Professional development of VET Teachers and Trainers;
- VET and organisational development in organisations.

7.2 Labour Market Developments and Curriculum Content

A first relevant theme, which deals with probably the most important planning question for TVET, is the analysis of changing numbers, pathways and contents of TVET, taking into account labour market developments as well as curriculum changes. TVET systems everywhere are facing challenges to prepare a sufficient number of people with the right skills to meet labour market demands. Matching skills, knowledge and attitudes to the needs of employment is increasingly challenging in the context of globalisation and rapid technological change, resulting in a constant reconfiguration and transformation of occupations.

The analysis as well as the translation into curricula is influenced by the degree in which professional work is organised in occupations with a more or less recognised status in the economic as well as labour relations system. In some countries there is a dominance of strong forms of occupational identity, in other countries this is weakly developed. There can be different labour market systems: (1) internal labour markets systems and (2) occupation-based labour market systems. The systems differ in their relations to the education system. In countries with an internal labour markets system, newcomers to the labour market start their career in low qualified jobs, learning on the job and additional courses will help them to acquire the competences needed for a career. The relation to the education system is rather loose. The United Kingdom, France, Ireland and Belgium are countries with an internal labour markets system. In countries with an occupation-based labour market system (Germany, the Netherlands, Denmark) it is the role of the vocational education system to qualify young people for the labour market.

All TVET systems need mechanisms to make sure that the number of people trained in different occupations matches labour market needs (OECD 2010). A critical issue for TVET planners and managers is how to train individuals for future jobs on the basis of information covering past and present work, enterprises and labour markets. This is a difficult task because of the changes in companies and labour market and because of the problems employers have to determine what kind of skills they will need in a couple of years, and also because VET cannot respond only to employers demands. Publicly funded provision needs to serve the interests of the whole society by balancing student preference and employer demands (OECD 2010).

Student preferences are relevant—if only because of the importance of motivation for study success—but such preferences on their own are usually not enough. A situation where many students choose an attractive, but dead-end qualification, causes both societal problems and personal disappointment.

While employer needs are important, it is not always easy to establish what those needs are, or how they will evolve. Forecasting what kind of jobs will be available in 6–8 years' time (the time that evolves between identifying a new need, designing a course, delivering it and students leaving with a certificate) is extremely difficult in a changing and fluctuating economy. And the same is true for forecasting exact skill demands for jobs in 5 years' time. The speed of change is too high. So, forecasting trends and probabilities becomes important.

There is an elaborated tradition of analysis of occupational profiles and trends as a source for training curricula, curricular frameworks and the related syllabuses for in-company as well as school-based vocational education and training. Profiles are always based on some form of investigation of qualification requirements. All countries with (i.e. Germany, Netherlands or Australia) or without (i.e. USA or England) advanced TVET systems have developed or are developing schemes of qualification research, in connection with introducing or upholding up-to-date qualification frameworks. Vocational certificates or 'qualifications' denote the knowledge, skills and attitudes that are defined as necessary for the performance of a specific set of professional tasks (Rauner 2009). The investigation of

Table 7.1 BIBB model of the development of proposals for training curricula (Benner 1996, 59)

Problem description
– collection of data on technical, economic and social developments
– insights into work and training situations
– formulation of hypotheses:
– work contents and requirements
– necessary skills, knowledge and patterns of behaviour
Case studies/Testing of the hypotheses
– examination of selected workplaces
– recording of the work contents and requirements in breadth and depth
– identification and structuring of skills, knowledge and patterns of behaviour
Task analysis/Representative surveys
– identification of the scope of requirements for areas of activity and occupational fields
– generation of the data basis for the content and structure of training programmes
Evaluation and curriculum development
– selection of training contents
– structuring of training components with regard to content and temporal sequence
– formulation of a proposal for the training regulation with statements on occupational profiles related to: structure, contents, duration, qualification title(s) of the new training programme(s)

qualification requirements represent the objective side of professional skills and knowledge. What underlies a working concept of qualification is the category of the complete professional action: the connection of planning, performing and evaluating professional tasks (Rauner 2009). In countries which use a more technocratic task analysis like the UK, Australia or at some stages the Netherlands, qualifications tend to become too detailed, inflexible and with little educational value (Brown and Onstenk 2002).

Much more than the development of the curriculum in general education, the development and modernisation of occupational profiles and training curricula is considered a prerogative of TVET experts and economic sectors. The public authorities responsible for education and economy usually trust domain experts more than others to have the competence for developing training curricula. Here, a division of labour has emerged between the experts of professional associations or large companies and qualification and curriculum research, according to which the cornerstones for the design of occupations and the basic structures of vocational curricula are defined by the experts of business organisations, whilst the details are delegated to the researchers (Rauner 2009). In many countries, these tasks are exclusively fulfilled by employers experts, without the participation of unions or TVET research. In many new apprenticeship programmes in Australia, United Kingdom or the United States, the contents of apprenticeship programmes are defined by the representatives of the involved enterprises.

At the core of curriculum analysis there are questions of the specificity, the occupation-relatedness and the adequacy of the qualifications to be transferred in the different trades (Table 7.1).

The results of the evaluation are used for improving the implementation of newly regulated occupations, occupational groups and occupational fields as well as for the further development of occupations and professional regulations.

In principle, such frameworks can make VET systems more transparent so that the value of different qualifications can be more clearly recognised by students, employers and other stakeholders (OECD 2010). Implementing a qualifications framework should be seen as part of a wider approach to quality and coherence in VET provision. Qualification typifies the 'labour market' facet of the relationship between training and employment. The term not only carries the notion of 'skills', but also the connotation of something that has been 'negotiated'. In this negotiation there could be confronted the lifetime perspective of a qualification and whether it prepares an individual in the short term for a particular job or also prepares the individual future developments, including possible career development and/or sideways moves into a new occupation.

7.2.1 Hybrid Qualifications

Across the globe more and more students in vocational education now expect to enter tertiary or other postsecondary education (OECD 2010). If the occupation at which a qualification is aimed is defined too narrowly, or the curriculum is too strongly vocational, the qualified worker will not be able to progress within the education system. Conversely, a vocational qualification used to gain access to higher education can lose part of its vocational content and, hence, of its value on the labour market (Méhaut 1997). Of course, this risk is less, if higher education itself becomes more professionally oriented (Zhao et al. 2011).

Qualifications also denote the professional actions as determined by the design and organisation of work (division of labour). An extended concept of qualifications emphasises the ability to reflect and to participate in changing and shaping the conditions of work (Rauner 2009). For the investigation of qualification requirements, this entails the consequence that the characteristic work settings of an occupation have to be examined. Qualification research is directed towards the analysis of professional work organised in occupations and the incorporated competences, the development of occupational profiles and the foundation of educational contents, objectives and structures of vocational education and training with reference to the characteristic work tasks and fields of agency in a particular occupation.

Technological, organisational and economical developments call for an extended concept of qualifications, emphasising the ability to reflect and to participate in shaping the conditions of work as well as one's vocational career. This includes the incorporation of key qualifications and work process knowledge, but can also demand for a redefinition of the concept of occupation itself. These new approaches are also adopted in countries with a more traditional VET system, like China or Korea, to adapt to new demands (Zhao et al. 2011).

7.2.2 From Activities to Competences

Vocational education always needs some form of analysis of incorporated competences, occupational profiles as foundation of educational contents and objectives with reference to the characteristic work tasks and fields of agency in a particular occupation. The central problem of sociological qualification research as it emerged in the 1970s and 1980s as a research area in the sociology of industry and in the 'work and technology' research is the fact that its research findings could contribute to occupation and curriculum development only to a limited extent (Rauner 2009). The analytical quality of sociological research led to a broad, politically oriented discussion on the relationship between rationalisation and the level of qualification requirements imposed on skilled workers. The ethnomethodological 'Studies of Work' developed by Garfinkel attempted to decode the knowledge incorporated in practical professional work. This way a fundamental question was posed for qualification research that the methods of empirical social research were unable to answer (Rauner 2009). A similar situation can be found in expertise research, which can demonstrate the fundamental importance of domain-specific knowledge for the transfer of professional action competences, but which has no methods at its disposal to establish a domain-specific qualification research.

Newer forms of qualification analysis have to be informed by research into expertise development, showing the need for integration and transformation of scientific knowledge into practical knowledge (Rauner 2009). That implies taking into account qualitative changes as well as specific attention for ways to organise and support integration and connections of learning experiences. Curriculum research can no longer be seen as a straightforward translation of occupational practise in educational content. Expertise research, showing the fundamental importance of domain-specific knowledge for the transfer of professional action competences should be related to domain-specific qualification and curriculum research. The international dissemination of the results and methods of qualification research has been made difficult by highly divergent systems of vocational education and training, but can now profit from the growing involvement of vocational education and training in processes of internationalisation. The chances for a dissemination of results and methods in qualification research have become larger. On the other hand, so have the challenges. Analysis has to take into account that employment is divided both horizontally ('families' of occupations) and vertically (in a job hierarchy). New production regimes and broader changes in the economy, influence both demarcations and hence cross traditional barriers between jobs and even economic sectors. In many ways, vocations have either disappeared, or are subject to deep changes with respect to object, methods and social standing.

The international dissemination of the results and methods of qualification research is impeded by a TVET landscape that is shaped by highly divergent systems of vocational education and training. In this respect vocational education is fundamentally different from higher or university education, which is largely represented by international scientific communities. However, since vocational

education and training has by now started to be involved in processes of internationalisation, the chances for a dissemination of results and methods in qualification research have considerably improved (Rauner 2009).

7.3 Competence and Expertise Research

An important reference point for international debates is a common understanding of new insights with regard to competence and expertise research. In the twenty-first century, those entering the labour market need immediate job skills, but they also need a range of career and cognitive competences that will enable them to handle changing jobs and career contexts and to sustain their learning capacity (Onstenk and Brown 2002; OECD 2010).

Röben (2009) discusses the enormous variation in definitions of competence found in the scientific as well as TVET-oriented literature (Onstenk and Brown 2002). The debate on competences is enriched by analysing the already mentioned literature on expertise development. In comparison to a novice, an expert is characterised by a specific quality of his or her knowledge (Benner 1984; Billett 2001).

Very different disciplines and theoretical concepts are used as bases for defining terms such as skills, vocational knowledge, competence or expertise. It should be emphasised that competence does not denote a simple set of skills, knowledge and attitudes connected to specific tasks or circumstances, but should be seen as the capacity of an individual to act effectively in a specific occupational field. Specific attention should be given to the question of knowledge (Young 2007). A quite common method of defining the contents of vocational education and training is a simple and straightforward transformation of codified discipline-specific knowledge generated by the sciences into teaching and learning contents for vocational training. This concept of 'applications' leads to a view of professional knowledge as a hierarchy in which 'general principles' occupy the highest level and 'concrete problem solving' the lowest (Schön 1983). As this method is very common it shall be discussed here although it does not, strictly speaking, belong to the methods of qualification research.

The basic assumption of this research approach is the thesis that social knowledge is generated by the sciences, and that it is available via their textbooks for all types of education and training. However, knowledge is differentiated (Young 2007). A vocational curriculum always has (or should have) dual purposes: providing access to the disciplinary knowledge that has transformed work and acquiring job-specific skills and knowledge. The former purpose relies on context-independent knowledge, whereas the latter will be context-specific, or related to specific workplaces.

The key curriculum and pedagogic issues can be expressed as 'double' or 'dual re-contextualization' (Young 2007). This term refers to two processes. One is the professional or vocational re-contextualisation of disciplinary knowledge for

occupationally specific purposes; examples are physics for physiotherapy or for engineering and is undertaken by the respective professions involved. The second process is the pedagogic re-contextualisation of professional knowledge for pedagogic purposes. This refers to the sequencing and pacing of professional knowledge for different groups and levels of learners and enabling them to integrate this knowledge in the context of specific workplaces; an example is the different curricula appropriate for nursing assistants and graduate nurses. Both these processes are deeply under researched in comparison to the parallel process of recontextualising disciplinary knowledge for pedagogic purposes within the general or academic curriculum (Young 2007).

Practical knowledge as it appears everywhere in professional work is interpreted in this perspective as being applied scientific knowledge. The knowledge-based approach recognises the crucial role of science in a vocational curriculum geared to the new science-based industries but often fails to consider how this new knowledge could be re-contextualised in the workplace (Rauner 2009; Young 2007; Billett 2001). The detailed task analysis or the UK standards-based approach tries to relate vocational knowledge to workplace practise by claiming to be able to derive it from outcomes-based analyses of different occupational roles. However, this not only failed to lead to a practical methodology; it neglected the extent to which only some of the knowledge relevant to particular workplaces has its origins beyond those workplaces (Young 2007). The TVET challenge is making connections between the codified knowledge of the college-based curriculum and the tacit and often uncodifiable knowledge that is acquired in workplaces that is the basis for what is distinctive about vocational knowledge.

This widespread common sense theory that has always shaped the attitude and conduct of TVET teachers and TVET planners has engendered manifold methods and rules which seek to transform theoretical knowledge into the language of users in the domains of work, to exemplify it with reference to specific contexts, and above all to transfer this knowledge by means of inductive learning methods such as action-oriented learning. ‘Pure mathematics’ thus becomes, in the world of vocational education and training, disciplinary and occupation-specific ‘applied’ or ‘professional’ mathematics. Technical matters in the vocational domains of construction, mechanical engineering, computer science and electrical engineering are interpreted and presented as applied sciences. The fact that technology springs from an inextricable relationship between what is socially desirable and what is technically possible so that technology is essentially a reification of societal ends escapes from attention in this perspective (Rauner 2009).

Distinctions have to be made between types of theoretical knowledge and types of everyday knowledge as well as the problems of bridging the gap between them through the process of re-contextualization. By treating all knowledge as potentially explicit and vertical, the standards-based approach fails to recognise the fundamental differences between theoretical and everyday or workplace knowledge. As a result, vocational programmes that rely on the standards-based approach deny learners access to the rules governing the production of knowledge by the scientific and professional communities. Greater clarity about what

knowledge is to be acquired by students on vocational programmes is crucial to wider debates about more effective vocational education and any possibilities of a move towards parity of esteem with general education.

In this respect, fundamental importance is attributed to the novice–expert paradigm (Dreyfus and Dreyfus 1986). This can be used to develop quite another procedure for the identification of paradigmatic work situations for vocational training (Benner 1984; Brown and Onstenk 2002).

Competence is complex and can only be revealed with relatively great effort. Mansfield and Mitchell (1996) distinguish four dimensions: task, task management, contingency management and dealing with the work environment. The last two dimensions are also covered under the concept of work process knowledge. Competence to act can be seen as the willingness and ability of the individual to act in an appropriately thought-out as well as individually and socially responsible manner in a range of specific occupational, social and private situations. Giving more emphasis on responsible problem solving competences rather than routine skills is not only characteristic for western countries, but is also seen in Chinese and other developing economies (Zhao et al. 2011), marking a decisive step in the change from a low-skill to a high-skill economy.

Competence is a multidimensional concept, including specific vocational knowledge and skills as well as work-process knowledge (Boreham et al. 2002). For example, in the Netherlands a concept of core competencies was introduced in defining qualifications as 'an individual's abilities to tackle occupational core problems in an adequate way'. Each qualification should encompass four subtypes of competencies:

- Professional/ craftsmanship and methodical competencies;
- Managerial/ organisational and strategic competencies;
- Social-communicative and normative-cultural competencies;
- Learning and shaping competencies (Onstenk and Brown 2002).

All subtypes include combinations of knowledge (theoretical as well as practical or tacit), skill, attitudes and even personality traits. Multidimensionality is characteristic for the competence concept, as compared to concepts like skill or ability.

In order to enable the VET system to deliver qualified students with these competencies, not only traditional qualifications should change (i.e. pay more attention to broad occupational fields than to specific occupations, cf. Rauner and Bremer 2001), but also the curricula preparing students to meet qualifications. In adopting the concept of competence-based education, VET should prepare its students to become a complete 'professional', not only mastering the skill side of an occupation, but also familiarity with the social-dynamic and cultural aspects of an occupation. From this viewpoint, the responsibility of VET is to guide its students in developing an occupational identity. Identity learning should be the essence of competence-based VET. That implies a focus on the internalisation of the 'habitus' of occupational practise, that is, the ever-changing configuration of

interpretations individuals attach to themselves, as related to the activities they participate in Geijsel and Meijers (2005).

7.4 Learning Places

The complexity of competence development as well as the close relationship to developing vocational practise necessitates the integration of different dimensions of vocational knowledge: codified and theoretical as well as tacit and practical (Young 2007).

Going from content to delivery, an important defining characteristic of vocational education in almost all countries is the existence of different learning places contributing to vocational development. Sometimes these are part of the same system (as in dual systems), sometimes they are sequential steps, as a process of more or less organised inclusion (practical, work-based learning) after a school-based trajectory of theoretical learning. This makes the connection of learning experiences in different learning places a crucial aspect in TVET planning and development (Guile and Griffiths 2001, 2003; Rauner and Smith 2010). Research on connections between different learning sites, processes and results is therefore an important aspect of VET planning and development. This implies cooperation between learning venues: collaboration of teaching and training staff at learning venues involved in vocational education and training in technological, organisational and educational terms (Walden 2009) The ongoing trend towards a pluralisation of vocational training is shifting the balance between individual learning venues.

In some countries, the importance of independent vocational school-based systems is strengthened (Walden 2009). This is likely to tend to increase further the significance of issues of cooperation for good training. Vocational education and training research needs to observe these developments and evolve solutions for any problems which arise. In countries without a formal apprenticeship tradition, on the other hand, this could include an opening up of public TVET institutions to the informal sector of small artisan micro-enterprises, which if done with care, is likely to produce positive indirect effects on initial training. Originally modelled on the school system, TVE has often not taken into account traditional apprenticeship—in spite of the importance of this sector for the economy, as well as for employment—and the need to improve it (Atchoarena and Delluc 2001). This underlines the importance of the development of regional TVET networks of schools, training authorities and small as well as large enterprises. Especially interesting is the development of training alliances between individual companies and schools (Walden 2009).

Walden (2009) sees cooperation as an overarching topic and relevant to a wide range of issues relating to vocational training. He identifies, based on the German discussion, a range of thematic aspects which have wider relevance for other countries. A first one has to do with basic theoretical principles of cooperation.

The necessity of cooperation between learning venues, the tasks assigned to the process and the extent, content and form of the cooperation are identified within the scope of vocational education and training research. There is, however, no comprehensive and consistent theory relating to cooperation between learning venues.

A second theme is research into cooperation in practise. Vocational education and training research carries out studies into the existing range of cooperation between learning venues, analyses the relevant factors influencing this cooperation and considers the issue of the effects of these cooperative activities on vocational training. This research focuses equally on identifying the differences between various areas of vocational training, determining the significance of varying initial conditions and approaches and the individual analysis of selected fields of vocational training.

A third theme deals with the extension of cooperation. Normative ideas and practical findings emerging from cooperation projects, or deficits identified in the course of the latter, form the investigative basis of possible extension and improvement of cooperation. This process also includes the development of concrete proposals for the creation of appropriate terms of reference for an improved level of cooperation in practise.

A fourth theme is the development of practise-related models. Vocational education and training research ultimately develops practise-related models to produce a good level of cooperation. This process involves the consideration of the specific conditions prevailing within the various areas of vocational training.

New combinations of learning venues which are developed (such as between specialised vocational schools and companies) should become a greater focus of research. This process needs to involve close dialogue with vocational education and training practise and policymakers. Alongside such specific research into cooperation, a further task will be the integration of cooperative aspects into the treatment of various research issues within vocational training. Cooperation is an overarching topic and relevant to a wide range of issues relating to vocational training.

Cooperation and connection between learning sites has to include mutual references between theoretical and practical knowledge acquisition, construction and development, without reducing or subjecting one learning process to the other. This implies practical collaboration of teaching and training staff at different learning venues involved in vocational education and training in technological, organisational and educational terms. Research into cooperation between learning venues frequently focuses on the relationships between quite specific places of learning, such as companies and vocational schools or vocational schools and inter-company training centres. Alongside the analysis of the forms of cooperation practised, considerable significance should be attached to the development of approaches for extending cooperation and of suitable practise-related cooperation models. There is a growing amount of research on improving the quality in terms of content and guidance of work-based learning, as well as strengthening connections between school and work-based learning.

In most countries, vocational training systems are becoming more important as well as more mixed (Brown et al. 2000). Traditional barriers between vocational and general or academic education erode, sometimes by making general education more vocational (as for example, in very different ways, in England or France), sometimes by making vocational education more general (as for example, in the Netherlands). In countries with a traditional strong dual system there is a strengthening of independent specialised vocational school-based systems, creating competition for the apprenticeship system of training. In countries with a traditional strong school system, new forms of apprenticeship are promoted. This implies an even bigger need for cooperation in order to deliver theoretically sound and practically relevant training. New combinations of learning venues (such as between specialised vocational schools and companies) should become a greater focus of research.

In the field of cooperation between learning venues, the aim of bringing about improvement in practise is also very closely linked to measures taken by those responsible for vocational education and training policy. This means that, as far as further extension of cooperative approaches in vocational training is concerned, there are fewer deficiencies in terms of academic findings than there are in relation to implementation (Walden 2009). Without suitable initiatives on the part of those bodies responsible for vocational education and training policy, it is not likely that there will be any clear progress in the area of cooperation, at least not in broad-based terms. The extent to which cooperation between learning venues and raining partnerships continue to form the subject of vocational education and training research (as they must) depends, therefore, on future developments in vocational training policy (Walden 2009).

7.5 VET Teachers and Trainers

The variety of vocational curricula, demands on expertise development as well as work-process knowledge make professional development of VET teachers and trainers an essential problem in VET planning and development. The key element in good vocational education is good teachers. As the current workforce ages, many countries are facing a shortage of teachers and trainers in VET institutions. Some teachers and trainers also lack recent workplace experience. Flexible pathways of recruitment should be encouraged and designed to facilitate the entry of those with industry skills into the workforce of VET institutions (OECD 2010).

Growing demands on quality and quantity of VET in most countries make research into expected competencies and training of VET teachers a hot issue. In many countries in Europe or elsewhere, TVET reform has meant that many professional educators do not (or no longer) have the official required qualifications (Cort et al. 2004). Professional development of VET teachers is lagging behind (Attwell and Brown 1999). While focussing on the German situation with its distinction between vocational teachers in vocational schools and trainers in

companies, Bauer and Grollmann (2006) analyse some important issues of broader relevance. The need for professional development is augmented by the growing diversification in vocational students (i.e. immigrants) as well as declared European policy objectives (Lisbon 2000 and beyond) aiming for rising enrolment in higher education, which put higher demands on professional and academic accomplishments in VET. There are a great number of deficits and problems with regard to vocational teacher training and professional development. Themes with respect to the relationship between vocational and pedagogical knowledge and expertise are relevant in all countries. New insights into learning and expertise development require a more sophisticated and varied repertoire in didactic and pedagogical methods, tools and practises. Vocational teachers are either trained and experienced professionals in their vocation or trained in general subjects such as mathematics, language or history. In the first case, especially in vocational schools, becoming a teacher implies the risk of not remaining up to date with respect to technological, methodical or organisational changes in vocational practise. In the second case, they often have no familiarity with the vocation, and so have difficulty in connecting general subjects to vocational issues.

Coming from a professional background, many vocational teachers and trainers lack proper pedagogical and didactical training, but even if they get any, questions can be raised with regard to quality and effectiveness. In most countries there is no tradition of vocational pedagogies. And if there is, actual training practises vary considerably in taking into account new insights into learning theory (i.e. cognitive, constructivist and situated approaches). The need for combining research into new didactic and pedagogical designs with research into professional development of teacher and trainers should be stressed (Onstenk and Brown 2002).

7.6 VET and Organisational Development

Research on VET planning and development has a double relationship with the economy and labour market. On one level it has to deal with demands with respect to competences and qualifications of the labour force. On another level it contributes to economic and organisation development by identifying specific sets of expertise and by developing learning and shaping competences. The existence of an elaborated system of high quality (and high level) vocational education is important in striving for an innovative high skills economy (Brown et al. 2000). Dybowski and Dietzen (2009) deal with this relationship by analysing innovative and dynamic VET as a strategic resource for innovation, both on the level of the economy as a whole and on the level of companies. This discussion is going on in all countries, with or without an established VET system. The chapter gives some lessons from Germany with regard to the role of the so-called vocational principle (Beruflichkeit), which traditionally characterised VET. Reported research findings confirm the hypothesis that ‘new professionalism’ (neue Fachlichkeit) is emerging (Onstenk and Brown 2002). As work-based learning is an important,

necessary—and in most countries— a growing part of VET (Raizen 1994), an enduring system of competence development can only be achieved if there are accompanying changes in organisational structures: development of appropriate structures for cooperation and communication in companies, strategic alignment of management personnel, creation of clear recognition and reward structures and promotion and development of working environments that foster learning (Nyhan 2002). On the other hand, competence development can be seen as a basic prerequisite of any technological, methodical or organisational innovation in the company, as it ensures that the workforce is equipped with the necessary capabilities to support such a transformation. As individuals, workers will need more work process knowledge and reflective abilities like 'organisational awareness', 'participation in processes of change' and the ability to 'define their own role'. They need this to negotiate the compatibility of their personal interests and career development with their occupational practise and the interests of the company.

The conclusion that elements of occupation-specific, process and social competence should increasingly be treated as an integrated whole is important for all countries. The analysis of content and relative importance of different components of occupational competence within the framework of existing and emerging occupational profiles is an important challenge for research in the area of VET planning and development. Mutual relationships between VET, skills development and organisational development should be centre stage in this research. This implies cooperation and communication between different and in many respect separated fields of research, i.e. management, learning organisation and organisational development, qualification research, expertise and competence development research and career research.

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Chapter 8
The Benefits, Costs, and Financing of Technical and Vocational Education and Training

Robert I. Lerman

Abstract The TVET is particularly an innovative application field of educational economic "Costs-Benefit-Quality"-research. This chapter gives an overview of the accumulating empirical evidence on the benefits, costs, and financing of selected TVET programs. Before examining the findings of individual studies, the author considers the context for studying TVET. The first step is to ask, what are the reasons for conducting researches on TVET's benefits, costs, and financing? Then he discusses frameworks for thinking about TVET and the methodologies for estimating TVET's costs and benefits. Finally, he turns to a review of studies of TVET costs and benefits from the perspectives of workers, employers, taxpayers, and the broader public. The research spans several countries and a variety of TVET systems and programs. The final sections summarize the findings and consider implications for policy.

8.1 Introduction

Human resources are central to the performance of every economy. Although reading, writing, and math skills are critical components of human capital, so too are competence and mastery in occupational skills and such noncognitive skills as listening, communication, problem-solving, and dealing well with superiors and peers. All advanced economies rely on universal primary education to teach verbal and math literacy. But, they differ in how they expect people to learn and use occupational and other workplace skills. Technical and Vocational Education and Training (TVET) plays a central role in occupational training in nearly all countries, but the governance, timing, delivery, location, and experience of TVET

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varies widely across and often within countries (OECD 2009). In some countries, the government dominates TVET, while others involve private employers extensively. TVET begins by age 14 in some countries and not until a student's early 20s in other countries. Most TVET programs focus on initial vocational education (IVET), but some include continuing vocational education (CVET) for upgrading the skills of workers already in an occupation (Cedefop 2011). The duration of TVET programs ranges from less than 1 year to over 4 years. Training systems vary in their use of work-based relative to classroom-based learning. The range of occupations within the scope of TVET varies widely as well, especially in such white collar fields as computer networking, banking, and commerce. Finally, the scale of TVET varies widely as well, with some countries relying almost exclusively on academic subjects, leaving occupational and firm-based training entirely to employers.

Given the diversity of skill development systems, no one approach or set of estimates can fully capture the costs, benefits, and financing of TVET (Hoeckel 2008). However, an expanding literature is increasingly able to document the nature and financing of TVET systems and to assess the economic returns to TVET programs. The main purpose of this chapter is to review the accumulating empirical evidence on the costs, benefits, and financing of selected TVET programs.

Before examining the findings of individual studies, this chapter considers the context for studying TVET. The first step is to ask, why conduct this study? What goals can good information about TVET's benefits, costs, and financing help address? Next, we discuss the various frameworks for thinking about TVET and the methodologies for estimating TVET's costs and benefits. We then turn to a review of studies of TVET costs and benefits from the perspectives of workers, employers, taxpayers, and the broader public. The research spans several countries and a variety of TVET systems and programs. In general, the studies examine the impact of TVET by itself but not in comparison with alternative ways of financing and delivering occupational skills. The final sections summarize the findings and consider implications for policy.

8.2 Why Study the Net Benefits of TVET Systems?

Formal education and training for most occupations began to develop only in the late nineteenth and early twentieth centuries. Until then, individuals developed occupational skills by a process of learning by doing, sometimes informally and sometimes through structured apprenticeships. Today, the government plays a central role in skill development, not only by financing and delivering universal general education but also in providing resources for teaching occupational skills. In a free society, we count on employers and workers to decide on their investments in vocational training based on their own cost and benefit calculations. Firms may worry about the "poaching" problem, whereby one firm invests in

training a worker only to find that another firm hires the worker after the training and thereby prevents the training firm from recouping their investments. The potential losses represent risks to the firm that must be considered before making a training investment. Workers may have to bear the costs of lost earnings and/or tuition in return for higher wages in the future. Although workers may rationally expect earnings gains from various types of TVET investments, they also face risks that the specific TVET they received will yield few gains because, for example, of changing market conditions. Still, as in other areas of economic life, we rely on the judgments of the parties directly affected to make decisions in their best interests. Because those making the investments have the most at stake in considering costs and benefits, policymakers should attach a high weight to their calculations.

Yet, even though markets play a central role in determining the size and composition of human capital investments, there are several justifications for providing government support for education and training. A common rationale is externalities. When a firm trains workers in general or in occupational skills, the costs are borne by the workers and firms, but the training may yield positive externalities to nearly all firms that use workers with general skills and to selected industries that use workers with the same occupational training.

Another critical rationale for estimating TVET costs and benefits is incomplete information. The government is better positioned to conduct long-term research on the costs and benefits of education and training. Research findings on the net benefits of TVET by occupation are a public good that is likely to be undersupplied if left to the market. Individuals making judgments about careers and employers deciding about long-term training needs can benefit from good information but have no incentive to conduct the research on their own. In particular, lack of knowledge about education and training systems can cause workers, firms, and governments to choose inefficient approaches to human capital development.

Credit constraints and distributional concerns provide additional arguments for subsidizing vocational education. Some young people may be unable to afford to forego earnings or to take very low wages because of family obligations. Though they could raise their earnings through TVET, they may be unable to borrow to invest in their human capital. The distributional case for supporting TVET is that most countries heavily subsidize college and university education, despite the fact that college and university students are likely to experience the highest incomes in their cohorts. Without any significant support for TVET, government funding for human capital investments would become regressive.

Notwithstanding these and other reasons for government support for TVET, the scale and method of support should depend on the size of TVET's social costs and benefits. By social costs, I mean the resources used up in the delivery of vocational education, including the time of teachers, classroom space, and the time of workplace mentors. By social benefits, I mean the resources gained, which can be added production during the training period, but more importantly are the increased productivity and earnings induced by the TVET activities. Other potential benefits are more difficult to measure; these include a rise in innovation

and the profitability of enterprises, improvements in job matching and job satisfaction, improved health and citizen participation, and, as youth unemployment diminishes, reductions in crime and anti-social behavior. Reductions in social welfare payments to the unemployed are sometimes viewed as a benefit to taxpayers offset by the costs to individuals. However, the structure of social welfare benefits and the taxes required to pay for them generate economic costs by distorting the choices of recipients and taxpayers.

A major rationale for studying TVET costs and benefits concerns decisions about which type of TVET system to subsidize or whether to offer any subsidies at all. Some TVET systems emphasize a dual approach combining school-based and employer-based learning. At the upper secondary level, Switzerland, Germany, and Denmark involve the highest share of students in dual programs (OECD 2009). Others rely almost entirely on school-based TVET; over 50 % of upper secondary students in Belgium and Sweden are in school-based vocational and technical programs. Governments typically apply the highest subsidies to school-based vocational education, relying on employers to pay all or nearly all of the costs of on-the-job training.

Costs and benefits are relevant to the issue of funding any publicly sponsored TVET system. Taking issue with the TVET enterprise in general, some researchers and policymakers believe that public money should finance only general education and leave the development of occupational and firm-based skills to enterprises. The latest example comes from Hanushek et al. (2011b). They argue that:

> The EU perspective on VET is particularly interesting given the suggestion by Krueger and Kumar (2004) that the slower long-term growth of European economies compared to the US may, in fact, be the result of Europe's greater reliance on vocational education as opposed to more general education. Firms would be slower to adopt new technologies when it is more costly because their workers with more vocational education are less able to use them.

Given the contested role of TVET and the varying approaches to TVET, well-developed micro and macro analyses of TVET's net benefits are crucial and are likely to become increasingly influential in policymaking. More broadly, improved understanding of TVET's impacts is critical to the development of human capital, of rewarding careers, and of economic growth.

8.3 Complexities Arising in Estimating TVET Costs and Benefits

TVET represents an educational process that—in addition to general education—covers the study of technologies and related sciences and the acquisition of practical skills, attitudes, understanding, and knowledge relating to occupations in various sectors of economic life. From this perspective, TVET systems can encompass education and training in medicine, law, accounting, and architecture

as well as in machining, welding, plumbing, and electrical installation. While a broad definition makes sense, the concept of TVET held by employers, workers, policymakers, and the public is in fact specific to individual countries. Learning occupational skills takes place more or less formally, depending on the scope of each country's TVET system.

Given the diversity of TVET systems and programs, how can one develop accurate estimates of TVET costs and benefits? The estimates can answer narrow or broad questions. At the micro level, one can ask: what are the rates of return to participating in, and to completing various TVET programs? What are the costs and benefits to workers from taking and completing apprenticeship programs in specific occupations? What are the gains and losses for employers resulting from various types of TVET programs, including apprenticeship but also school-based programs? What costs and benefits do governments (taxpayers) bear in the context of various TVET programs?

The broader questions concern the macro economy. How does the scale and composition of TVET affect youth unemployment, wage inequality, economic opportunity and mobility, international competitiveness, innovation, and economic performance? From an economist's viewpoint, the micro issues involve marginal effects in single markets (or partial equilibrium) while the macro issues involve all markets taken together. Because of the importance of interactions among parties and markets and of expectations of workers and employers, answering the macro questions is quite difficult. One approach to determining system-wide effectiveness is to examine the experiences of countries with varying systems. For example, Germany and Switzerland—two countries with large dual TVET systems—have far lower youth unemployment rates than countries with small or school-based TVET systems. However, while we can observe both the dual systems and the low youth unemployment rates, it is far more difficult to prove causation, since other factors may be the real causes of low youth unemployment.

This chapter deals mainly with the micro studies of costs and benefits, with the marginal costs and the causal impacts of individual programs on workers, firms, and taxpayers. For school-based programs, the benefit estimates depend largely on what happens to students over their careers. Usually, analysts project how the lifetime earnings profile changes with additional education (in this case TVET) and then calculate the discounted present value of the differences in earnings over time. The costs of school-based programs are mainly the foregone earnings of students plus the outlays on teachers, classrooms, materials, and the annual use of equipment. Empirical studies of school-based TVET programs rarely examine the impacts on employers, despite frequent concerns expressed by employers about the availability of skilled workers, often even in recessions. For apprenticeships and other work-based TVET, studies examine both the impacts on workers as well as on employers. A major focus on employers is natural, given that employers bear most of the costs and make the decisions about the number and composition of apprenticeship opportunities.

Conceptual and practical issues arise in trying to estimate TVET costs and benefits. The first involves recognizing the wide variation in the structure and

breadth of TVET. The term encompasses school-based learning at the secondary and the postsecondary levels, varying amounts of work-based learning (from a few days or weeks to several years), and heterogeneity in general versus occupation-specific training and in the nature of career focus. In fact, the variety is so wide that many studies focus on a few types of TVET and/or a few occupations. This approach provides more refined estimates but makes generalizations difficult.

A second issue is defining the counterfactual, or what would have taken place in the absence of vocational education. Answering this question rigorously is difficult. In the absence of TVET, would the government have supplied purely academic education or would most TVET participants have entered the labor force with little or no vocational education or training? Comparing students or workers who go through a TVET program to those who do not is subject to the selection problem. Even if the comparisons are between TVET participants and nonparticipants with the same observed characteristics, there may be unobserved factors, such as the motivation to work or the desire to avoid an academic-only program, that affect entry into TVET and post-TVET earnings. One solution, used in evaluations of US job-training programs, is to use a social experiment in which applicants are randomly assigned to treatment groups with access to TVET or control groups with no access. Unfortunately experiments are expensive, take a long time, and typically provide no evidence on employer impacts. On the other hand, it is difficult to determine whether the outcomes for a comparison group accurately represent what would have happened to TVET participants had they not been exposed to TVET.

Another issue is that TVET programs, including apprenticeship, may work well for some occupations but not others. Generalizing in these contexts is difficult. A fundamental problem is the ex-post character of cost-benefit studies. They show the impact of past programs on past earnings and productivity gains. The results do not necessarily generalize for future time periods or different economic environments. A related issue involves the timing of studies. Learning about the effectiveness of TVET for today's cohort may require waiting 5, 10, or even 30 years. By that time, policymakers will often have made their decisions. Hanushek et al. (2011a, b) argue that the benefits of intensive TVET erode over time and that workers with TVET experience have lower employment levels after age 55 than workers with general education and similar test scores on reading and math. As Heise and Meyer (2004) put it, "…people belonging to different generations or birth cohorts are exposed to very disparate chances and risks regarding their education, training and working career and therefore receive a very different quantity and quality of education and training benefits."

Still another issue is risk and uncertainty. Typically, investments in TVET are at least somewhat irreversible, particularly in terms of foregone earnings and tuition and related expenses. (You cannot resell your time or your seat in the classroom last semester.) This irreversibility, combined with uncertainty about earnings outcomes from training, has implications for how to evaluate the returns to investing in TVET by the worker and by the employer (Jacobs 2007). In particular, the standard present value calculations do not necessarily serve as a

guide to the decision to invest in TVET. Instead, in an investment decision under uncertainty and irreversibility, you should take into account the option to postpone the TVET investment. As Jacobs notes, the ability to enter TVET at any point is similar to a financial call option. The student has the right but not the obligation to invest in human capital at some future date. When the student decides to enroll immediately, he exercises his option to buy the human capital asset and gives up the opportunity to wait and see when new information about the future investment returns become available. For potential TVET students, especially those in school-based programs, the option value approach makes individuals more reluctant to invest and thus raises the required expected returns. The reason is that the option to wait has value. By investing now, you give up something of value. Because the irreversible costs in foregone earnings and tuition are far less for those entering apprenticeships than for those entering school-based TVET, the option value and required returns are lower and thus more attractive.

Risk and uncertainty apply to the issue of general education versus vocational education. From one perspective, general education offers students more options by allowing occupational choices to take place later, after more information becomes available. On the other hand, students may be able to build on the skills acquired through TVET to reach higher levels in a wide range of occupations.

Real options are also relevant to evaluating investments by employers in training. Leuven and Oosterbeek (2001) consider firm-specific investments in on-the-job training. Given uncertainty about the productivity returns from irreversible investments in particular workers, the firm's investment creates a real option. When the training is completed, the firm has the option but not the obligation to hire the trained worker. This option value raises the firm's returns and increases the likelihood that they will invest in training.

Finally, several noneconomic outcomes are difficult to quantify but do show some association with VET. One analysis (CEDEFOP) found that TVET experience is linked to higher confidence and self-esteem, improved health, higher citizen participation, and higher job satisfaction. These relationships hold even after controlling for income. Other studies have indicated that TVET improves youth development (Halpern 2009) and vocational identity (Brown et al. 2007), but it is difficult to quantify the economic value of these social benefits.

8.4 Empirical Estimates of Costs and Benefits

Notwithstanding the difficulties in producing rigorous estimates, a vast literature has generated a range of estimates of components of benefits and costs of TVET. The findings cover both school-based and dual (school and work-based) TVET and deal mainly with impacts on students and impacts on employers in a number of countries. Sometimes, costs and benefits to the government are taken into account. The studies vary widely in the level of detail (a specific occupation, firm, industry, or country), the education level (secondary or post-secondary), and coverage

(inclusion of both costs and benefits to various groups). This review offers a selective review of estimates of impacts, with an emphasis on recent studies.

8.4.1 Costs and Benefits for Students and Workers

Several broad reviews of TVET have appeared in the last decade. The OECD's Learning for Jobs (2009) provides an overview of vocational education systems in 17 countries, but cites only a few studies dealing with benefits and costs of TVET. The OECD's Off to a Good Start: Jobs for Youth (2010) highlights the role of vocational education, especially apprenticeships, in smoothing the transition from school to work and in maintaining low youth unemployment. Research on rates of return to TVET programs in individual countries is common as well, such as in Australia, Austria, Germany, Switzerland, and the U.S. The recent contribution by Hanushek et al. (2011a) is an ambitious attempt to develop estimates of the returns to vocational education across 18 countries.

Most studies find that vocational education yields significant gains for young workers. In the U.S., the comprehensive National Assessment of Vocational Education (2004) reported that:

> Recent studies indicate a positive average effect of vocational education on annual earnings, measured just over a year or several years after high school graduation. Seven years after graduation, for example, students earned almost 2 percent (about $450) more for each additional high school vocational course they took, or just over $1,350 more for occupational concentrators. These benefits appear to extend to students who go to college, to those who have economic and educational disadvantages, to those with disabilities, and to both men and women; studies differ over whether there are earnings advantages for students who never attend college, an increasingly small group.

In another analysis, Meer (2007) finds that students choosing a technical vocational track in U.S. secondary schools earned significantly more than they would have earned had they chosen a general or academic track. On the other hand, students actually choosing academic tracks earned more than they would have had they chosen a vocational track. Thus, Meer shows that the diversity of tracks reflects the diversity of students: forcing a student choosing a technical vocational track into an academic track would worsen his or her outcomes in the job market. Other studies indicate that vocational education increases the rate at which students graduate from secondary school (Arum 1998; Bishop).

Another approach to TVET in the U.S. is Career Academies, or high schools organized around an occupational or industry focus, such as health care, finance, and tourism. They operate within regular high schools and try to weave related occupational or industrial themes into a college preparatory curriculum, using applied learning in academic courses as well as career-focused courses. The role of work-based learning varies, however, and long-term internships are not always a part of the student's experience. An experimental evaluation randomly assigned students applying for career academies into a treatment group with access to career

academies and a control group excluded from the academies. This approach yields highly reliable estimates of impacts. Career academies induced striking gains in earnings. In the period between 4 and 8 years after applying for the academies, young men in the treatment group were earning 17 % more than those in the control group (Kemple and Willner 2008). The gains were especially high among minority young men. Moreover, the longevity of the gains is by the fact that the treatment group reported a significantly higher likelihood of promotion than controls.

School-based postsecondary vocational education in the U.S. takes place mainly in public community colleges and private (often for-profit) 1- and 2-year colleges. A 2002 review by Grubb found an extensive set of estimates showing good returns to completing a vocational program within public, 2-year colleges. A recent study by Cellini and Chaudhary (2012) finds earnings gains of about 20 % from completing a 2-year degree in an occupational course, with similar impacts from public as well as from private, for-profit colleges.

One U.S. study examined the government costs as well as the worker and government benefits of three types of TVET—secondary vocational education, postsecondary vocational education (in community colleges), and apprenticeship programs—taking place in the State of Washington. Hollenbeck (2008) compared the earnings of secondary TVET students with earnings of all high school graduates. For workers with postsecondary TVET and apprenticeships, he used groups that entered employment offices and who had the same preprogram earnings. The earnings increase over the first 2.5 years after program exit exceeds the government and worker costs substantially for apprenticeships and secondary TVET. For postsecondary TVET, the results show costs approximately equaling benefits after 2.5 years but solid 7–9 % rates of return when net gains projected on a lifetime basis. Absolute and relative gains in earnings from apprenticeship are highest, reaching about $2,000 per month compared to only about $1,500 per month among those participating in occupational programs in 2-year colleges. When projected for a career, Hollenbeck's estimates of the benefits far outweigh the costs for all the TVET programs. By far the largest gains are for apprenticeship. Missing from the analysis is any assessment of employer costs. The implicit assumption is that employers gain sufficient benefits from sponsoring apprenticeships to offset their costs.

A broad study of apprenticeship in 10 U.S. states also documents large and statistically significant earnings gains from participating in apprenticeship (Reed 2011). It estimates how the length of participation in an apprenticeship affected earnings, holding constant for pre-enrollment earnings of apprenticeship participants. Using this "dosage" model, the author obtains estimates of what the level of earnings would be for comparable workers who did not participate in apprenticeship at all. The estimated impacts are consistently and highly positive. At 6 years after starting a program, earnings of the average apprenticeship participant (average duration in an apprenticeship) stood at 1.4 times the earnings of nonparticipants with the same pre-apprenticeship history. The gains were highly consistent across states although the earnings advantages narrowed between the

6th and 9th year after program entry. On the cost side, the study takes account only of government costs—both administrative and oversight costs as well as the costs of government-funded classroom instruction. Costs to employer and union-management sponsors of apprenticeship are not examined. Overall, the study finds that apprenticeship returns nearly $28 in benefits for every dollar of government and worker costs. The net dollar gains projected over a worker's career amounted to about $125,000.

Many studies have examined the earnings gains from apprenticeship training in European countries. They generally find high rates of returns to the workers, often in the range of 15 % (Krueger and Pischke 1995; Winkelmann 1996; and Fersterer and Winter-Ebner 2008). On the other hand, some cast doubt on high returns to apprenticeship training, arguing that German apprentices have similar wage profiles to U.S. high school graduates without occupational training. Unfortunately, few studies are able to isolate the net impact of apprenticeship rigorously. They are generally unable to account for a major concern of existing studies—the role of selection bias that results from the employer's selection of young workers who are more capable than their counterparts in ways that the analyst cannot observe. Unobserved heterogeneity can cause researchers to make comparisons between apprentices and nonapprentices that do not fully reflect the higher (or lower) capabilities of those entering apprenticeships.

One recent study of the returns to apprenticeship training in small Austria firms (Fersterer et al. 2008) overcomes much of the selection problem. The authors focus on the interaction between apprenticeship duration and failing firms. In the context of apprenticeship, a firm going out of business will generally cause a sudden and exogenous end to the apprenticeship training for apprentices in the firm. More generally, the timing of firm failure will affect the duration of apprenticeship training a particular worker experiences. By looking at apprentices who obtained training in failed firms, one can examine a large number of trained workers with varying durations in their apprenticeships. The sample covers small firms, where the closing of the firm is likely to occur most suddenly. The authors use an instrumental variables (IV) approach, in which the duration of a worker's apprenticeship is a function of the time between entering the firm and the firm's failure. Using this duration variable as an IV makes sense, since it is a good predictor of the duration of the worker's apprenticeship but does not predict long-term wages except through its indirect impact on apprenticeship. The results show a significant wage effect resulting from longer relative shorter durations of apprenticeship. Specifically, the estimates indicate that apprenticeship training raises wages by about 4 % per year of apprenticeship training. For a 3–4 year apprenticeship, post-apprenticeship wages end up 12–16 % higher than they otherwise would be. Since the worker's costs of participating in an apprenticeship are often minimal, the Austrian study indicates high overall benefits relative to modest costs.

A recent Canadian analysis indicates a high wage premium for apprenticeships for men but not for women (Boothby and Drewes 2010). Apprenticeship completion is the highest attainment for only about 7 % of Canadian men.

However, for this group, earnings are substantially higher than the earnings of those who have only completed secondary school and nearly as high as those who have completed college programs that are less than a university BA. Overall, the gains for men from apprenticeship training are in the range of 17–20 %. Even evaluated after 20 years of experience, apprenticeship training in most occupations yields continuing returns of 12–14 %.

Evidence from one Australian study shows very high rates of return to individuals undertaking TVET. Ryan (2002) finds that a male school leaver who completes a skilled vocational qualification while working part-time reaps a return of about 24 %. This gain far exceeds the 3.9 % return to a male who works part-time while obtaining an associates diploma (2-year college degree). Another analysis of the returns to skilled qualifications in Australia finds significant gains for those who did not complete 12 years of schooling.

A 2004 analysis of returns to apprenticeship in the United Kingdom yields much lower, but still positive rates of return for males (McIntosh 2004). The estimates suggest a respectable 7 % return to apprenticeships among men, though not for females. Not surprisingly, the gains from apprenticeship vary by occupation.

Although a number of researchers have highlighted the benefits of well-structured TVET systems (Steedman 1993; Acemoglu 2001; and Ryan 2002) and the OECD reports on youth comment favorable on the positive role of apprenticeship, some researchers argue that the evidence remains uncertain. In a recent review of European education and training policies, Wößmann argues that, "The debate on vocational versus academic qualifications and their payoffs is more heated in some European countries than others. But despite its prevalence in many European countries, there is a general lack of hard empirical evidence on which to base a sound analysis of efficiency and equity issues in vocational education." He indicates that TVET can be especially equitable, citing evidence that countries with well-structured TVET systems have fewer dropouts from secondary school and that French disadvantaged youth who go into apprenticeships have a higher likelihood of employment than those in school-based vocational education. Still, Wößmann concludes by viewing any efficiency or equity advantages of vocational education as tentative.

Wößmann's collaboration with Hanushek et al. (2011a, b) goes further in casting doubt on the benefits of TVET systems. This chapter deserves careful attention since it is an ambitious analysis likely to attract wide attention. The authors use data from the International Adult Literacy Survey (IALS), covering 18 countries in 1994 and 1998, to examine the impact of vocational education relative to general education on employment and earnings over the life cycle. The samples include 16–65 year-olds who completed at least secondary education and are not currently students. General education is defined as academic or college preparatory or a program leading to a BA or BS degree. Vocational education is a program in business, trade, or vocational that does not lead to BA/BS degree.

The estimates of general versus vocational education impacts rely on regression and matching techniques that essentially compare individuals who differ in terms

of type of education but have the same literacy scores, age, sex, years of schooling, adult training, and parents' educational attainment. Literacy scores (prose, document, and quantitative) are higher for general education individuals, but the overlap between the vocational and general education is substantial.

The authors argue that vocational education (including apprenticeships) improves employment and earnings outcomes of young people but the advantage erodes to a disadvantage at older ages. The gains at young ages are consistent with a variety of other studies highlighted by Wolter and Ryan (2011). Hanushek et al. (2011a) argue that the erosion of gains at older ages is clearest in countries that emphasize apprenticeship, such as Denmark, Germany, and Switzerland. Yet, according to several estimates in this chapter, the advantage in employment rates linked to vocational education in the apprenticeship countries remains through approximately age 60 (Table 6). Moreover, in the apprenticeship countries, the advantage in employment rates is sizable, providing men with vocational education a 9 %age point higher employment rate at age 40 and a 4 point advantage at age 50. Looking at the results using individual age categories instead of a linear age term, one again finds positive employment outcomes for the apprenticeship countries as a whole until ages 56–65, when the employment rates are equal for those with and without vocational education (Table 8). In the case of Germany, the same table indicates a large disadvantage for those with vocational education when men reach ages 56–65 and less of an advantage in the early ages.

While the employment results appear to vary across specifications and the employment advantage in apprenticeship countries is always highest at younger ages, many of the estimates show little or no disadvantage until workers are well over age 60. Such an employment shortfall might be due to higher benefits from early retirement for those with vocational education. Turning to differences in annual earnings, the authors find only insignificant effects of general versus academic education by age for most countries. Notwithstanding these insignificant effects, the final section includes estimates of differences in the present value of lifetime earnings within countries based largely on employment differences. The precise method and discount rate used are unclear, but the authors conclude that lifetime benefits from vocational education occur only in Switzerland and losses occur in Germany.

While the findings of the Hanushek, Woessman, and Zhang paper are interesting, they are subject to several limitations. First, the estimates cover a specific time period (1994 and 1998), using cross-sections of people at varying ages to generate life cycle patterns. Thus, the data do not follow individuals through their life cycle; instead, they capture employment and earnings of different birth cohorts only at one age. This problem may be particularly significant, given the specific years involved. Germany, in particular, went through an especially difficult period in the 1990s, having to absorb East Germany. At the time, German policies specifically tried to encourage early retirement and Germany's benefit system provided very high replacement rates for workers. In today's context, the situation for older workers with a vocational education background may be quite different from the period studied in the paper. Second, by including only those who completed at

least secondary school, the estimates ignore the potentially positive effects of vocational education on reducing high school dropout rates. Third, the results prove nothing about whether the apprenticeship countries would have achieved a better economic performance or improved outcomes for their workers if they deemphasized in-depth vocational education. Overall, the results of this chapter do not overturn the wide body of evidence showing significant benefits to vocational education.

8.4.2 Costs and Benefits for Employers

Since TVET in the form of publicly supported vocational schools relieve employers of classroom costs, the focus of studies of employer costs and benefits is on work-based TVET, such as apprenticeships. For employers, the net costs depend on the mix of classroom and work-based training, occupation, skill and wage progression, and the productivity of the apprentice while learning to master the required skill. The benefits depend on the extent to which apprenticeships save on subsequent hiring and training costs, lower turnover costs, and enhance productivity more than added wage costs. Also valuable is the employer's increased certainty that apprentice graduates know all relevant occupational and firm-specific skills and can work well alongside other skilled workers. In addition, having extra well-trained workers, such as apprentice graduates, provides firms with a valuable option of expanding production without reducing quality in response to uncertain demand shocks and covering for sudden absences of skilled workers.

Although few if any studies have been able to quantify all of these costs and benefits in a large sample of employers and countries, an increasing number have estimated the net costs and some of the benefits to employers of apprenticeship investments. The main direct costs include apprentice wages, the wages of trainer specialists for the time they oversee apprentices, materials, and the costs of additional space required for apprenticeship (Wolter and Ryan 2011). The benefits include the value of production generated by the apprentice, sometimes separated by whether the activities would otherwise have been performed by skill or unskilled workers. A common and realistic assumption is that, as the years in training take place, the apprentice's work contributions increasingly substitute for tasks undertaken by skilled workers.

The most extensive studies of net costs of apprenticeships deal with German and Swiss employers. One analysis compares results from surveys of 1,825 German firms and 1,471 Swiss firms. Looking only at the training period, the authors calculate the gross costs—outlays for worker wages, trainer wages, and materials—and the benefits to employers derived from the productive contributions of apprentices during the training period. On average, the gross costs per year amounted to 15,500 Euros for German firms and about 18,100 Euros for Swiss firms. Although Swiss firms spend more than German firms, they derive substantially higher benefits from the value added by apprentices. Swiss firms gain

over 19,000 Euros per year, more than double the 8,000 Euro benefits that German firms attribute to the value of production generated by apprentices. For a 3-year apprenticeship, Swiss firms are able to recoup the 54,400 Euro cost with benefits of 57,100 while German firms experience a 46,600 Euro cost but only 24,000 in benefits.

The reasons for these differences are instructive for apprenticeship programs as a whole. In Switzerland, the wages of management, skilled workers, and unskilled workers far exceed those in Germany. On the other hand, the wages paid to apprentices are far less in Switzerland than Germany. In addition, apprentices are at work for more days in Switzerland than in Germany (468 vs. 415 for a 3-year apprenticeship). Further, when at workplaces, Swiss apprentices devote 83 % of their time to productive tasks, compared to only 57 % among German apprentices. The differences in time spent on tasks with no direct value to the firm are larger as well. Again, the Swiss have the advantage, with apprentices devoting time to these tasks only 13–21 % of the time, while these tasks take up from 31–57 % of the time in Germany.

One striking feature of apprenticeships in both countries is how quickly apprentices ascend from taking on unskilled to skilled tasks. In Switzerland, the productivity of apprentices rises from 37 % of a skilled worker's level in the first year to 75 % in the final year; the increase in Germany is as rapid, increasing from 30 to 68 % of a skilled worker's productivity over the apprenticeship period. Still, the data suggest that nearly all German firms with apprenticeships (93 %) incur net costs while a majority of Swiss firms (60 %) more than recoup their costs.

Are the higher in-program net costs to German firms offset by any advantage after the apprenticeship period? The study indicates differences on one key outcome—retention of apprentices within the firm. In Switzerland, only about 36 % of apprentices remain with the firm that provided the apprenticeship training. The figure was 64 % for apprenticeships in the former West Germany, where employers receive less or no subsidy than in East Germany. Thus, while German firms bear much higher net costs than Swiss firms during the apprenticeship period, they are better able to reap higher returns during the post-apprenticeship period.

Evidence from the Germany surveys of employers offer some insight into post-program benefits (Beicht and Ulrich 2005). Recruitment and training cost savings average nearly 6,000 Euros for each skilled worker trained in an apprenticeship and taken on permanently. The report cites other benefits, including reduced errors in placing employees, avoiding excessive costs when the demand for skilled workers cannot be quickly, and performance advantages favoring internally trained workers who understand company processes over skilled workers recruited from the job market. Taking all of these benefits into account makes the apprenticeship investment into a net gain for employers.

Not all recent studies indicate high net costs of apprenticeships in Germany. For example, Mohrenweiser and Zwick (2008) find that for many occupations, the gains to the firm during the apprenticeship period more than offset the costs. They draw their conclusions by estimating the impact of apprenticeships on company profits. For apprenticeships in trade, commercial, craft, and construction

occupations, the estimates show a positive impact on profits. However, in manufacturing, the effect on current profits is negative, indicating a positive net cost.

In another careful study of German apprenticeships, Rauner et al. (2010) finds that the majority of the 100 firms in the sample recouped their investment in apprenticeships during the training period. This study used a tool called QEK (for quality, returns, costs) that allowed employers to make a detailed self-assessment of the costs and benefits of apprenticeship during the training period. In contrast to results reported by Dionisius et al. (2009) based on a larger sample, the Rauner et al. study finds that most firms experience low net costs or even net benefits from sponsoring apprenticeships. However, the net costs vary widely, with some firms gaining more than 10,000 Euro and other experiencing net costs. Somewhat surprisingly, net costs are inversely related to the quality of the apprenticeship. High quality apprenticeships have higher gross costs but are much more likely than low quality apprenticeships to help employers recoup their investment during the training period.

Although net cost studies of apprenticeship in other countries are less comprehensive that those conducted in Germany and Switzerland, they offer additional evidence on costs and benefits. An extensive study of Canadian employers sponsored by the Canadian Apprenticeship Forum (2006) estimated employer costs and benefits of apprenticeships in 15 occupations. The study drew on responses from 433 employers, with at least 16 per occupation. All were 4-year apprenticeships. The average gross costs ranged from about $78,000 for cooks to $275,000 for construction electrician. Average in-program benefits—measured as the revenue generated by the apprentices—varied widely as well, ranging from $120,000 for cooks to $338,000 for construction electricians. For all 15 occupations, employers earned a positive return to their apprenticeship investments even without taking account of any post-program benefits. In fact, the average benefit was 1.38 times the average cost.

A recent analysis of apprenticeships in the United Kingdom is based on eight employers in each of four industries—engineering, construction, retail, and business administration, including foundation and advanced levels (Hasluck and Hogarth 2010). The authors estimated that the average gross costs were higher than the average benefits during the apprenticeship period in all the four industries. However, the patterns varied by industry. In retail and business administration, the gross costs were only modestly higher than the benefits, which covered 80–90 % of gross costs. However, in engineering and construction, the productive contributions of apprentices covered less than 60 % of the substantially higher gross costs. Still, the authors estimate that employers at least break even during the early post-apprenticeship period, when the contributions to production of apprenticeship graduates are worth more than their wages.

In the United States, there are no rigorous studies with estimates of employer costs and benefits of apprenticeships. However, evidence from surveys of over 900 employer sponsors of apprenticeship indicates that the overwhelming majority of sponsors believe their programs are valuable and involve net gains (Lerman et al. 2009).

8.4.3 Government Costs and Benefits

Estimates of the government costs of TVET should take place in context, by determining TVET spending compared to what government spending would be in the absence of TVET. A common perspective is to estimate government costs of TVET compared to government costs of academic education. In general, government outlays per student are believed to be considerably higher for vocational education than for academic education (Psacharopoulos 1993; Middleton 1988; Gill et al. 1999; Klein 2001), especially in less developed countries. School-based vocational programs sometimes require special equipment, more expensive teachers with industry experience, and small classes. Notwithstanding these differences, there are strikingly few detailed studies of government spending on vocational education and in many countries the cost differences are modest. A detailed analysis of spending per student in Greece shows only modest gaps between academic and vocational education (Kostakis 1990). A graph prepared by Cedefop (2012) indicates virtually identical expenditures per student in a number of European countries, though it shows that outlays are substantially higher for vocational education than general education in France and Germany. In a study of the Geneva canton of Switzerland as of 1994, government costs per student were about 50 % higher in full-time vocational education than in general education but government costs per apprentice was only half the costs of general education (Hanhart and Bossio 1998).

Cost analyses rarely examine the way in which spending per student varies with the type of TVET (school-based or employer-based) and with the occupational field. In dual TVET systems, government costs are clearly lower than in school-based TVET for three reasons. First, government funding for schooling is lower because student's time in school declines from 5 days per week to 1 or 2 days per week. Second, government spending on equipment is less necessary for TVET dual-program students because students gain experience with the relevant equipment at their work site. Third, successful dual systems reduce the need for government spending on university education or on second-chance training programs.

A recent study in the U.S. Reed et al. (2012) estimates the government costs and benefits of registered apprenticeship in the 2000s. On balance, governments at all levels spent about $715 per apprenticeship participant, an amount only about 7 % of government spending per year on 2-year college programs. At the same time, public spending per student on 2-year postsecondary, school-based vocational education is about the same as academic 2-year programs; both are far less than academic programs in 4-year institutions. While Hollenbeck (2008) estimates a smaller but still substantial gap between school-based postsecondary TVET and apprenticeship (about $7,600 vs. $2,700) in Washington State. He projects an incremental cost for TVET at the secondary level of less than $1,000 per participant.

The long-term benefits of TVET accruing to governments are rarely estimated. The returns to taxpayers include how TVET-induced gains in earnings increase tax

revenues and decrease social benefit programs. If employers and other workers share in the TVET-induced increase in economic growth that might arise from increased innovation and reduced skill mismatches, then taxpayers would benefit from the associated added revenues. In the case of U.S. apprenticeship, Reed estimates that over the career of an apprentice, the tax returns are more than $27 and the total benefits are more than $35 per dollar invested. According to Hollenbeck (2008), the government obtains about 20 % of the overall net gains in earnings linked to various types of TVET. Projecting earnings gains that are sustained but phase out between the 2.5 year post-program observation period and age 65, Hollenbeck (2008) comes up with the long-term benefits from TVET. Using data on current costs and long-term benefits, he estimates implicit rates of return to the government for various TVET programs. They range from about 3 % for postsecondary, school-based TVET, to about 10 % for secondary, school-based TVET and 24 % for apprenticeships.

There are surprisingly few good studies of the government costs of TVET. While vocational programs vary widely on a whole range of dimensions, the evidence suggests that the costs per student in secondary education are higher in vocational than in academic programs, though the size of the differential depends significantly on whether the programs need specialized equipment. At the post-secondary level, the evidence is less clear and will be especially sensitive to the fields. Physics labs are part of academic programs, while business vocational programs require no special equipment. One clear conclusion is that apprenticeship programs are less costly to the government than is full-time schooling, whether vocational or academic. In most apprenticeship programs, the government pays only for part-time schooling, often only 20–25 % of a full academic schedule. Generally, the schooling component of apprenticeships does not require special equipment and if they do, employers often pay these extra costs.

8.5 Findings and Policy Implications

An overall assessment of the costs and benefits of TVET systems is methodologically challenging and requires common data that are not generally available (Hoeckel 2008). The analysts must recognize the heterogeneity of TVET, obtain data for specific types of TVET, and follow participants over a number of years after leaving TVET. A cost–benefit analysis of TVET must specify the relevant counterfactual, or what would have happened to TVET participants in the absence of TVET. Moreover, the analysis must consider potential external costs and/or benefits, such as reduced wage inequality and increased solidarity and innovation. Given these challenges, the scarcity of comprehensive cost–benefit analyses is not surprising.

The literature concentrates on the long-term net benefits to TVET participants and, in the case of apprenticeship or other employer-led training, on the net benefits to employers. The studies rarely deal with costs or external benefits.

For example, the study by Hanushek et al. (2011a) ignores the lower costs of apprenticeship versus other types of vocational education.

Still, the evidence suggests a number of conclusions about the costs and benefits of TVET. First, for the participant, TVET generally yields gains in wages, with gains especially high for participants in apprenticeship programs. Only one major study indicates that the long-term gains from TVET may fall short of the gains from general education, especially in TVET outcomes beyond age 55. On the other hand, even this study agrees with nearly every study in finding clear benefits in the early post-high school period. The net gains for participants are especially high for apprenticeship programs, partly because the skill development is highly suited to the needs of employers, partly because some valued learning can only take place in the context of the workplace, and partly because apprentices pay low or no costs. They often pay very little tuition and they do not generally forego earnings because they earn money from employers during the apprenticeship.

For employers, the patterns of costs and benefits vary widely. Under school-based, vocational education, employers pay little or no costs and may or may not reap clear benefits. Even when students are well-trained to enter the profession and be highly productive, the market for their services may raise their wage sufficiently to offset their added productivity. A focus of several studies is on the net costs to employers of providing apprenticeships. In well-structured, quality apprenticeships, the net costs depend on the wages of trainers and on the wages and productivity of apprentices. Careful analyses find that the majority of employers in Switzerland and possibly in Germany as well are able to recoup their investments in training within the training period itself. We do not know what would be the net costs of apprenticeships to those employers not currently sponsoring apprenticeships.

In estimating costs and benefits to the government, the counterfactual is often spending on academic programs. From this perspective, government outlays per student in school-based TVET are typically higher than outlays on general instruction but outlays on apprenticeships are generally lower than spending on general education.

Given the low public cost and high wage gains from dual work-based and school-based programs, the natural policy implication is for countries to de-emphasize school-based TVET and turn more to apprenticeship training. This policy shift would be significant in several countries, including the U.S., but not necessarily in other countries. No one policy can deal with high youth unemployment, low youth skills, the rise in inequality, and the decline of middle-skill jobs. But, TVET in general and apprenticeship in particular can help with these problems.

Finally, the weaknesses in the literature point to extensive shortcomings in research and data on TVET programs. Filling these gaps is critical for devising sound policies to prepare young people for careers in a cost-effective system.

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Chapter 9
Competence Research

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Abstract The most important target of TVET is to promote professional competence development. The professional competence research is not only an essential theoretical foundation of the curriculum research in TVET, but also an important part of the qualification research. This chapter introduces the latest research on professional competence in different countries/cultures and different disciplines, presents different interpretations on competence and professional competence, i.e. professional action competence and cross-vocational competences including shaping competence and key competence. Various terms related to professional competence and prospect of the development of professional competence research are also exposed. It is mentioned that if solid competence research is to be implemented, there should be a breakthrough in the empirical and quantitative research.

Competence is an intensely discussed concept in TVET research and innovative projects worldwide. There are two reasons leading to the phenomena. First, huge changes were brought out in the workplaces by globalisation, the development of knowledge-based economy and the fundamental reorganisation of work (Maag Merki 2008, p. 517). Second, more attention is devoted to the leading role of education. All these reflect the development and advances in TVET research and practice.

Nevertheless, a common understanding on competence is still absent. Many discussions are merely based on subjective perception and simple experience summary. Inadequate understanding on (professional) competences lies in indefinite differentiation on competence and skill. Many terms such as 'key competence' and 'core competence', etc., were used to explore cross-curricula competence. Some studies intend to categorise competences and establish competence models in the absence of empirical evidences. They could only give hints

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rather than convincing interpretations. As a result, vocational education institutions have various ideas and concepts in practice. They use the same wording while discussing relevant topics, however, what they express is not the same as that of other counterparts. Therefore, it is difficult to attain theoretical achievements and real innovation in practice with widely workable values.

9.1 The Concept of Competence

To conduct a solid scientific research on competence, a precondition lies in an unequivocal (unnecessarily the only) understanding of the terminology of competence. As competence is not a simple objective fact but an individual character, competence finds various definitions in many disciplines and research areas (Röben 2008, p. 342). Many factors, such as the complexity of the concepts, diversity of social culture, knowledge constraint of subject and discrepancy in research perspective, also contribute to the different interpretations of competence.

9.1.1 Definition

Competence is (of people) having the necessary ability, authority, skill and knowledge. It is an individual's psychological character. For competence to be defined, many factors play an important role, e.g. education systems, cultures, economical structures, vocational traditions as well as situations in the labour market.

9.1.1.1 Interpretations of Different Disciplines on Competence

Competence is an important research topic in psychology, which has a close linkage with activities and serves as a psychological character. "Competence determines the speed, difficulties and consolidation of the process in which people master the important skills required by conducting activities" (Cao 1987, p. 271).

Research from Germany exerts a vital influence on vocational pedagogy. The term competence advocated by Weinert refers to an individually or interindividually available collection of prerequisites for successful action in meaningful task domains (Weinert 2001, p. 62). Here, a gap is bridged between acquired abilities and successfully meeting the prerequisite of a complex demand. This definition not only encompasses the cognitive aspect but also entails elements of motivation, ethics, will and society. Competence is acquired only with exploration in specific domains in-depth as 'cognitive domain-specific performance dispositions' (Rauner et al. 2012, p. 4).

The interpretation of competence by human resources development research is often linked with the performance and output of the work. Norton defines

competence as "achievement of the knowledge, skills and attitudes required by a worker in order to perform a given occupational task" (Norton 1997 Appendix C). The discussion by the working group on "Qualification Development Management" has proved important as well. Competence is defined here as the ability of self-organisation that the individual possesses in the form of a disposition (cf. Erpenceck 1996, p. 311). However, this approach has been criticised from the viewpoint of ideology critique, because it has been faulted for missing the central issue of the internalisation of heteronomy, a condition in which the individual is fundamentally lacking in self-determination (Bolder 2002, p. 662).

Chomsky has implemented competence research in linguistics. He employed competence as a linguistic capacity in a general sense and the performance as the actual application of language. He traced performance errors (errors in grammar and pronunciation) and analysed the factors of these errors as socio-cultural, social, individual psychological and situational (Chomsky 2006). This is an important impulse for the TVET research.

9.1.1.2 Understandings by Different Cultures

Competence understandings vary from culture to culture in TVET. Due to the impact of the English language, the competence concept from Britain exerts a vital effect. In Britain's National Vocational Qualifications (NVQs), competence is defined by the outcome of learners. In philosophy: if a learner can finish a task, he should be equipped with the required competences. NVQs established a competence structure. For example, based on the qualification criteria of Edexcel,[1] the qualification encompasses several units. Each unit is described by a series of assessment criteria for the learning outcome. This outcome-oriented concept based on learning objective description by behaviourism has a far-reaching influence on TVET in Europe and worldwide (Clement 2002). The training packages in Australia are, for instance, also a reflection of a similar concept (Tao 2004). In countries that have exercised occupational qualification/certification systems, work tasks and processes were broken down into a series of observable, describable units of competences (tasks) in order to make examinations workable (MoHRSS and OSTA 2006).

The understanding of competence out of behaviourism has evident constraints, which is challenged by criticism from education experts even in Anglo countries. Eraut (1994, p. 174) pointed out that competence shall be distinguished from competency. Competence, which is given a generic and holistic meaning, refers to a person's capacity while competency refers to specific capabilities. Norton gave a specific definition on competency, a description of the ability one possesses when they are able to perform a given occupational task effectively and efficiently (Norton 1997, Appendix C). However, all these efforts fail to solve fundamental problems encountered by behaviourism thinking.

[1] The UK's largest awarding body offering qualification test and certificate.

In the German TVET system, every 'learning field' course is a didactically designed functional working field. The objective of a training programme is also outcome-oriented. Different from the de-contextualised depiction of Edexcel, it is closely linked with a holistic professional task. In Germany, the objective of training is acquisition of 'professional action competence' with the widely advocated concept of 'complete action mode'. The development of action competence is to promote overall personality development with a focus on self-regulated willingness and ability exercised by vocational actions responsible for oneself and the society, i.e. "exploring the reality by probing facts, reflection and judgement on motives and problems" (Bader 1989, p. 74). It is a comprehensive understanding with an aim to enable people to act in a vocational and ethically rational manner under a certain situation (Ertl and Sloane 2006, p. 120). It coincides with Weinert's definition on competence, i.e. "successfully meeting the prerequisite of complex demands" (Weinert 2001, p. 62).

The term 'competence' in China was introduced by a Canadian development project. Competence was defined as "a combination of knowledge, skills and capabilities by which a job or an occupation can be effectively performed and regarded as an observable and measurable activities when a task is finished" (CBE Expert Group 1993, p. 19). China's occupation certificate system and vocational colleges influenced by the Anglo culture adopt a similar understanding as DACUM. For instance, Shanghai's curriculum framework for secondary vocational schools defines vocational competence as "activities or strategies taken to finish work tasks" (Office of Teaching-learning Research Shanghai 2011, p. 10).

The Chinese TVET also has extensive cooperation and exchanges with Germany, and has also accepted the German term of action competence. Documents from the Ministry of Education (MoE) mention that the "holistic professional competence" is "subjective conditions of being engaging in vocational activities and realising overall development for one to survive and live in the modern society" (Liu 1998, p. 13). This understanding surpasses the simple functional demands and focuses on the overall literacy and development potential of human beings.

In view of the diversified definitions and understandings, Lehmann (2002, p. 121) summarises that the current debate on competence "[suffers] from not insignificant theoretical deficits; it threatens to degenerate into meaningless generalisations and to become no more than a passing fad despite the fact that this impression has been challenged with vehement optimism by those with an interest in defending the idea". This paper is intended to sort out the relevant competence studies, particularly on professional competence as a term with significance in TVET research.

9.1.2 Different Views on the Concept of Competence

Different approaches were established by competence research from different methodologies. Sandberg (2000) classified the understanding of competence into three types: behaviourism-oriented, traditional rationalism research and

interpretive research approach. The taxonomy of Kuang (2010) comes from the perspectives of behaviourism, cognitivism, humanism and constructivism of different schools of psychological theories. The recent competence research in TVET could be summarised in three perspectives (Hager 1995).

9.1.2.1 Behaviourist Approach

It can also be called task-based competence approach, closely linked with the concept of Competence-based Education (CBE). Competence is defined here by the action required by a work task. CBE emerges from the teacher training programme in the U.S. in the 1960s. Teachers were encouraged to translate teaching objectives into observable behaviour changes of students. It spread later to many countries, especially in English spoken countries (Sandberg 2000). TVET under the guidance of the behaviourist approach lays an emphasis on improving learners' skills by the realisation of learning objective. It does not care about the link between different tasks (competences) and seldom or cannot care about the role of personality and cognitive performance dispositions in finishing tasks.

9.1.2.2 Competence Approach Based on General Personality

It focuses on the important and general characters required by individuals to finish tasks. The prerequisite is: those who have outstanding performance share some common personality like communication, diagnostic and systematic thinking, especially "key competence" (Mertens 1974; OSTA 2007). Those who are equipped with these characters might apply them into actual tasks and transfer them to multiple or all work situations. This approach holds competence as a general level of competence and disregards applied contexts. It is criticised for its de-contextualisation. First, it is not sure whether general competences really exist (Hager 1995, p. 143). The expertise research finds that competences of experts boast of special features of domains; second, people can (to some extent) identify some work competences and find out the personality characters, but these characters are not always meant to help people finish work tasks (Röben 2008).

9.1.2.3 Holistic Competence Approach

The holistic competence approach holds that competence is a combination of knowledge, skills and attitudes under specific contexts. Personality is linked with the relevant occupational work situations. By this way the holistic requirements for practice are reflected. Competence understandings of the latest research are mostly holistic, for example, the concept of "action competence"(Bader 1989), the idea of

"holistic vocational education" (Ott 1995), work process knowledge research (Fischer 2000) and competence assessment research (Rauner 2008). Rauner classified professional competence into functional, process and holistic shaping competence (Rauner 2011, p. 48). This taxonomy is a systemic development of the modern competence research. Documents and reports of most international organisations also have an understanding of integrative competence. An ILO report for instance stresses "with more autonomous, adaptable and multi-functional workers",… "overall competence of individuals and especially on their ability to communicate, to solve problems, to work in teams, rather than on their purely technical skills alone" (Axmann 2004, p. 3). The relevant literatures show that though many competence definitions exist, most definitions note the integrative features of competence. It mirrors the cognition trend of integrative view on competence (Liu and He 2012, p. 70).

9.1.2.4 Summary

The connotation of the competence is all encompassing, which can be summarised from three perspectives:

First, competence consists of many elements such as thinking, strategy, experience, knowledge, skill, method, plan, organisation, decision-making, etc. Sometimes, people attribute competence manifesting by a single element to one competence-like method or communicative competence; competence which manifests many elements is called an integrative one, e.g., action competence. The differentiations on competence elements and their conditioning lead to a diversity of different competence classifications in practice.

Second, the feature of competence is an important sign of identifying the competence concept, which mainly manifests by:

- Differentiation in individuals. Competence is loaded with individual and different characters, and can be developed and improved.
- Comprehensiveness. Competence is a combination of many elements in an individual. These elements form a special competence structure under specific conditions, which can be analysed and improved from different perspectives.
- Practicality. Competences is formed and developed by acquired growth and practice, which are closely linked with context of the practice.
- Functionality. Competence has objectives and functionality features. To satisfy special needs, people promote competence development entailing functions and adopt appropriate methods to measure their efficacy.

Third, the level of competence development manifests the cognitive performance dispositions of individuals and is equipped by learning and practice. Its actual performance depends on the role, working situation and demands.

9.2 Professional Competence

Professional competence is an important term for the TVET research and practice, which is related to vocation pedagogy, vocational discipline, human resource development and qualification research.

9.2.1 Definitions of Professional Competence

Professional competence is the cognitive domain-specific performance disposition related to occupation. In the discussion about professional competence, factors such as vocational tradition and TVET systems should be taken into consideration. As 'vocation' is considered globally as a typical German way of social organisation (Dostal 2008, p. 168), achievements of competence research attained by Germany serve as important reference for relevant research.

The term professional competence was first advocated by H. Roth in Germany. He classified professional competence into self-competence, specialised competence, method competence and social competence (Roth 1971). Subsequent discussions were conducted on this basis, for instance Erpenbeck and von Rosenstiel (2003) classified professional competence into "personal competence", "active and applied competences", "specialised and method competences" and "social competences". Competence is understood here in three dimensions: (a) activity subject: competence can be developed by handling relevant incidents and facts; (b) environment: competence development needs certain environment like family, company and society; (c) willingness: competence involves individual motivation and depends on the willingness to accept challenges rather than averting or refusing them.

Professional competence is a kind of competence which works "in the form of vocation", is subjective related and the potential required for finishing of professional tasks are determined by the occupational profile. The success of TVET is characterised by graduates' professional competences, i.e. he can be engaged in an occupation. Therefore, professional competence has a feature of functionality. In Germany, the level of professional competence is reflected by "action competence". When learners pass the graduation exam they are equipped with the professional action competences defined by the "Ausbildungsordnung" (curriculum), including knowledge, abilities and skills (Rauner 2008).

Most countries with the Anglo culture pay little attention to whether work in form of a vocation is organised. There is no English word to exactly express the meaning of Beruf in German or Zhiye in the Chinese language. The German term Beruf entails all or partial connotation of words such as vocation, occupation, profession, trade, job and career (Dostal 2008, p. 162), while career is often translated as Zhiye (vocation) in Chinese.

Professional competence in English mainly refers to performance of finishing work tasks, while for TVET, it generally refers as the learning output of knowledge and skills. Since the late twentieth century, the TVET concept of CBE/CBT has been popular. It originated from economics and failed to bring benefits for the pedagogical competence research. Instead, competence in pedagogy's term is excluded by the term of "(quasi)skill" in economics. In the practice of DACUM, competence, competency and skill are basically synonyms. Although there appeared some amendments (e.g. CBT was replaced by CBE), in fact much relevant research fails to surpass the level of vocational pedagogy in Germany in the 1950s. At that time, R. Dahrendorf distinguished functional competence from the extra-functional one (as cited by Ott 1995, p. 71). The definition of competence by DACUM advocated the terms of attitude, but it is very abstract and loaded with words like careful, meticulous, etc. It is difficult to establish a direct link between these terms with real work situations. Therefore, it is difficult to implement in the VET practice, let alone to assess the outcome.

The discussion on professional competence began in the late twentieth century in China. Currently, professional competence has been widely accepted as an important objective for TVET, although views on professional competence are divided. The understandings originate from the following perspectives:

- Education objectives on the macro-level: Professional competence is regarded as "the total of vocation and cross-vocation competences required by an occupation, by employment and lifelong development" (Yang 2011, p. 4). This view is similar to the German concept of professional action competence.
- From a narrow and broad sense: The demarcation between job and occupation is blurred in the Chinese culture. There is a lack of sensibility to "work in form of vocation". Professional competence in a narrow sense refers to the work competences for a job or to finish a task, while in a broad sense it refers to the common competences of occupation groups and refers to the potential to finish vocational activity by adequate learning (Yan 2007, p. 11; Meng 2000, p. 32).
- From the perspective of competence analytic methods in curriculum development. (1) Influenced by CBE/DACUM, professional competence is understood as qualifications/psychological factors to finish a work task; (2) being determined by professional task. When typical professional tasks of an occupation are determined, professional competence is also determined (Xu 2005, p. 1; Zhao 2009, p. 33). These understandings lead to very different task analytical approaches and curriculum concepts.

A research project of the Chinese Ministry of Labour classified professional competence into three levels: (1) specialised competence of various occupations; (2) general competences manifested by an occupation group; (3) core competence which are necessary to career, everyday life and can be transferred (Chen 2003, p. 26). These classifications exert an extensive influence on the practice of certification tests. Some institutions even conduct competence tests on core competences like cooperation, self-study, etc. (OSTA 2007). This shows that the

behaviourist approach is unusually combined with the general personality competence approach (there being part of economic reason).

Generally, integrative and holistic features of professional competence are mostly accepted by the Chinese TVET. Most definitions on professional competence centre on the objective of both current employment and long-term career development of learners. Therefore, the term "integrative professional competence" is employed in the latest official documents, for example the "Regulations for Integrated Curriculum Developing" (ren she ting fa [2012] No. 30) of the Ministry of Labour (MoHRSS).

Different understandings on professional competence lead to different curriculum modes, training methods, competence measurement concepts and strategies of TVET institutions. With the output-oriented behaviourist approach, TVET schools/colleges can communicate easily with companies as skill expression is explicit. On the other hand, due to the emphasis on operation skill training, (part of) educational objectives could be likely to lose, e.g. personality development. If TVET is shaped by understandings on holistic professional competence, students can be aided with broader and a more solid basis of professional development. Meanwhile, it calls for higher demand for implementation conditions and outer mechanisms such as cooperation between schools/colleges and companies (modern apprenticeship) and policy.

9.2.2 Professional Action Competence

Professional competence is interpreted as "professional competence to act" and is shown by "action in form of an occupation". The term professional action competence plays a major role in the debates on vocational pedagogy, particularly in Germany (Czycholl and Ebner 1995). Since 1996, the "Culture Minister Conference" has issued the "Framework teaching plan for vocational schools". Action competence is mentioned as individuals' decent and suitable reflection under specific vocation, society and private context and the willingness and capability responsible for individuals and the society (KMK 2000, p. 9).

Action competence is a cognitive domain-specific performance disposition. It is regarded as an indicator of the level of professional aptitude, and expresses the expectation that after passing the final examination the trainee is equipped with the knowledge, abilities and skills (qualifications) defined in the vocational curriculum (Rauner et al. 2012, p. 15). Action competence refers to how an individual acquires, develops and applies the relevant approaches, views and values in his life, and therefore it is also called as "complete action competence". It can help human beings to deal with complex and uncertain vocational situations and to shape actions. These actions are responsible, reflective, self-critical and featured with clear objectives, initiatives, flexibility and sensibility (BIBB 1991).

In most related discussions, professional action competence is classified into specialised competence, method competence, social competence and personal competence (Eckert 1998, p. 89).

9.2.2.1 Specialised Competence

Specialised competence refers to the "competence within vocational scope which is based on specialised knowledge and skills. It is the willingness and capability which, by the guidance of specific approach, can solve problem with a purpose independently and assess the results by technical requirements" (KMK 2000). Specialised competence is not only an instrumental competence but also in-depth understanding of the spiritual dimension of an occupation. It focuses on strategic reflection on domain-specific problems, and translates routine, blind and unreasonable behaviours into forward-looking, prudent and sensible ones. It responds to requirements of the relevant occupational community of practice and satisfies multifaceted quality requirements for work achievement (Rösch 1990).

Within specialised competence, work process knowledge plays a significant role. Kruse first advocated this term, i.e. the unique and relevant knowledge of experienced skilled workers (Kruse 1985). "Work process knowledge is directly required and acquired by oneself during the work process, in particularly refers to the knowledge that generates from the specific relationship between work experience and reflection on theories after special experiential learning" (Fischer 2000, p. 121). Considering the implicit character of work process knowledge, the way to its acquisition is an important research topic worldwide in industrial psychology, vocational discipline and expertise research (Fischer and Rauner 2002; Jenewein et al. 2004).

9.2.2.2 Method Competence

Method competence refers to willingness and capability which are oriented to work tasks and formulate independent solutions and implement them. It is part of all competences and links specialised competence with the social one (Wilsdorf 1991, p. 43). Method competence emphasises the objective and planning of solving problems and the procedure for attaining achievement, entails self-regulation and assessment of work quality and shoulders responsibility for the outcome of potential behaviour. It manifests in vocation as well as in individual and social life such as interpretation, reflection and judgement on development opportunities, requirements and limitation on family, vocation and public life (Achtenhagen and Lempert 2000). Discussion related to method competence often involves terms such as learning competence, which is closely related to the lifelong learning concept.

9.2.2.3 Social Competence

Social competence refers to competences of communicating, cooperating, living and working along with others. It is the willingness and capability to experience and establish social relationships, feel and understand others' sacrifice and conflicts, realise mutual understanding and get along with others, including a social sense of responsibility and union. In practice, social competence manifests in interpersonal communication, public relationships and work organisation. It is related to group mentality and social responsibility as well (Wilsdorf 1991, p. 43; KMK 2000). There are some related terms in discussions on social competence such as cooperation competence and communication competence, which complement and guarantee specialised and method competence.

9.2.2.4 Personal Competence

Personal competence refers to individual interpretation, reflection and judgement on development opportunities, requirements and limitations on family, vocation and public life. It is the willingness and capability that can expand his talent and spur him to make progress continuously (KMK 2000). It entails personalities like independence, critic, confidence and responsibility. Development of values and commitment to self-value belong to this competence dimension (Rösch 1990).

It can be concluded that the concept of professional action competence is an important guidance for the shaping of the teaching–learning process in TVET. It can help learners to prepare for their vocational, personal and public life. But it is just an education idea and guideline. The knowledge of this precondition does not constitute a basis for determining how to design measures for the development of these competences. To be able to shape such measures, it is necessary to develop a conception of what competence entails (Röben 2008, p. 374). It needs a detailed competence model which can be transferred, implemented and measured in TVET practice.

9.2.3 Terms Related to Professional Competence

There are closely related terms in TVET such as qualification, skill, intelligence and ethics. By comparing vocational competence and these terms, vocational competence can be better understood.

9.2.3.1 (Vocational) Qualification and Skill

Qualification and skill are interlinked terms. They also have a close connection with competence, but different theoretical geneses. Skill is the usable achievement

from learning and the applicability of capabilities, which is not related to objectives in cognition and spiritual movement. Qualification refers to the requirements for finishing a task. In occupation descriptions (profiles), qualification is usually described by the levels of skill. Research and practice in TVET pay little attention to the differences among competence, qualification and skill, which is unimaginable in the natural or engineering science research.

Erpenbeck and von Rosenstiel (2003, p. XI) hold that the difference between qualification and competence is that qualification is the residue of the process during which techniques and skills are objectivising. It manifests not only in self-organised action, but in standardised test situations that can be worked on step by step. Professional qualifications are constituted by objective features of work assignments and business processes in companies.

Rauner (see Rauner et al. 2012) makes a distinction between competence and qualification with the help of the criteria of "object and subject relatedness", "learning" and "objectivitisation".

	Qualifications	Competences
Object–subject relation	Qualifications are objectively defined by the work tasks and processes and the related demands	Competences are domain-specific abilities and strategies in the sense of mental performance dispositions; their applicability is open
Learning	In the process of acquiring qualification the human being is a holder of qualifications, a (human) resource that is prepared by training for the performance of specific activities	The acquisition of competences is a part of personality development and includes the skills defined by the educational objectives
Objectivitisation	Qualifications describe the skills and abilities that have not been objectivised or mechanised, and define the human being as a holder of qualifications that are derived from work process	Professional competences focus above all on skills that are difficult or impossible to objectivise and which extend beyond current professional tasks to the mastering of future tasks

Rauner et al. (2012)

Professional competence is based on the unique intelligence as well as the part of competence which is manifested by specialists when human beings interact with machines. It is to understand, reflect, assess and accomplish professional tasks. It participates jointly in the prerequisite of shouldering the social, economic and ecological responsibility, to shape the technology and society development rather than execute routine tasks (Rauner 1995; Heidegger et al. 1997; KMK 1991; Rauner 2008). Competence development is closely related to personality development but acquiring skills is only one of the prerequisites of responding to a work requirement.

Differentiating between competence and qualification is of vital significance in the TVET practice. Whether the competence or qualification concept is employed represents different orientations of teaching–learning design, i.e. satisfying the functional demands or ensuring and expanding learners' domain-specific cognitive potential. The issue is attributed to how to deal with the relationship of "education" and "training".

9.2.3.2 Intelligence

Another important related term is intelligence. Hartig and Klieme (2006) classified competence and intelligence from the aspects of contextualisation, learnability and internal structure.

Competence	Intelligence
Contextualised ability adequately to specific situations and demands	General ability to solve new problems
Can be learned and is acquired through experiences with specific situations and demands	Stable over time and determined by biological factors to a significant extent
Internal structure is determined situations and demands	Internal structure is determined by fundamental cognitive processes

(Hartig and Klieme 2006, p. 131)

Gardner advocated the concept of multiple intelligence which exerts an extensive influence on TVET. It emphasises diversity of intelligence, holds that everyone has independent intelligences related to different cognitive types such as mathematical, verbal, musical intelligence, etc. (Gardner 2000). The manifestation of intelligence is different from person to person. Development of professional competence is also a representation of specific intelligence feature determining competence development.

According to this concept, we can describe professional competence development as the realisation of abilities whose development is structured by specific intelligence profiles (Rauner et al. 2012, p. 8). It is more precise than that of other competence models established by general cognition theories, e.g. specialised, social and method competence (professional action competence) or key competence. Because the latter has an implicit viewpoint, all elements of learners' competence are developed in a balanced way, which is contradictory to the Multiple Intelligences concept.

The Concept of Multiple Intelligence emphasises the potential for competence development given by the context of professional work and the intelligence profile of the individual (Rauner and Grollmann 2006, p. 122). Professional competence is not a simple sum of intelligence and cultural elements, it is something that can be learned and influenced and is also different from intelligence.

9.2.3.3 Professional Identity and Occupational Commitment

Professional competence development is affected by motivation and sentiment, and is related to professional identity and commitment.

Professional identity is the outlook of an individual on his objectives, social value of his vocation. It is the result of a development process that is closely linked to the development of professional competence, and is also an important dimension of professional competence development (Rauner et. al. 2012, p. 31). "Professional competence development requires students to shift the mode of thinking: they must accept and identify a specific vocational role, otherwise he is impossible to acquire professional competence". This statement is proved by empirical studies. Blankertz advocated that without occupational commitment, it is impossible to explain the rule of professional competence development (Blankertz 1983, as cited by Rauner 2010).

Occupational commitment refers to identity, devotion and sentimental attachment to an occupation, and the extent of unwillingness to change occupation due to internalisation of social norms. It is related to organisation commitment, but is sentiment and attitude higher than organisation commitment. In TVET practice, professional identity and occupational commitment, duty, quality and work willingness are important education objectives.

The vocational learning is a common development process of professional competence and identity. According to the logic of vocational development "from novice to expert" (Dreyfus and Dreyfus 1986), the process of professional competence can be identified through professional tasks at different development stages. The development of professional competence is also a process of vocational cognition developing into high-level professional identity. During the process, learners will be acquainted with and respond to their occupational community forming professional identity to the corresponding levels and dimensions of professional competence (Rauner 2008).

9.3 Cross-Vocational Competences

9.3.1 Key Competences

Entering into the late twentieth century, horizontal work division is gradually weakening; the demarcation between vocation and job is blurring; it is difficult to analyse, depict and assess work activities; it is even more difficult to make prediction on qualification demands. Sociologists desire to know what qualified workers should be equipped with to remain invincible, or at least not to be replaced by machines.

Against that backdrop, Mertens (1974) put forward the term key qualification in the labour market research, which is unrelated to specific tasks or knowledge, but

important in the modern production and society, as a key to 'open the door to the future'. He tried to settle the problem which cannot be solved by traditional education. Because of the rapid technology development, people can never master all of the knowledge. Key qualification could be used as a tool to help learners to deal with complex and new situations and to make up the insufficiency of specialised training (Klein 1990). The recent literature tends to use "key competence" as synonyms.

The concept of key competence exerts an important effect on the TVET practice. Many projects have been implemented in curriculum and teaching reform, a popular one is the PETRA (Projekt- und Transferorientierte Ausbildung) by Siemens. It identifies key competences into five groups and puts forward different approaches to systematically organise and assess the teaching process to develop different kinds of key competences for skilled workers engaged in complex work (Klein 1990).

The key competence (core competence) concept aroused the attention of many industries worldwide. The Further Education Authority of Britain, for example summarised 11 kinds of core competences. In 1992, the National Council for Vocational Qualifications of Britain classified six core competences into two categories in the NVQs (Wu 2004). Carrying on the Anglo-culture, the British marched ahead on behaviourism and output-orientation on the key (core) competence concept and conducted extensive practice. In the late twentieth century, the concept of key competence was introduced in Australia (DECS 1997). Currently, Australia has put this concept in its training strategy on employability skills (Wibrow 2011).

Besides key competence, researchers use other terms to describe 'cross-disciplinary' competences such as cross-curricular or common competence, referring to competences that are out of the scope of domain with horizontal transferrable features, and play an important role for successful learning and work. Nevertheless, these terms fail to meet the quality requirements for theoretical and/or empirical research. The concept of key competences lacks empirical testing of whether these key competences can be used effectively to solve the problem of unforeseeable demands arising within the workplace. In addition, it fails to empirically clarify the internal structures of the key competences involved and its lack of plasticity (Maag Merki 2008, p. 519). Key competence is also contradictory to the concept of multiple intelligences, nor does it conform to the domain-specific principles.

9.3.2 Shaping Competence

In the 1980s, a trans-disciplinary research on "human-centred computer integrated manufacturing" put forward "developing competences for shaping the world of work and technology" (Corbett et al. 1988). This shaping-oriented guiding idea exerts a large influence on TVET development. It gradually matured by the efforts of reformist vocational educators represented by Rauner and Heidegger (Rauner 1995;

Heidegger et al. 1997), which was determined by the German parliament to be the guiding idea for TVET and was detailed in the Guidelines for Curriculum Development by the Culture Minister Conference (KMK 1991).

According to the shaping orientation concept, there is no deterministic relation among education, work and technology. There is shaping space between technology possibility and social demand. As an important education objective at a higher level, it enables learners "to shape the world of work and the society in the spirit of social acceptability and ecological compatibility" (KMK 1996; Rauner 1988). Shaping orientation encompasses two aspects:

- Education exerts an influence on social desire by multi-cultural orientation and can (participate to) shape technological development. TVET becomes an independent variable among technology, work and education. TVET should consciously promote a positive influence on development of work organisation and technology, and realise a paradigm change from adaptation orientation to shaping orientation.
- The goal of shaping-oriented learning is to satisfy enterprises' demands for both production quality and employees' innovative abilities through solving the characteristically professional tasks. Learning is not only limited to functional aspects but also takes technological development as a social process.

Gardner also explained the significance of shaping competence in his intelligence research: "I want my children to understand the world, …, My hope is that their insights enable them to change the world so that humans can lead a better life" (Gardner 2002, p. 217, cited from Rauner et al. 2012, p. 26).

Shaping orientation is also a reflection to the demand of reconstruction in companies and serves as a structural change of TVET system targeting at the world of work (Kern and Schumann 1984). It manifests a compromise between technological possibility and economic, social, ecological benefits and values.

Since the late twentieth century, the "complete action mode" theory has shown immense value in the TVET practice and has become a guiding theory for teaching–learning arrangement (Pampus 1987; Yang 2004, p. 256). Shaping orientation is a further development of the action orientation concept. It provides a tool and ideas not only for TVET reform, but also apposes refined labour division (Heidegger et al. 1997). It exerts an important influence on TVET teachers training, innovative TVET research as well as research on cultural and regional development (Fischer et al. 2001) and lays a theoretical foundation for establishment for vocational discipline and development of modern vocation pedagogy (Bannwitz and Rauner 1993).

Due to the influence of traditional TVET concepts, there is still a long way to go to realise shaping-oriented TVET completely, because technology determinism still dominates the minds of people worldwide. TVET is at the stage of passively responding to technological development; people place high hopes on elite innovative competence yet pay little attention to shaping competences of skilled workers.

9.4 Competence Assessment Research as a Conclusion

It can be summarised that competence understanding has a number of deficiencies in the TVET research and practice. One of the reasons is scarcity of empirical survey although many 'in-depth' theoretical debates have been conducted. Theoretical research and empirical survey are closely related to each other. If solid competence research is expected to be implemented, there should be a breakthrough in the empirical research (Haasler and Erpenbeck 2008).

Research on professional competence measurement is particularly of significance because of:

- Demand for management: Core parameters for TVET development can be acquired by professional competence measurement. It can improve the level of quality control for TVET system.
- Demand from practice: Teachers need sufficient education theory based, empirically tested competence measurement approaches. It can help them to analyse teaching arrangement and problems emerging from the TVET practice.
- Demand from international comparison research: Large-scale diagnosis can provide empirical basis for international comparison similar to World Skills and the OECD's Programme for International Student Assessment (PISA). It can support all stakeholders of TVET to conduct constructive dialogue and cooperation (Rauner 2008).

There are many approaches and tools for competence measurement in the area of human resources development. They are mainly aimed at staff recruitment and job design, some of which are developed into marketised programmes or online assessment tools. The ICA assessment tool developed by the Swedish labour psychologist, for instance, is employed to assess competence on the basis of work experience (Lantz and Friedrich 2003); Germany adopts standard questionnaires based on self-evaluation to measure social and method competence. Kasseler-Competence-Raster (Kauffeld 2002) and the Assessment Centre (Schuler 2006) introduce activity model by outside observers' assessment on individuals; America's Behaviour event interview (BED) analyses the approach of competence structure for specific occupation (McClelland 1973); China's public servants' entrance examination employs written tests to measure administrative competence (http://www.gwyksw.com).

Based on the aforesaid approaches some data surely can be collected. But the academic community has different views on these approaches because of methodological limitations. The dominant criticisms are: these approaches are employed to assess competences independent of the work process and work situation, while expertise research shows that competence can only be indirectly evaluated in a special context or by work action (Röben 2001). McClelland holds that competence measurement cannot predict complex work and performance of high-level work as it is often unjustifiable to disadvantaged groups like ethnic minorities (McClelland 1973). Research also shows that these competence measurements lack sufficient

validity (Seyfried 1995); they are high in cost and do not exert any influence on companies and on real practical work (Haasler and Erpenbeck 2008, p. 768). The assessed abstract competence contributes also very little to solve complex educational problems and to develop intelligence (Maag Merki 2008, p. 522).

With the development of technology and work organisation, vocational work is featured with unpredictability, which poses an immense challenge to identification and measurement of professional competence. Without support from mature theories, competence measurement is of little significance (Erpenbeck and von Rosenstiel 2003). Because competence is an internal treasure which is difficult to measure directly, observation is the only way to know whether somebody is competent to solve problems in a difficult situation. But observation is a method that cannot accurately evaluate social reality, it is impossible to measure professional competence, but only diagnostics can be conducted on it (Rauner 2008).

Through professional competence diagnostics, we can evaluate whether the education objectives of TVET have been attained. The precondition of competence diagnostic is competence model and measurement model based on modern pedagogical and psychometrical theory. The COMET international competence assessment project led by Rauner has made progress in many aspects (see Rauner et al. 2012).

The COMET project established a three-dimensional competence model according to the concept of action orientation (Bader 1989; Czycholl and Ebner 1995), the theory of developmental task and development logic curricula (Havighurst 1972; Rauner 1999, Benner 1995), the novice–expert paradigm (Dreyfus and Dreyfus 1986) and the concept of work process knowledge (Boreham et al. 2002; Fischer and Rauner 2002; Kruse 1985), which is widely acknowledged in expertise research and vocational pedagogy. The development of professional competence can be explained by three dimensions:

- Level of competence: functional competence, process competence, holistic shaping competence;
- Learning areas: (1) knowledge for orientation and overview/orienting work tasks, (2) integrated knowledge/systemic work task, (3) knowledge of details and functions/problem-oriented, special work tasks, (4) experiential and systematic in-depth knowledge/unpredictable work tasks;
- Action dimension: inform, plan, decide, implementation, control, evaluation (Rauner et al. 2012, p. 51).

The practice has shown that the COMET competence model and assessment concept can diagnose the quality and efficiency of vocational education and serve as direct support for teachers' teaching design as well (Rauner 2008, 2011; Zhuang and Zhao 2012). The model is featured with good trans-occupational domain and trans-culture (see Rauner et al. (2012) for further information).

To be sure, professional competence assessment by scientific standards (validity, reliability and effectiveness) needs further research, diagnostic research on concrete and individual professional competence and on implicit professional knowledge in particular.

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Chapter 10
Curriculum Research

Zhiqun Zhao

Abstract There are different geneses and focuses of TVET curriculum research in different countries and cultures. In the U.S., there are at least three research fields with significant impacts on TVET curriculum research: the theoretical research on general education curriculum; the practice of DACUM and the expertise research. The research results in Germany are fruitful and have rather limited impact on other countries due to the language barrier. There are many problems in TVET curriculum development practices in developing countries lacking solid theoretical basis. This contribution focuses TVET curriculum research, which is categorised into three models: curriculum with theory and practice in parallel (TPP); curriculum with theory in the service of practice (TSP); and integrated curriculum between theory and practice (ITP). Occupational research and qualification research are explained as two empirical bases of TVET curriculum development. It also compares two popular occupation analysis tools in the TVET curriculum development: DACUM and EXWOWO.

10.1 Theoretical Basis of Curriculum and Curriculum Development

10.1.1 Definition

10.1.1.1 Curriculum

The term curriculum which originates from Latin basically means 'the action of running'. Curriculum is not only a static object but also a dynamic process; it is the learning 'track' designed for students, the 'running process' of students on this

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track and the individual learning experience. Curriculum is interpreted from different perspectives. For instance, it was understood as a teaching subject or a learning result (Bobbitt 1918); affected by the Pragmatic Theory, it was also explained as the experience gained by learners during the education process and their understanding of such experience (Hass 1987). According to Block, curriculum is a prearranged knowledge system and the method of dissemination of such knowledge system (Block 1998), which means learning plan for learners designed by educational institutions for achieving the educational goals. In general, the understandings of curriculum can be divided into two categories: one considers curriculum as a prescription, which is predictive, while determining what should happen in the future; the other considers curriculum as experience, which is retrospective and focused on things happened during the courses (Ellis 2004).

The different interpretations of curriculum show that curriculum is a complicated concept with ambiguous meanings. This directly reflects the complexity of curriculum research. In fact, the birth of every new definition indicates a different development of curriculum research (Zhong et al. 2008). Since the late twentieth century, the following development trends of vocational education curriculum have emerged:

- Competence orientation: traditional curriculum, especially in school education system, has been systematically focusing on the knowledge of scientific or technological disciplines, such that the connection between learning and working is not tight. Currently, the development of professional competence has been regarded as the orientation of curriculum development in many countries, even though there are different understandings of competence (Röben 2008; Sandberg 2000; Chen et al. 2009).
- Focus on long-term career development: The curriculum based on job requirements is facing huge challenges due to the changed world of work. With the popularisation of the concept of lifelong learning, the promotion of career development and situated learning regarding modern apprenticeship have become an important task of modern curriculum (Barabasch and Rauner 2009; Grubb and Lazerson 2009).
- Focus on the connection between learning and work: Along with the change of work organisation, the connection between vocational learning and work process has become even tighter. The acquisition of work process knowledge can be achieved only through case learning in workplace and during work process. The work place has become an important venue of learning again (Pätzold and Rauner 2006; Billett 2001; Cunningham et al. 2004).

10.1.1.2 Curriculum Development and Curriculum Design

Curriculum development is the activity and process of continuous determination and improvement of curriculum in order to meet the requirements of social, economic and technological developments. In English language, similar terms adopted in the history are curriculum making, curriculum building and curriculum

construction. In 1971, the Japanese Ministry of Education and OECD have jointly defined the term of curriculum development as "the entity of a series of operating process of making, experiment and verification of curriculum—improvement—repeated making, experiment and verification of curriculum" (Zhong 1989, p. 320). Curriculum development is often referred to as curriculum design, yet there is subtle difference between them: the curriculum design refers to the confirmation of objectives and content, while curriculum development also includes the implementation and evaluation of curriculum (Xu 2005).

The design of vocational education curriculum is the feasibility study with respect to the objectives, content, structure and evaluation criteria of vocational education. The major questions to be answered here are: what are the requirements for occupational qualification? What kind of curriculum structure can better achieve this goal? Nölker and Schoenfeldt have divided the development process of vocational education curriculum into two interconnected systems: one is the explanation and justification, which is the research on occupational qualification including situation analysis, preconditions analysis, didactic analysis, objectives of learning and training; and the other is the implementation and evaluation, which include organisation of learning and training, teaching practice and evaluation (1980, p. 92). Curriculum is not only the framework of action for teaching and learning, but also the system composed of teachers, students and learning resources in the specific learning situation. Therefore, curriculum development also includes the entire system of learning resources and quality assurance (Australian National Training Authority 2003). This article mainly discusses curriculum model and the methodology of curriculum development in vocational education.

10.1.2 Curriculum Model of Vocational Education

There are multiple classification approaches for the curriculum models in vocational education (Huisinga 2005; Huang 2001; Xu 2008). The handling of relationship between theoretical and practical learning has always been a core issue in the discussion about vocational education curriculum. The practice of vocational education curriculum development is in large part the practice of handling the relationship between theoretical and practical learning. It reflects the variation of understandings about curriculum and vocational education. In accordance with the relationship between theory and practice, the vocational education curriculum can be divided into three types: curriculum with theory and practice in parallel (TPP); curriculum with theory in the service of practice (TSP); and integrated curriculum between theory and practice (ITP).

10.1.2.1 The Curriculum with Theory and Practice in Parallel

The traditional (school-based) vocational education curriculum has been established surrounding two centres, e.g. 'teaching of knowledge' and 'skill training'.

There are relatively independent two systems for teaching of theory and skill training, the coordination between its content and time plan is not be pursued, or cannot be pursued. Among them, the theory courses are usually divided into general courses, basic specialised courses and specialised courses. In China, this is called 'three-stage curriculum' (Lei and Guo 1994). This kind of curriculum of 'theory and practice in parallel' (TPP) has reflected the idea of 'parallel curriculum' of Foshay (1968), where students are expected to explore and solve practical problems in reality at work during the learning of system knowledge (Liao and Tian 2003). The features of TPP Curriculum are:

- emphasis on completeness and systematism of knowledge and focus on reproduction, understanding, verification and memorising of theoretical knowledge;
- the content of theoretical learning is the result of didactical reduction with respect to knowledge with 'fact' and 'symbol' as the main forms of presentation without direct connection with work situation (Rauner 1986);
- practical teaching emphasises on operation techniques and skills, there is a lack of learning in real work process.

Determining the contents of vocational education here is the transformation of the discipline-specific knowledge generated by the sciences into teaching and learning contents. Schön criticises this concept of deriving practical knowledge from science: 'This concept of "applications" leads to a view of professional knowledge as a hierarchy in which 'general principles' occupy the highest level and 'concrete problem solving' the lowest' (Schön 1983; quoted from Rauner 2008, p. 366).

TPP Curriculum must also face the following problems which are difficult to solve:

- without treating 'work' as an entity, the complete understanding of work cannot be developed, the corresponding work experience cannot be obtained;
- teaching-learning process focuses on the infusing knowledge and training of skills while neglecting the values of discovery learning and action learning such that in the end the highest level of professional cognitive competence cannot be developed;
- students of vocational education are not good at the deductive learning approaches based on abstract thinking, they are facing extreme difficulty in theoretical learning out of the work situation and also cannot realise the knowledge transfer.

In practices, schools usually focused on the knowledge learning or they failed to conduct in-depth work practice due to the lack of equipments, facilities and organisational conditions, thus overlooked the practical experience. It is difficult for them to achieve the educational idealism of 'self-realisation' of parallel curriculum proposed by Foshay.

10.1.2.2 The Curriculum with Theory in the Service of Practice

Vocational education should first meet the utilitarian requirements of the economy. There is identical or similar guiding ideology of curriculum development in most countries, which is the identification of qualification requirements, curriculum objectives and learning content based on demand analysis of the labour market, occupational and work analysis. The most typical examples are the concept of the Competence-Based Education (CBE) originated in North America and the closely related DACUM curriculum development method (Norton 1997). Starting from the job requirements, CBE/DACUM has regarded knowledge learning as the supporting measures for skill learning and the basis for competence development with no requirements of quantity and systematism of theoretical knowledge, thus forming the curriculum type of 'theory in the service of practice' (TSP). The widespread slogan "Theoretical knowledge should be adequate for application" in China is a good portrayal of the pursuit of such curriculum (CBE Expert Group 1993; Lv 2011).

TSP Curriculum regards learning as a simple process between input and output and the competence development as the top down transfer in accordance with the willingness of educator/trainer. It emphasises on the enhancement of qualification achieved through accumulation of knowledge and skills, focuses on the observable changes in behaviour. This is directly related to the Behaviorial Learning Theory (Hager 1995). The basic assumption of the TSP curriculum concept is that practical knowledge as it appears in professional work is interpreted as being applied scientific knowledge. "This widespread common sense theory rules which seek to transform theoretical knowledge into the language of users in the domains of work, to exemplify it with reference to specific contexts, and to transfer this knowledge by means of inductive learning methods" (Rauner 2008, p. 366). The impacts of tacit knowledge and tacit skills on the development of professional competence have been neglected here (Polanyi 1966).

The ultimate goal of TSP curriculum is to meet the job requirements, it has neglected the 'educational goals', e.g. the development of professional cognitive competence and the requirements of integration between theory and practice. There is also problem with the modern learning theories, e.g. situated learning and constructivism (Lave and Wenger 1991; Gagnon and Collay 2006). In spite of this, the TSP curriculum has received promotions in a wide range. For instance, CBE was introduced into China at the end of last century through international cooperation programmes with Canada, the World Bank and other donors. The guiding idea of CBE is generally in practice used to replace the traditional knowledge based vocational education. It almost initiated a revolution against traditional curriculum, when reform was taken to make a vocational education system oriented towards the economy need. The idea of "Theory in service of practice" is contradictory to the traditional Chinese Confucian Culture of 'knowledge accumulation is superior to practice'. Therefore, it has fundamentally changed the relationship between theory and practice and thereby determined the new position of 'practice is more important than theory'.

10.1.2.3 The Curriculum with Integration Between Theory and Practice

In today's world, technology and social development have entered a human-oriented era, the holistic development of labourer has been increasingly important (Ott 1995). Effective learning is the cognition and reflection of students with respect to the tasks, processes and contexts in work situations, based on which the acquisition of knowledge and skill, process and method, attitude and value. In order to achieve this goal, the curriculum design should be conducted in order to find the proper carrier of learning content to allow students to not only learn knowledge and skills, but also obtain professional identity and method competence during work process and situations and eventually develop shaping competence (KMK 1991; Rauner 1995; Heidegger et al. 1997), which requires the learning by doing using both brain and hands and action oriented learning based on integration of theory and practice (Dewey 1916; Czycholl and Ebner 1995). Thus the relationship between theory and practice must be explored at a higher level.

Since the end of last century, people have done a lot of attempts in the aspect of integrated curriculum between theory and practice (ITP). In China, project teaching has been promoted as a kind of curriculum model (Xu 2008). For example, in 2003 the Ministry of Education (MoE) has begun emphasising the teaching content as knowledge and skills in work process with experience nature which are required by actual work with 'core teaching and training projects' by launching a pilot programme through improving the education quality to deal with the shortage of skilled personnel while replacing traditional (discipline) curriculum (MoE and MoC 2004).

The implementation of learning field curriculum has begun in Germany in 1997. Learning filed is the specialised teaching unit based on competence in form of 'action field', is a kind of occupational activity field through instructional design (KMK 1996; Sloane 2001). The purpose of learning field is to promote the development of professional action competence, which is mentioned as individuals' decent and suitable reflection under specific occupation, society and private context and the willingness and capability responsible for individuals and the society (KMK 2000). The features of learning field can be summarised as:

- curriculum objective is development of holistic professional competence, where students can obtain the development of professional cognitive competence while obtaining the occupation qualification;
- the learning content is the professional task, is not (direct) corresponding with discipline knowledge;
- the learning process is equipped with the work process, where students can conduct learning and thinking in comprehensive actions.

Starting from the world of work, the ITP curriculum helps to understand the connection between knowledge and work, to obtain the work process knowledge and context awareness (Kruse 1986; Fischer 2000), it could realise the unification of action, perception and emotion and the return of curriculum from the world of science back to the world of work. From the perspective of learning theory, ITP

curriculum is in line with constructivism, situated learning and action orientation, should be the direction in the future.

In recent years, curricula in form of learning field have been generally accepted in vocational education in China, especially the curriculum reform of higher vocational education. People believe that it is in compliance with the guide lines of work process and shaping orientation and may realise a holistic development of cognitive strategy and action competence of learners (Jiang 2006). However, the practice shows that there are still many difficulties in the large-scale promotion of ITP curriculum, the most important among them is that vocational education institutions lack the understanding about the significance of 'educational value' of vocational education. In addition, the high and comprehensive requirements of ITP curriculum have surpassed the qualification average level of teachers. The implementation process of the ITP curricula has broken the traditional management of school education (e.g., classroom principle, independent organisation of theoretical and practical teaching) thus posing the challenge against existing teaching arrangement (ITB and ISB 2004; Zhao 2008).

10.2 Empirical Basis of Vocational Education Curriculum Development I: Occupational Research

The understanding of vocation is one of the important basis of vocational education curriculum. Occupational research is a fundamental work of curriculum research, including the occupational classification research based on employment management policy and practice and the academic research related to associated disciplines, e.g., researches in the fields of (vocational) pedagogy, human resources management and sociology. As an interdisciplinary research field, the academic status of occupational research is not high because of the squeezing by the traditional disciplines. This is reflected by the facts of no specialised academic journals, and the small number of researchers and influential research achievements.

The focuses of occupational research related to vocational education curriculum are work, working process, changes of the world of work and its revelation of vocational education. The purpose is to obtain the basic data of qualifications, occupational profile, programme setting, teaching design and evaluation of learning effect. The results of occupational research can provide empirical basis to curriculum development, are also an important foundation for formulating vocational education policies.

10.2.1 Definition of Occupation

Occupation is "the classification of social work engaged by employee for acquiring the main source of income" (National work committee for Occupational Classification and Qualification 1999, p. 9). The meanings of occupation/vocation

in a modern society is complicated, while it is understood differently in different cultures. For example, the German term of occupation (Beruf) can be translated into different English terms in different occasions, e.g., vocation, occupation, profession, trade, job and career. In Anglo-Saxon culture, the meaning of occupation/vocation is not specifically clear. For example, in the related research, the 'work organised in the form of occupation' is not an explicit topic (Donkin 2010). International academic community sometimes believes that occupation is a kind of typical German phenomenon (Dostal 2008). In Germany, the original meaning of occupation is to fix a person's life to a certain social status by God's delegation. M. Luther was the earliest to use vocation to refer to conventional work such that the vocation/occupation has evolved from the religious "God-given duty" into the important foundation of social structure. Today, the vocational education in Germany is still carried out in accordance with "training vocation" (Ausbildungsberuf). China is the country with earlier recording of occupation/vocation (zhiye). However, except for a small number of literatures related to apprentices' activities, occupation/vocation has not been the main topic of any social science research. The different understandings of occupation/vocation have reflected different characteristics of social structures thus leading to deep impacts on the development of vocational education curriculum.

Along with the development of technology and society, the changes in the world of work have triggered a lot of discussions. Some sociologists believe that occupation is not suitable for the requirements of rapid social development and comprehensive work missions thus losing the original significance. In the U.S., the vocational education is being replaced by career education. Some even think that occupation is only a humanly retained concept in labour market and vocational education (Baethge and Baethge-Kinsky 1998). There are also scholars against such an 'anti-occupation' point of view because not all professional developments of works are heading toward the academic directions. The development emphasising high quality 'practical work' is also an important trend of professionalisation (Dostal 2008; Mieg 2008).

Chinese vocational college/school education is organised in accordance with the 'specialty' (zhuanye), but the connection between specialty and occupation is not very clear. For example, the names of specialties are usually based on specific objects (e.g. roads and bridges), production and operation activities (e.g. electric operation and control), or specialised technology (e.g. electronic and information technologies). They are rarely named after the occupation. The consequence of this kind of 'specialty education' is: students are lacking the understanding of 'occupation' such that it is difficult to establish the sense of occupational identity. If we compare the results of the large-scale diagnostic of vocational college students based on P.J. Meyer's commitment scale (Meyer et al. 1993), career commitment and vocational commitment scale of Blau (1988) with the German control group, it appears that Chinese students cannot specify the difference between the sense of occupation commitment and work ethic (Rauner u.a. 2008; Yang and Zhao 2010).

The establishment of awareness of 'occupation' and the clarification of relationship between specialty and occupation have fundamental significance for the

development of vocational education curriculum. This means the identification of occupational profile through the research on occupation and associated technologically and social issues. Currently, the enhanced comprehension and flexibility of work have led to increased focuses on process and shaping competence, and tacit knowledge in addition to job requirements. It has posed challenges to the methods of occupational research. People can no longer describe occupations simply through the analysis on job skills. Instead, more focuses have been put on the 'secondary factors' of an occupation (career development, working environment, autonomy etc.) and social functionalities of occupations, e.g., the establishment of social equality and occupational identity (Ranuer 2004b; Dostal 2008).

10.2.2 Research on Occupational Classification

Occupational classification is the basis for specialty setting of vocational education. Under the conditions of labour market backgrounds in different countries, the evolvement, development and specific content of occupation can be very different, they can be reflected in the occupational classification system in a country. The International Labor Organization has established the International Classifications of Occupations (ISCO) since 1923. Based on four levels, the new version of 'ISCO-08' has divided occupation into 10 major groups, 43 sub-major groups, 125 minor groups and 436 unit groups (ILO 2012). Along with the development of globalisation of labour market, the occupational classification has been developed into an international research field (Petersen 2008) and provides statistical data for the labour markets. It also provides a empirical foundation for the specialty settings of vocational education. For example, the 'nationally recognised training occupation' in Germany is the specialty of vocational education itself, thus establishing the direct relationship between specialty and occupation. The number of training occupations in Germany is generally around 350. The "Regulatory training instruments" of every training occupation established the national curriculum of vocational education, including the name of training occupation, the duration of training, the content of training and the test requirements (www.bibb.de).

Some countries have established their own classification systems based on the ISCO. For example, the structure of Chinese occupational classification system is basically consistent with the ISCO structure, just the quantity of each level may be different (National work committee for Occupational Classification and Qualification 1999). The Standard Occupational Classification system (SOC) of US revised in 2010 includes 23 major groups, 97 sub-major groups, 461 minor groups and 840 unit groups (SOC 2012). This is not exactly identical to the ISCO structure because different classification criteria have been adopted. According to the suggestions by Munford et al., the U.S. Department of Labor has established the occupational database O*NET as the important basis for curriculum development (Peterson et al. 2001). O*NET has provided the information of tasks, activities and the requirements of any occupation, and described six aspects

(worker characteristics, worker requirements, experience requirements, occupational requirements, workforce characteristics and occupational specific information) of occupation from four dimensions (worker-oriented, cross occupation, occupation specific, job-oriented). (Online, http://www.onetcenter.org)

The occupational classification system has provided government, organisation and individual users with a common platform of work and information, but the occupational classification systems of different countries have different functionalities. For example, the main functionality of SOC is to provide information service to government, private institution and individual with respect to re-employment of unemployed staff, occupation choice by college students and restructuring of job positions in company (Pollack et. al. 2002). The "Nationally recognized training occupation directory" in Germany is the basis with legal status for the implementation of vocational education. The occupational classification system in China is an integral part of the national qualification administration system. However, in all countries the researches on occupational classification have provided assistance with different scopes and extents with respect to development of vocational education curriculum.

Occupational research is a relatively new topic in the field of vocational education. The promotion of work-oriented concept and the increased complexity of labour market have made people realise the importance of occupational research. With the participation by researchers from other disciplines, e.g. psychology and economics, people now have begun to focus on the methodology of occupational research, thus leading to the emergence of deeper and quantitative researches (Dostal 2008; Rauner 2000; Pahl 2013). However, due to the weak research infrastructure, e.g., the lack of qualified research staff, research institutions and research culture, it remains a huge challenge to achieve breakthrough anytime soon.

10.3 Empirical Basis of Curriculum Development II: Qualification Research

The basis of work-oriented vocational education curriculum is qualification requirements. The occupational qualification (simplified as qualification) is the indication of competence or potential which can be utilised during vocational activities and can be obtained through learning, which refers to the requirements for finishing a task, or the systematic combination of professional task and the competence to be learned (Hartung et al. 1981; Hartig and Klieme 2006). The qualification research is analysing the work in form of vocation, the qualification required by work, the task of occupation and the relationship between the objectives, learning content and curriculum structure of vocational education (Becker and Meifort 2004; Rauner 2004b). There are two major objects of qualification research. One is the relationship between social development and qualification, the other is the content and structural of occupational qualification. They are closely

related to the social and political systems and economic and technological developments in different countries.

Even though the relationship between social development and qualification is not the focal point of curriculum research, the result of such research has a direct impact on the guiding ideology of curriculum development. The traditional guideline of qualification research is the 'autonomous technology', which means the identification of qualification requirements in accordance with the 'materiality of technology'. Currently, people are looking at the relationship between social development and qualification from more aspects. The indication of this turning point is the publishing of the report 'The Machine that Changed the World' of Womack et al. (1990), where the work organisation and the division of work have become important factors and paths for optimising qualification.

Nonetheless, the inspiration of identifying qualification requirement variation still comes from the sentiment toward technology development. For example, the exploration of the consequence of information technology application has always been the hot topic of qualification research with the well-known publication, e.g., 'Being Digital' by Negroponte (1996). In China, this research topic has been expanded to almost all technical fields. The MoE in China has pointed out in the curriculum development guidance that "attention must be paid to the latest corporate technology development for timely adjustment of course setting and teaching content" (MoE 2011). This has also confirmed the significance of qualification research with respect to vocational education, especially to the curriculum development.

10.3.1 The Qualification Research in Classical Discipline

The objects of qualification research include the variation of work and occupation, the early recognition of qualification and occupation requirements, analytical and systematic treatments for typical professional tasks, work processes and methods, design of relationship between work and learning, occupational qualification and professional competence (Spöttl and Lewis 2008). In the field of curriculum development, the mission of qualification research is to clarify the relationship between work, qualification requirements and learning content. This relationship is vague in most cases and need a strong methodological guidance. The horizontal division of work in the modern society has been gradually weakened, the accurate analysis, evaluation, measurement and summary of work behaviours have become more and more difficult, and the reliability of analytical results based on traditional methods of work study has become lower and lower. Scientific research methods and tools have become even more important for the quality of qualification research.

10.3.1.1 The Qualification Research of Vocational Pedagogy

The mission of qualification research in vocational pedagogy is to reveal the connection between content and form of vocational education in order to

determine the teaching-learning content. Different educators have emphasised on different priorities for learning content. For examples, Robinsohn has proposed education should be able to provide competent life skill (Robinsohn 1967); Dewey believed that vocational education is not merely the tool for economic development, and emphasised that what learners should learn is an occupation worthy of life-long dedication instead of just a job for the wages (Dewey 1916), the well-known Chinese vocational educator Y. Huang said that the vocational education should seek enhancement of work performance and the recognition and rapid development of nature and talent of worker (Cheng 2006, p. 221). These ideologies have led to impacts on the selection of learning content in the practices of vocational education.

In different vocational education systems, missions assumed by vocational education institutions are different, so are the focuses on qualification researches. For example, in the German vocational education based on the dual system, the mission of learning in vocational school is to (in the part of theory) make up for the lack of training in company, which is to take care of the part of occupation-related learning content left by the company (Lipsmeier 1995). Therefore, qualification research was not the priority of vocational pedagogy research. However, along with the introduction of work process-oriented concept, since the end of previous century (Dybowski et al. 1993; Bremer and Jagla 2000; Fischer and Rauner 2002; Jenewein et al. 2004), and the implementation of curriculum in form of learning field, the qualification research has gradually become a focus of vocational (technological) didactics research, based on which even a new discipline has been developed, which is called occupational discipline (Bannwitz and Rauner 1993; Pahl and Rauner 1998; Pahl and Volkmar 2010).

Currently, the lack of uniform curriculum plan for vocational school/college in China has forced schools/colleges to conduct some qualification researches with different scopes and depths such that the qualification research and curriculum development have been developed into an integrated process. However, without reasonable methodology, the quality of such research is a problem.

In the past, people have placed more emphasis on the competence requirements in the fields of cognitive and skills with the lack of focus on mental skills. Since the latter part of last century, the researches on sentiment areas and social competence have been gradually emphasised. As a result, certain seemingly contradictory terms have emerged, e.g., extra-functional qualification, key qualifications and core skills. Even though they are not directly related to specific occupation, they can actually lead to important promotion of professional development (Mertens 1974; Clement 2003). Currently many investigations have been conducted by the qualification researches of vocational pedagogy for figuring out the measures for integrating these inter-occupation qualifications into the vocational education (Klein 1990; OSTA 2007).

10.3.1.2 Psychological Qualification Research

Psychological qualification research is increasingly turning towards the subjective dimension of qualification requirements, inclusive job analysis and work analysis. Schultz and Schultz have differentiated job analysis from work analysis by considering the former as using specialised terms to describe the nature of task composition implemented by workers, and the latter as the research on certain task and technology in order to ensure worker to move from one work to another. They have summarised the main methods for work analysis, e.g., interviews, questionnaires, direct observation, systematic activity logs and critical incidents (2004, p. 53). The latest research results have been mostly reflected in the systematic development of those tools for work analysis and evaluation. Dybowski etc. has divided these tools into three categories including:

- For the analysis of job tasks: the Job Diagnostic Survey (JDS), the subjective work analyses and subjective task analyses, the investigation of regulation requirements and obstacles, the stress related work analysis and the Task Analysis Inventory (TAI);
- For the assessment of job tasks: criteria of feasibility, tolerability, reasonableness and satisfaction; the task assessment system (TBS); the contrastive task analysis (KABA) for design recommendations for the supporting application of ICT;
- For the design of work tasks: criteria of work design with extensible leeway for flexible actions and autonomous decisions, promotion of prospective work design, concepts of task extension, alternative approaches to human-centred work and technology design (Dybowski et al. 1993, p. 145).

Overall, the results of analyses on mental behaviours of works in company have not led to too much contribution and impacts on vocational education due to the lack of focus on the content of work in detail. The conclusions drawn according to these standardised analytical procedure are either too abstract or with more significant individual differences such that they cannot be used to determine the specific work content, nor can they provide strong support to curriculum development (Frieling 1995; Rauner 2008).

10.3.1.3 The Qualification Research of Sociology

The qualification research carried out in the fields of industrial sociology has analysed the work as a social phenomenon. It is closely tied to the qualification research in curriculum development because of identical research objects, e.g., work content, qualification requirements and division of work. The analysis results are also the detailed descriptions of works. However, the purposes of these two kinds of researches are different from each other: the former is aimed at the design and organisation of work process as the basis of occupational development, while

the latter is for determination of learning content as the basis of vocational education and training.

In the 1970s and 1980s, studies on the transformation of skilled work led to a considerable deepening of the debate on dequalification. Littek et al. (1982) point out that sociological qualification research has the aim "to develop, on the basis of the work situation in the enterprise, analytically relevant levels and dimensions for an understanding of the social structure of work in our society. These instruments might well be used as a means of structuring important aspects of the work process, but the abstract formulation of the items is inadequate for the analysis and evaluation of concrete work contents" (quoted from Rauner 2008, p. 369).

Although the qualification research of sociology cannot provide enough empirical basis for curriculum development, it still provides important inspiration and analytical tools for the qualification research in curriculum development. In the German Sociological Association (Gesellschaft für Arbeitswissenschaft, GfA), a specialised branch has been established to solve the problem of contents in cooperation between work studies and technical occupational disciplines.

It should be pointed out that social and cultural factors have important influences on the determination of occupational qualification and corresponding work evaluation. For example, the deeply rooted traditional Confucian thoughts have led to severe concept of feudal official position occupation such that the administrative directives and administrative levels tend to be more important than specialised occupation qualification in practices.

10.3.2 Qualification Research of Vocational Disciplines

In curriculum development, the purpose of qualification research is to solve the problem of 'content of professional work'. This is a field of inter-disciplinary and comprehensive researches with high requirements and a lot of difficult problems to be solved, e.g., the determination, explanation and classification of specialised occupational requirements, and the determination, analysis and description of professional tasks and work processes for converting them into the curriculum in line with vocational learning rules. Late in the last century, along with the establishment and development of vocational discipline, qualification research has officially become the important research content of vocational disciplines (Hangzhou Declaration 2005; Bannwitz and Rauner 1993; Pätzold and Rauner 2006).

A series of research methods and tools have been developed for qualification research on the research results of vocational disciplines, vocational didactics and work study. They are based on the combination of quantitative and qualitative research (e.g., expert worker workshop and scenario forecast) with the consideration of impact of subjective characteristics (Pahl and Rauner 1998; Rauner 2004b; Neuweg and Putz 2008). The core of qualification research in vocational discipline is to identify professional tasks and to clarify the work and business process. Becker has classified these methods by four levels:

- Sector analysis. The literature analysis is usually adopted for the analysis on typical job positions, tools and tasks of certain occupation in the entire sector in order to determine the standard for case selection.
- Case study. The representative enterprise is selected for observing and recording of production or business process. The best practice of work process design, work division and problem-solving can be found through interviews in order to identify the gap between current status and ideal situation.
- Study of work. It is also known as work analysis or task analysis and is focused on analysing the relationship between technology, work and education by frequently referencing the research methods for relevant fields, e.g., expertise researches, education anthropology research and implicit knowledge research.
- Expert worker workshop. This is a occupational analysis procedure through analysing professional tasks with two purposes: one is to describe vocational work in the form of professional task, the other is to divide the level of difficulties of these tasks for curriculum design (Becker 2000; Becker and Meifort 2004).

The results of qualification research are basic data for curriculum development and for the evaluation of vocational education. But the competence structure of researchers have influence to the result. By comparing the research of different research staff with different backgrounds (e.g., industrial psychologists, engineers and teachers) with respect to the same occupation, Rauner has found that the correctness and accuracy of research results can only be assured when the researchers are capable of speaking the languages of workers and explaining the observed professional behaviours from the professional perspective (2004a).

10.3.3 Occupation Analysis Tools in the Curriculum Development

By late last century, a terminology system of the vocational education curriculum development and systematic occupational analysis tools have been gradually established. Two kinds of development approach have been found in the practice: one is the 'authoritative qualification research procedure' conducted by administrative organisations, while the other is the occupation and work analysis method (frequently) conducted by vocational education institutions, the typical examples are the methods of DACUM (Developing a Curriculum) and EXWOWO (Expert Worker Workshop).

10.3.3.1 Qualification Research Procedure and Framework for Curriculum Development

In China, the main part of the vocational education system is vocational school/college, yet the researches on specialty setting and curriculum development for

these vocational schools/colleges have been rather weak with almost no systematic and operable methodology and procedure (Lei 2005). As late as 2003, the MoE and five other related Ministries have begun the exploration of developing technical procedures for vocational education curriculum in a national pilot programme to train the skilled personnel in manufacturing and modern services (Zhao 2004). At the same time, some local governments have also begun the establishment of local curriculum development procedures. The influential example is the research on 'Model of teaching standard development for secondary vocational education in Shanghai' (Office Teaching-learning Research Shanghai 2011). Based on the project 'Researches on occupation development trend and national occupation classification system', the formal Chinese Ministry of Labor has begun discussing the issues of establishing methodological standards for curriculum development with the following specific objectives:

- Assisting vocational institutions in specialty setting to meet the requirements of labour market and economy development;
- Developing curriculum in line with the law of occupational development and corresponding to national occupational standards;
- Shaping of learning situation and learning process in favour of the growth of skilled talents;
- Based on which the administrative authority can conduct simple and effective quality control over curriculum development and implementation in vocational education (OSTA 2006).

The research on establishment of curriculum development procedure does not take place in China only. According to the Vocational Education Act in Germany, all vocational education curriculum developments are conducted by the Federal Institute of Vocational Education (BIBB) according to a national authoritative qualification research procedure, which is called OQF (Ordnungsbezogene Qualifikationsforschung) in Germany. From a legal perspective, it is almost impossible for other institutions and schools to have any impact on the methodology (Rauner 2005; Rauner 2000). After the practices for more than half a century, the OQF procedure has been almost perfect, which is summarised by Benner into four steps:

- Overview of problems: collection of data related to technological, economic and social development; observation of situation of work and vocational education; submission of working hypothesis;
- Case study: investigating selected job and position, identifying the depth and breadth of work content and requirements, determining structural division of knowledge, skills and attitudes.
- Work analysis: extensive survey conducted with respect to the requirements for occupational activities in order to obtain basic data related to training content and structure.
- Evaluation and development of curriculum: selection of learning content with time and arrangement, development of draft curriculum for review and approval including name of occupation, structure, content, training duration (1996, p. 59).

According to Becker the OQF qualification research could be divided into three fields, i.e. qualification state research, qualification application research and qualification development research (Becker and Meifort 2004). The research on qualification existence is analysis of the content and structure of vocational education based on statistics, relevant publications and existing curricula (Rahmenausbildungsplan), which is of great significance for perfection of curriculum. Strictly speaking, the OQF procedure in Germany is not purely a scientific research method, but with a certain degree of political consultation. It is essentially the coordination mechanism between both employers and employees, federal ministries and the KMK of states. This procedure is mainly a process of data collection. The product of such occupational qualification is a result of political compromise among all interest groups rather than a result of scientific research, because it has neglected the 'quality' aspect. The legitimacy of the qualification content cannot be assured, making the OQF procedure only a 'semi-scientific method' (Rauner 2004b).

The authoritative qualification research/curriculum development procedure should control over the working method and quality of all aspects of curriculum development including occupational analysis, curriculum design, implementation and evaluation. At least two requirements have been proposed for the curriculum development methods:

- the occupation analysis should be focused on the relationship between technology, occupational activities and vocational education, and the work situations with complete work process;
- the procedure should be an open framework in order to meet the constantly changing requirements of economic, technological and social developments.

Currently, the Chinese Ministry of Human Resources and Social Security (MoLSS) has just developed "Guidelines for the Formulation of National Training Standards for Skilled Talents", which adopted the occupational analysis methods of professional task analysis/EXWOWO (Bremer and Jagla 2000; Kleiner et al. 2002; Reinhold et al. 2003; Zhao 2009) and included a series of specialised regulations and procedures with respect to the entire vocational education process (learning arrangement and environment, teaching staff and quality evaluation etc.) (MoLSS 2013). The Guidelines also have the characteristics of semi-scientific method, in spite of great effort both in research and practice.

10.3.3.2 Method for Occupation and Work Analysis: DACUM

Practice shows that the conclusions drawn by researchers with different disciplinary backgrounds, with respect to the same research object, by adopting the same method according to the same procedure, will not necessarily be consistent (Drescher 1996; Rauner 2004a). Researchers can only try to reduce their distances from research objects (being in the working process) and to achieve the balance between 'proximity' and 'estrangement' in order to ensure the quality of research (Heinemann

2008). This is an indication that 'authoritative qualification research procedure' alone is not enough. It has to be combined with high quality work analysis method in order to meet the scientific requirements of qualification research.

The researches on work analysis methods can be traced back to the study of work carried out by Gilbreth (1911). The popularisation of Taylor's "Principles of Scientific Management" (1919) has led to the widely utilisation of the method. Bobbitt (1918) was the earliest to use this method for curriculum development. He has divided human activities into several fields for conducting analysis in order to indentify the objective and content of curriculum. The frequent adoption of work analysis method during the practices of curriculum development is directly related to the promotion of competency-based training (CBT) concept. The first studies on this topic were conducted in the U.S. Army in the 1950s (Miller 1953; Davies 1973). For enhancing the diagnosis quality of qualification and inclination in occupational guidance, Molle (1965) has introduced the concept of occupational analysis as the theoretical basis in curriculum development (quoted from Rauner 2008, p. 365).

The influential occupation and task analysis in North America as the basic method of curriculum development is the DACUM, which was developed by Canadian experts and systematically improved by R. Norton at Ohio State University and introduced in many countries (Norton 1997). DACUM is a process of objective treatment for the subjective judgment by any practice expert. The result of DACUM, -DACUM chart, represents the empirical basis for CBE and for the 'instructional development' based on CBE.

In the international discussion of vocational education, there is a huge difference between understanding and utilisation of the term 'competence' (refer to Chap. 9). According to the DACUM, competence is regarded as the skill, knowledge and attitude for accomplishing work tasks which can be observed, confirmed and described. The sum of all these 'primary factors of occupation' is the entity of an occupation. This kind of approach based on behaviourism has neglected the internal connection between factors, which is the holistic characteristics and experience element of human work. It also has difficulty in focusing on the "sustainable development" (Buch and Frieling 2004). "The responsibility for the success of the learning process lies predominantly with the learner, and the learning process itself is subordinate to the successful learning outcome. For the educational standards, the content-related specifications are only of secondary importance" (Rauner 2008, p. 514).

DACUM did not provide theoretical basis and tools for systematic treatment of work analysis results. It has been indicated by practices that people tend to return to the old path following the "logical framework of discipline knowledge" while forming curses by classification of these competences. The curriculum development tool based on DACUM, "Systematic Curriculum and Instructional Development" (SCID) is mainly about refining the analytical design in the aspects of educational institutions and teaching factors without any essential change to the methodology (Norton 1999).

10.3.3.3 Professional Task (BAG) Analysis

The development of technology and work organisation has led to higher requirements on holistic competence of skilled workers. Work and job analysis should be conducted with respect to comprehensive tasks and flexible labor markets including technological, social and environmental factors. It is difficult for DACUM to meet all those requirements due to the lack of methodological and strategically learning concepts. Since the 1990s, along with the start of discussion about work process-related curriculum, people have begun the pursuit of more scientific work analysis methods which can properly describe and reflect the law of professional competence development. One of the most important results of these researches is the BAG method—professional task (Berufliche Aufgaben) analysis, developed by the Institute of Technology and Education at the University of Bremen (ITB), which is exemplified by occupational curricula structured according to the theory of developmental logic (Rauner and Kleiner 2004).

BAG is a continuation of Expert Workers Workshop (EXWOWO) adopted by DACUM for identifying work task through expert workers (Kleiner et al. 2002; Spöttl 2000). By introducing the concepts of development logic, work process knowledge and the latest results of expertise research, BAG is equipped with "professional competence of own peculiar quality" and raise the understanding of practical knowledge to a new level (Rauner 2002; Boreham et al. 2002). The EXWOWO adopted by BAG is different from the workshop of DACUM. It regards work as an entity by screening, analysing and dividing work tasks in accordance with the law of vocational development with the focuses on holism of work process.

The professional task with complete work process is the core of BAG, which is different from the task of DACUM or the competence unit in English culture. It is a working relationship which can be taught in an occupation and has not only the paradigmatically significance of the occupation, but also the ability to promote the development of professional cognitive competence. BAG has a solid foundation of learning theory, e.g., developmental task (Havighurst 1972), developmental logic curricula (Rauner 1999) and novice–expert paradigm (Dreyfus and Dreyfus 1986) etc.. In the U.S., Benner (1996) has indentified and described the paradigmatic work situations with respect to nurse education in accordance with similar approach. She has explained the practical knowledge (tacit knowledge) through six dimensions while providing theoretical basis for the work analysis of BAG. By conducting systematic treatment on "secondary factors" of occupation (career development, working environment etc.), BAG is capable of in-depth and overall control over occupational work, thus achieving the leap from work analysis to occupational analysis so as to meet the requirements of description of a modern occupation (Dostal 2008).

10.3.4 Summary and Outlook

Even though there is a long history and tradition for curriculum research, the curriculum research for vocational education is still a relatively new field. In different countries and cultures, there are different genesis and focuses of curriculum researches. For example, in the U.S. there are multiple origins of relevant researches and at least three research fields with significant impacts on world vocational education curriculum research:

- theoretical research on general (school education) curriculum;
- research and practice of curriculum development originated from human resource development with the core of DACUM method; and
- curriculum research and practice based on expertise research.

Interestingly, the interaction among these three fields is not significant. For example, there is no in-depth discussion and practice about the extremely rich and well-developed curriculum theory in vocational education. The DACUM method, with international influence, did not try to seek support from educational and curriculum theory, while the fruitful results of very high level expertise research have only led to rather limited impact on practices of curriculum development.

In English-speaking countries, e.g., Britain and Australia, due to the pursuit of competence-based vocational education and special understanding of "competence", the curriculum researches are mainly at practical level. The research on methodology built on the basis of pedagogical theory is still at start-up stage. However, with the worldwide influence of English language, the curriculum practices in these countries have led to significant impacts on other countries, especially those developing countries.

In Germany, the relevant researches have traditionally been conducted within the framework of vocational (technical) didactics and are very active. In many universities, there are institutes or professorship of vocational didactics. These researches have led to fruitful results and have reached international advanced level both theoretically and practically (Ott 1995; Schelten 1995). However, due to the language barrier, these results can only lead to rather limited impacts on other countries in the world. In the research area of vocational didactics, "curriculum" is merely a lower term without occupying any particular important place. Curriculum research has only gradually become an explicit topic along with the establishment and development of qualification research and vocational discipline in recent years, and the expansion and deepening of international cooperation in vocational education.

In developing countries such as China, people have learned curriculum theory from developed countries for conducting corresponding practices such that there are inclusive characteristics among relevant researches. However, the exchanges with developed countries sometimes work as a "double-edged sword". On one hand, researchers have acquired a lot of inspiration and tools for reducing the time of groping during practices in order to achieve results in a short period of time; on

the other hand, due to different research traditions and curriculum ideologies in developed countries such as the U.S. and Germany, researchers of different research and learning backgrounds have also encountered a lot of problems while carrying out their works based on their own knowledge. For example, there are different understandings of competence (Kompetenz) in English and German cultures, based on which curriculum concepts are rather different. It is difficult for scholars grown in these two backgrounds to carry out any effective cooperation. This will lead to certain negative impacts on the curriculum practices in developing countries lacking solid theoretically basis. These aforementioned issues could only be solved by enhancing exchanges among different cultures and research traditions.

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Chapter 11
Research Methods in Technical Vocational Education and Training

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Abstract TVET research is faced with the difficulty to justify and to develop an original research and development concept corresponding to the subject of research. Various interrelated research fields require a broad spectrum of TVET research methods. Since 1990s methodological discussion about the subject-related characteristics of TVET research and application of TVET research methods have been started. It showed that, when the research deals with the contents of occupational work and education, new subject-related research methods are needed. In this chapter, the authors present seven categories of research methods concretely: comprehension methods, survey methods, observation methods, case studies and studies of work, experimental methods, designing and developing methods, and evaluation methods. Particularly in the area of vocational scientific research, the subject-related research and development methods are of great importance.

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11.1 Introduction: Universal or Specific Vocational Research Methods for Technical Education and Training?

Although all relevant researchers largely agree on the fact that technical vocational education and training (TVET) has no such thing as *the one and only* research method by means of which all important issues could be solved (Rauner 2005, p. 14; Neuweg and Putz 2008, p. 699), there is a controversy about whether the research methods applied in TVET should be universal like, for example, the conventional methods of empirical social research, or rather very specific and "subject-oriented" (Rauner 2008a, p. 117) or even occupation-related (cf. Rauner 2008b, p. 703 et seq.). This controversy can only be discussed reasonably if one takes a look at the relevant objects of research in TVET and the possibly related research objectives. Concerning the respective objects of research, we wish to follow-up on a proposal made some time ago for vocational education and training (VET) research in general which, in our opinion, also applies to TVET (Fischer 2003a). According to this, VET research first deals with the practice of employment, second with the practice of the related training and advanced training, and third with the question as to which conclusions are drawn from these analyses as regards education programs and how these conclusions affect the shaping of work, technology, and education.

11.1.1 First Research Area: Practice of Employment

VET research, among other things, investigates the practice of employment. Studying changes in work processes and in demands on work and looking into the question as to how employees can meet these changed demands, answers are found as to which competences are required in the working world.

11.1.2 Second Research Area: Practice of Initial and Continuing VET (BIBB)

Second, VET research investigates the practice of initial and continuing VET. Assessing the basic conditions and general requirements of the VET system, VET planning and curriculum development, training and teaching processes, action by teachers and training supervisors, students, and apprentices, the respective studies determine the skills to be taught through the training system and the competences acquired actually by learners.

11.1.3 Third Research Area: Reflection Range of Education Programs and Shaping of Work, Technology, and Education

Finally, the double practical relevance of VET research is discussed regarding the conclusions to be drawn from it for training programs. The answer to the issue of such conclusions neither directly results from the practice of existing employment nor from the practice of existing VET. The conclusions lead up to research into the shaping of the relationship between work, technology, and education.

Traditionally, the second research area, i.e., analysis and shaping of initial and continuing VET, was and still is in the focus of VET research. First of all, research in that field means research into general and technical didactics: Teaching and learning processes are investigated and optimized with respect to successful learning. But what is understood by successful learning as related to initial and continuing VET*?*

This question points to the above-mentioned first research area, the domain of employment. Irrespective of which further (education) targets are associated with initial and continuing VET, the objective of these latter options is to qualify for that domain. Work contents, thus, must be analyzed as precisely as to allow to synthesize from them contents of initial and continuing VET.

VET research, in particular in technical domains, is confronted with the specific difficulty that the contents of the competences to be achieved are not mainly of a general nature (as for example mathematical/scientific skills) but are much more subject to technical/organizational changes and social shaping. VET research that is related to work and technology deals with contents of teaching and learning that are rather different from those dealt with by, e.g., didactic research in physics. Instead of coping with physical facts whose validity is proven or must be proved theoretically and experimentally, a concrete technology always represents a compromise between economic interests, legal regulations, anticipated user expectations, and the like. If the diverging interests can be condensed, so to speak, into a purpose and then be operationalized as one specification (that is technically feasible), technology will be resulting from the process of concretion of that very purpose. In view of the above, research into the contents and forms of technical work and training has nothing to do with “right” or “wrong” but with always changing, more or less appropriate and alternative techniques and objects of labor. Neither the techniques as such nor the working systems are given as fixed reference parameters. The subject of VET consists in both the existing working reality and the working reality that still remains to be structured and developed. Having said this, one gets to consider the third field of research which studies how a future working reality should look like.

Research into TVET, hence, investigates

- the world of vocational work,
- the domain of initial and continuing VET related to that world, and

- the domain of development, enactment, and administration of occupations or vocational work.

Research into VET and vocational sciences intends to establish connections between the above three fields. Hence, each of these fields is a subject of knowledge of VET and vocational sciences. Skilled workers and managers, apprentices and trainers, students and teachers, university students and professors, education administrators, social partners, and politicians are the related subjects of action.

The above three areas of research bring about a broad spectrum of research methods because VET research in general and technology-related VET research in particular are considered (Rauner 2005, p. 561)

- research into human sciences if emphasis is on the development of the personality of the learning person,
- socioscientific research if emphasis is on individuals, organizations, and institutions in employment and on the related training and advanced training processes,
- subject-specific or occupational-related research if the emphasis is on work and education in particular professional domains.

This means that none of the methods within the range of human, social, subject-specific, and educational scientific research is being excluded. "Anything goes!" (Feyerabend 1995). Comprehension and surveying methods may be as relevant as observation methods, experimental methods, designing and developing, or evaluation methods. Whereas Feyerabend (1995) opposed to a constraint of methods, today's maxim is rather based on a pluralism of paradigms where empirical-analytical and hermeneutic methods are understood as complementary approaches to research.

Though if one just says that the respective method must suit the subject, one takes the easy way out and doing so, one would ignore that the subject of knowledge *can as well be constituted* by the method or by methodological considerations.

For example, the subject of knowledge "learning (germ. = Lernen)" (understood as a *change in behavior* as distinguished from a *gain in knowledge*) has been brought forth by the behaviorist method dealing with measuring observable behavior. The subject of knowledge "occupation (germ. Beruf)", at least in its present form in the German-speaking countries, is also constituted by the methods of government-guided research into education and training regulations. This at least requires reflection on each method's suitability for the respective subject of knowledge.

Let us start by taking a look at hermeneutics, the methods of comprehension or understanding: Empirical-analytical scientists (who are representatives of modern empiricism) reject hermeneutic methods by arguing that understanding is neither necessary nor sufficient if not even unscientific for not being linked to anything observable. But it can be proved, however, that even the empiricists' approaches

(the finding of correlations for the occurrence of phenomena) are based on (partially unacknowledged) processes of comprehension, i.e.,

- understanding of the community of researchers (studies of issues that are interpreted as being scientifically relevant),
- understanding of the subjects of knowledge (studies of phenomena that are relevant to human action are preferred over random studies of arbitrary correlations between phenomena),
- understanding of language and images (analyses of texts, documents, images, and sometimes situations which themselves require interpretation).

However, if explaining depends on comprehension anyway, it is important not to discredit it as a research method but harness it in such a way that it eventually consists in more than just an *arbitrary/subjective* reconstruction of phenomena. Conversely, understanding remains rather bland and "ivory-towery" if it does not deal at all with the phenomena of the real world, i.e., with empirical data.

Those dedicated to research into TVET are required to understand the sense of human action that cannot be directly understood neither by acting individuals nor by researchers. If the sense of action was understood completely by the respective individual, it could be simply communicated to the researcher as a conversational partner. If, conversely, the researcher would from the first understand the immanent logic of action, that logic, too, would just have to be communicated to the acting individual or anyone else. In both cases, research would be largely unnecessary. Since—or if—this is not the case, the inner logic must be found by reconstruction. It is assumed in that case that factually, mentally, and linguistically, the acting individuals are aware of only part of the logic of their actions. They are not aware, more or less, of the social powers that behind their backs perform their action, of the rules incorporated in their action, and of the process of integration of knowledge into (competent) action (Polanyi 1958, 1966; Neuweg 1998, 1999, 2004; Fischer 2010a, b).

The rules, in a very broad sense, the actions of individuals that follow are assessed together with the relevant significant contexts. The concept behind such rules implies that the individual does not act completely accidentally but instead gives its actions—as implicit reflexes and explicit reflections of given social and material conditions—intentions while following certain interests. In doing so, more or less competent action is achieved and the results of that action are evaluated. The concept of context assumes that the learned rules of action must be "situated" by the individual, which means that they have to be communicated together with the concrete material and social work requirements in a working partnership which again may have retroactive effects on the learned repertoire of actions.

The results to be found by the researcher are based on hypotheses or questions that arise from the knowledge of the state of science and the knowledge of the action situation to be analyzed. This means that the researcher must understand which rules, in practice, are followed by the community of researchers if he does not want to be considered unscientific. Besides, he must have acquired a

preliminary understanding of the rules of practice to know which open questions to be posed to science do result from practice.

It follows from the above that the domain of research into TVET is basically open to hermeneutical and empirical, qualitative and quantitative research methods. The differing relevances of these methods result from the object of and interest in knowledge the latter of which is constituted, among other things, by scientific and social practice. To assess, for example, the quantity of advanced training made use of on average by skilled personnel, one can use the conventional interviewing techniques of empirical social research. Assessing the suitability of advanced training contents for a certain occupation by means of the same techniques, however, may yield only restricted results: Such research can document opinions but cannot assess their cogency or soundness. In the case of acquired competences or competences that still remain to be acquired, VET research is confronted with the difficulty that "vocational competence to act (germ. Berufliche Handlungskompetenz)" consist in the integration of knowledge toward the targeted goal of action and that the related process of integration proceeds largely implicitly (not necessarily consciously and in a difficult-to-verbalize way). Neither the acting individual nor an observer could specify, without much ado, the competences that the action is based on (see above). Although this does not really restrict standardized tests of knowledge, it limits the range of diagnoses of the vocational competence to act.

From the above view and to reflect the state of scientific and social practice, the specific significance of research methods is discussed on the basis of selected issues and research targets for which these methods are suited more or less.

It must be considered, however, that research quality criteria may differ in accordance with the selected method. In general, the quality criteria for application of research methods consist in objectivity, reliability, and validity (Häder 2010, p. 109 et seq.):

- Objectivity denotes that the research results obtained are independent of the person of the researcher. However, since researchers as persons in empirical social research always influence the experimental situation and are persons as researchers documenting and evaluating the research results, the objectivity requirement will be met through the observance of certain rules that the researcher needs to follow.
- Reliability denotes the scope and measure of the reliability of research results: using the same analytical instruments, it must be possible to reproduce the same and equally precise result at any time.
- Validity refers to the validity of the research results and, thus, deals with the question whether what was meant to be communicated has been communicated actually. One differentiates among validity of contents (can facts to be assessed, e.g., vocational competence to act and not only mathematical competence, be assessed completely by means of the respective analytical tool?), validity of criteria (can facts to be assessed be represented not only through the respective analytical tool but also through one or several external criteria, e.g., do

vocational aptitude tests reflect the actually achieved vocational success?), and construct validity (can facts to be assessed be traced back to a joint origin, e.g., can vocational competence to act be attributed to the concurrence of "professional, methodical and social competences (germ. Fach,- Methoden- und Sozialkompetenz)".

The observance of these quality criteria is not independent of the respective assumed theoretical relationship and the respective chosen research paradigm. For some researchers, it may be opportune to, e.g., break down the construct of vocational competence to act into diverse partial constructs for reasons of exact measurability. After statistically measuring the respective values of these partial constructs, they are reassembled, so to speak, into an individual-related vocational competence to act. A contrary position would be to think that vocational competence to act is revealed only when cooperating with other working persons in real working life and could thus be observed only in real action ("in actu") in the working world ("in situ"). While, when following the first above position, one would try to eliminate as "disturbing variables" all variables that are opposed to a precise measurement of the construct to be determined (e.g., "operation" or "other employees"), it is these very "disturbing variables" which in accordance with the last-mentioned position would be constitutive for the vocational competence to act. Research methods, thus, must be related to the respective assumed theory.

Besides referring to the analysis of current statuses, argumentation must consider research methods that investigate the development of nominal conditions. As described above, VET research is by no means limited to analyses of occupational work and initial and continuing VET. Similarly, to medicine or engineering sciences, VET research deals with the question as to which scientific methods can bring about nominal states, i.e., as to how educational program conclusions can be drawn from current-state analyses and lead to the shaping of work, technology, and education. Such methods comprise the anticipation and design of future development. Research, for example, focuses on the social construction of professions and of methods of curriculum development.

11.2 Comprehension Methods

As mentioned initially, processes of comprehension are indispensable for gaining scientific knowledge. Methods of understanding, based on independent research strategies, hence have a long tradition but also are important in today's VET research. In the context under review, we would like to outline two significant fields of application: historical and international comparative VET research. Based loosely on Kant's philosophy, it is true for both areas of research that any knowledge depends on the interaction between perception and idea.

11.2.1 Areas of Research Based on Comprehension Methods

Regarding the relevance and standards of *historical VET research*, Zabeck (2009, p. 2) can be cited for a first general statement: Irrespective of whether scientific interest is primarily focused on the "description of certain given facts" or on "their theoretical linking" or whether the intention behind it is "sense finding and sense orientation," or "solving formation problems", it will always come across facts and things that have become historical and it will always have to use historically burdened terms and concepts. In view of this, it is also indispensable for VET research "that it assures itself of its conditions, issues, and instruments quite thoroughly, i.e., while considering its origin and development."

Only against such a background can specific questions such as whether technical training can be assigned an educational value in a way that can be justified by vocational training or whether "Bildung im Medium des Berufs" ("education in the medium of occupation") (Kutscha 2009) is possible at all be answered. This is equally true for understanding the genesis of the dual system of VET in the German-speaking countries. Without reconstructing its complex historical social development, neither the special form of organization nor the specific functionality of this training model can be understood (cf. Greinert 1995). As a matter of fact, even the assessment of the efficiency of model project needs to orient itself on judgment criteria which have been derived from a specific historical cultural context (cf. Sloane 2006).

Internationally comparable VET research is a second very heterogeneous field of application for comprehension methods. Long before the increase in the political importance of transnational interdependencies, "foreign countries have been significant arguments in the discussion of the educational reform" (Zymek 1975). For a longtime, the interest in gaining knowledge in the area of comparative VET research has been focusing on the relationship between vocational training and social, and in particular, economic development (cf. Lauterbach 2005; Deißinger 2001; Georg 2005). Via the "detour" of comparison with experiences in other countries, the researchers hope to find explanations in two respects: First, they assume to gain deeper insight into the nature of the underlying problem in their own society. Second, they believe to gain insight into the impacts of reform measures by means of a "natural quasi-experiment" (cf. Georg 1997, p. 164). However, as is generally known, the main difficulty of comparative research is in the definition of criteria by use of which cultural or national conditions can be compared without inducing misunderstandings and systematic biases by mere selection and operationalization of the reference criteria. According to general belief, finding a suitable "*tertium comparationis*" is the more difficult, the more complex the reference object. For example, it makes only little sense to differentiate between vocational and general education in countries (e.g., in the USA) where mainly advanced-training institutions and universities are responsible for vocational qualification. Also the contents of seemingly less complex constructs such as "vocational education", "vocational training," or "technical education"

can only be concretized by considering differentiated context information (cf. Lauterbach 2005, p. 45). All efforts to obtain a context-transcending scientific terminology where different structures of different countries can be described at a meta-level are hardly suited to solve the basic problem of comparative analytical categories. "Any attempt at defining representative categories always already contains a cultural projection. Using categories such as competence, qualification, or profession, seemingly identical social phenomena become reference objects whose differentness is measured by standards that are bound to the national-social and institutional-disciplinary context of the comparing person" (Georg 2000, p. 182). In connection with the development of the European Qualification Framework (EQF), it is, therefore, particularly difficult to develop an understanding of vocational competence which regarding linguistic, semantic, and functional equivalence can represent a suitable compromise throughout Europe (cf. Brockmann et al. 2011). The determination of reference criteria covering all contexts turns out to be a central challenge to comparative VET research.

11.2.2 Dialectics, Hermeneutics, Phenomenology

Due to the particular initial situation and cognitive interest, the two areas of research outlined above often use methods that are attributed to qualitative or interpretative social research. These research methods mainly feed on the source of the history of ideas of hermeneutics, which since ancient times has been considered a special method for the logical interpretation of significant written documents (mythologies, legal texts, historical sources). As the idea of thus obtaining different textual versions or achieving comprehensions of dogmatic validity was overcome, several variants of a scientific hermeneutics developed at the modern universities (cf. Geldsetzer 1992). Under the general term of "geisteswissenschaftliche Pädagogik" (humanities pedagogy) three trends have developed in German educational science: phenomenology, hermeneutics (as related to educational science), and dialectics (cf. Danner 1989). To get to the core of matters, phenomenological research describes the facts to be investigated with as little as possible heed to the conditions that may be involved. Hermeneutic research intends to extract comprehensive information from the object of research and interpret it in several stages so as to infer a meaning. Dialectic research practice contrasts competing positions with the objective of overcoming immanent objections so that they can remain visible in syntheses but are resolved anyhow both theoretically and practically. In spite of all these differences in detail, these three research trends can be summarized methodologically into one historical-hermeneutic paradigm whose joint objective is not anymore ultimate justification but the intersubjective and argumentative interpretation of the real and given facts. In this respect, the historical-hermeneutic is by all means consistent with the empirical-analytical paradigm. As opposed to research methods trying to "explain" the nature of empirical facts and the probability relations between them,

the historical-hermeneutic methods are characterized by a cognitive practice that tries to "understand" the sense and meaning hidden below the empirical-tangible surface. In line with this, the main interest of the hermeneutic methods is neither in having quantifying (standardized) access to the object of research nor in the detection of nomothetic relationships. By trying to allow for the individual particularity of the research object, these methods are rather oriented toward the holistic reconstruction of the research object's complexity and multidimensionality. Methods of understanding primarily serve to collect nonnumerical and nonstandardized data and to explain them or convert them through multistage interpretation into information. Provided that priority has been given to the meaning and not to the quantitative value of the information gathered, assessment methods such as these for some years have been referred to as "qualitative methods" in the German-speaking countries (cf. Mayring 2002, p. 9 et seq.; Flick 2009, p. 22 et seq.). Mainly in the human and social sciences, and in interdisciplinary and explorative projects in particular, these methods are applied selectively for generating hypotheses and developing theories. So far, however, there has been no widely accepted canon as regards qualitative methods. The main assessment methods that are treated as such in most of the relevant handbooks are: Participating observation (cf. 4), qualitative interviews (cf. 3), and qualitative content analysis. Since, when doing qualitative research, the line between data collection and data analysis may be blurred (e.g., in the case of participating observation), special forms or hybrid forms can be developed depending on the respective question (cf. Bortz and Döring 2006, p. 307).

The basic material that is collected and evaluated using different techniques and is "made to tell its story" in the pure sense of classical hermeneutics can look differently. Besides all types of texts (including transcribed interview recordings and observation protocols), one finds audio-visual recordings, photos, or tape protocols as well as artwork, and museum exhibits. The systematic interpretation of the information contained in these different representations of social reality (data carriers) basically follows the same pattern, i.e., the so-called hermeneutic circle (cf. Danner 1989, p. 55). Based on a hypothetical or preliminary comprehension feeding on the previous knowledge, the assumptions, and expectations of the researcher, a first understanding is developed in a first step of theoretical pervasion. Mostly, this leads to the awareness that a comprehensive understanding demands further context information or investigations on questions of detail. In the light of additional information, the basic material is screened for a second time. Screening is repeated until the interpreting person is convinced to have determined all relevant relationships and have understood all their contents and meanings. This is where the comprehension methods meet with the criticism that as soon as the circle of interpretation is interrupted, it is the subjective opinion of the interpreting person that counts. In the current discussion, this criticism is tackled by developing methods and quality criteria for findings obtained by interpretation (cf. Flick 2009, p. 487 et seq.; Mayring 2002, p. 140 et seq.). For our purposes, it suffices to point out two strategies which for assuring objectivity in the context of VET research have already been tried out several times. First, the "communicative

and argumentative validation" of interpretations. Using this strategy, the findings obtained are checked for their tenability/acceptability in discussions with the respective persons or the argumentative plausibility and logic of the relevant interpretations are verified in expert talks. Second, the method of "triangulation" where the interpreting person tries to support or contrast his or her interpretation by referring to results from other data sources. In that way, a combination of different research methods, findings of other research projects, and differing theoretical perspectives can contribute to objectifying and accentuating one's own interpretation.

11.2.3 Content Analysis Methods

Content analysis has a long tradition and is still used very frequently today in the context of historical and comparative VET research. Mainly textual communications are analyzed for content and for formal aspects to derive conclusions about nonlinguistic personal or (socio-) structural facts. In that way, information about the significance and nature of conventional sectorial technical means for work can be derived from historical documents as regards the organization and shaping of education in certain professions (curricula, examination regulations, etc.). In the same way, information about different country-specific or cross-national relationships between educational and occupational systems can be inferred from reports from countries struggling with the problem of unemployment among young people. Besides textual communications, information carriers such as video recordings and images can be analyzed for contents. Before being analyzed, nonlinguistic contents of communication are mostly transferred into text form. If content analysis is mainly applied to existing contents of communication, it is understood primarily as a method of evaluating rather than as a method of collecting data (e.g., in the case of translation into speech data). Both as regards its quantitative and qualitative characteristics, content analysis, is thus in the group of the nonreactive research methods like, for example, standardized questionnaires (Atteslander 2010).

It was not before the second half or the twentieth century that *qualitative content analysis* developed into an analytical method accepted as such by modern science (Merten 1995). The decisive factor in that development, strongly influenced by linguistics and by communication research, was the criticism of the conception of content analysis as a quantifying method for the "systematic, intersubjectively comprehensible description of the form and content of communications" (Früh 1998, p. 24). The criticism of formal frequency and contingency analyses focuses on the insufficient consideration of contexts of speech (meanings vary depending on the statement context), the neglect of latent structures of meaning (difference between lexical and intended meaning), the neglect of distinctive individual terms and concepts, and the nonconsideration of facts that have not been broached in the analytical text (Ritsert 1972). Taking into consideration

quantitative analytical findings, the qualitative methods, therefore, follow a specific theoretical methodology and systematically interpret the text material within its context of communication and in due consideration of already existing findings. The different qualitative methods agree in so far as they do not relinquish the claim of systematic, methodologically controlled, and intersubjectively comprehensible content analysis. However, there are, indeed, different epistemological opinions as regards the fixing or generating of the analytical categories that have been used for analyzing the contents of communications. If these categories are fixed by means of deduction from the theoretical preliminary assumptions or the previous state of research, one incurs the risk of not recognizing "latent structures of meaning." If, on the other hand, one tries to obtain these categories inductively from the material to be analyzed, one incurs the risk of getting stuck with occasional statements or of infringing the principle of intersubjective plausibility while trying to generalize the insight won. In view of these very fundamental difficulties, research resorts to transparent, rule-governed analytical methods that again and again must stand the test and, in doing so, refers to the widely accepted compromise formula of paradigm pluralism.

The qualitative content analysis method most widely used in the German-speaking countries was developed about 30 years ago by Philipp Mayring and has been increasingly refined over the years. To proceed practically, Mayring developed a "general content analysis model" that systematically subdivides content analysis into nine substeps (2003, p. 54): 1. "Definition of material," 2. "Analysis of initial situation," 3. "Formal characterization of material," 4. "Orientation of analysis," 5. "Theoretical problem differentiation," 6. "Determination of analytical method(s) and definition of concrete model," 7. "Definition of analytical units," 8. "Analytical steps based on classification system (summary, explication, structuring)," and 9. "Interpretation of results with regard to initial question". Steps 1–7 elucidate and document the initial and basic conditions of text analysis. Step 8 stands out by its differentiating three "basic forms of interpretation": Summary, explication, and structuring (ibid., p. 58 et seq.). Summarizing content analysis mainly intends to reduce text amounts to essential contents by leaving out padded, illustrating, and redundant passages. Explaining content analysis aims to make use of text-immanent or cross-text context materials for better understanding of certain passages. Structuring content analysis filters certain structural aspects (distinctive text characteristics, judgments or preset coding rules) and applies them to the entire text.

Another content analysis method used in the German-speaking countries is referred to as "objective hermeneutics." Based on the differentiation between latent and subjective structures of meaning, underlying objective social structures are inferred from the interpretation of subjective (text) analyses. Similar to the sequential model developed by Mayring, the practical method of objective hermeneutics is based on a rule-governed, intersubjectively verifiable scheme of interpretation (Oevermann et al. 1979). Finally, it should be mentioned that numerous computer programs have been available for text analysis for several years. Most recently, one even finds programs that are suitable for qualitative

content analysis and facilitate considerably the time-consuming transcription and encoding of audio and video materials. In this regard, the question as to whether to proceed inductively or deductively when generating analytical categories is gaining in significance again.

11.3 Survey Methods

Depending on the respective kind of communication, one differentiates between three types of interviewing in the scientific context of empirical social research: Personal face-to-face interviews, interviews by phone, and written surveys. These three types differ by their individual degrees of structuring or standardization and may be located between completely structured (e.g., questionnaires) to unstructured/open (oral interviews) (Diekmann 2008, p. 437). According to the relevant research projects and objectives, different types of interviews can be made during one and the same study. In accordance with their different structuring degrees, these types of interviews can be classified by different forms of communication (Atteslander 2008, p. 122) (Table 11.1).

11.3.1 Questionnaires as a Quantitative Surveying Method

Surveying by means of written questionnaires is the most structured and standardized method of interviews. Questionnaire surveys are mostly used for studying attitudes or opinions, beliefs or value orientations, for evaluating persons or their behavior, or for assessing well-defined personality traits or socio-statistical characteristics. Written questionnaires, which belong to the quantitative surveying methods, are mainly used for surveying of a large basic population with comparatively little time and effort (Diekmann 2008, pp. 437/471; Porst 2011, p. 51).

In VET research, this surveying method can be used wherever quantitative data surveys are required. It is a suitable option for providing data and information on, e.g., the distribution of qualification structures within the society, the qualifications of certain groups of persons, for example, in technical fields the number of skilled personnel participating in professional training programs or the allocation function (Greinert 1995) of a society.

There are various conceivable *conceptions* for quantitative questionnaire surveying. Any written questionnaire has specific question-oriented characteristics. Basically, questionnaires must meet diverse quality criteria to fulfill the function of standardized measuring instruments with informative value. Objectivity through maximum standardization is the precondition for the instrument's reliability, and reliability is the crucial factor for validity (Mayer 2009, p. 89). The research design of written surveys involves the review of the measuring model, hypothesis formation, the construction of a surveying instrument, and the determination of the

Table 11.1 Types of interviews (cf. Atteslander 2008, p. 123)

Type of communication	Form of communication			
	Less structured	Semi-structured	High structured	
Oral	Informal talk Expert interview Group discussion	Manual-based talk Depth interview Group interview Expert survey	Face-to-face interview Survey by phone Group interview	Combined verbal and written form Personal/telephonic announcement of questionnaire distribution Dispatch or delivery of questionnaires Checking by phone, supplementary interview
Written	Informal target group inquiry	Expert survey	Postal survey Personal distribution, joint completion of forms	

evaluation method. The measuring model includes assumptions (hypotheses) about relationships between individual characteristics or variables. Moreover, it is essential to clearly define the object and objective of investigation to be able to evaluate the survey (Mayer 2009, p. 58 et seq.).

The *construction* of instruments for surveying depends on different aspects. Standardization during questionnaire construction can basically be achieved by formulating questions, fixing possible answers (i.e., defining scale levels), and establishing the order of question categories. Questionnaires can be constructed based on the following central questions: Should the relevant answer categories be closed, semi-open, or open? Will only single or also multiple nominations be possible? Should the scale be a verbalized or endpoint-defined one? Is an even or an odd scale used? Is the scale formulated in one or two dimensions? How many scale points are required? Is it a nominal, ordinal, or interval scale? How does the introductory page look like? What is the dramaturgy of the questionnaire? (Porst 2011, pp. 51 et seq., 69 et seq., 95 et seq.)

Prior to the overall survey, the questionnaire should be subjected to a pretest "assessing the comprehensibility of questions, the unambiguousness and completeness of the predetermined questions, and the duration of the interview" (Mayer 2006, p. 97). One differentiates between written, postal, and online interviews.

It is called a written survey if a group of interviewees attend the survey at the same time and fill in their questionnaires in the presence of the researcher or another person. In the case of postal interviews, where response rates may be lower, questionnaires are distributed by the post. Alternatively, computer-assisted surveys can be carried out via the Internet. Due to low costs, low time and effort, and an easier analysis and evaluation of the respective data, these so-called online surveys are becoming increasingly popular (Bortz and Döring 2006, p. 260 et seq.).

Standardized questionnaires can be *evaluated* using multivariant evaluation methods that are based on statistical programs, for example spreadsheet applications such as Excel or SPSS for statistical data analysis. To achieve correlations between variables, the interview answers are evaluated by means of factor analysis. Cluster analyses allow condensing and reducing the objects or units of analysis. Multiple regression analysis investigates the influence of several independent variables on one dependent variable (Mayer 2009, p. 154 et seq.). Qualitative data obtained from standardized survey questionnaires, e.g., open questions from a questionnaire, can be processed, for example, by means of MaxQDa, a program evaluating qualitative data through encoding processes.

The *advantages* of quantitative surveying methods are in a reduced expenditure of time and money and in the possibility of reaching a high number of test persons. Straight answers can be expected due to anonymity and an inhibition threshold that is lower than, e.g., during face-to-face surveys.

The *challenge* of written questionnaires is in their low impact on the interviewing situation. Questions ought to be intelligible and unambiguous because anonymity hardly allows interviewees to check with the interviewers. Care must

be taken to adapt questionnaires to the interviewees' verbalization capacity and literacy because otherwise questions may be answered incompletely, imprecisely, or not at all. Besides, it must be considered, in particular when making postal or computer-assisted surveys, that response rates may be in the range of 10–90 % (Porst 2011; Bortz and Döring 2006, p. 256).

In VET research and in other fields, the use of questionnaires always depends on the respective questions, the intended objectives, and the amount of new knowledge to be gained from a specific survey. Written questionnaires may be quite suitable for obtaining socio-statistical traits or behavior patterns, ratings or opinions from a basic population at low costs, and reduced resources.

11.3.2 Interviews as a Qualitative Surveying Method

Whereas quantitative questionnaires are referred to as strongly structured survey, qualitative interviews, or face-to-face surveys, are personal and partly structured or unstructured. Being highly reactive, these methods emphasize the *collection of verbal data*, *description of the development* of single or several cases, and the *context of experience* (Mayer 2009, p. 37). In addition, qualitative interviews, as compared to the written questionnaires, are moderately structured methods for assessing interrelations, memory and judgment, events and activities, personal information or personal facts, or for "supplementing the more standardized methods" (Schnell et al. 2011, p. 316).

VET research has various possible uses of interview-based surveying. Personal interviews can contribute to gaining knowledge on the motivation for participation in continuing VET programs or the quality of such programs, on the professional training or qualification demands of skilled personnel after implementation of new technologies or on safety engineering options in the case of accidents at work. Moreover, interviews, and mainly specialist interviews or expert interviews, serve to, e.g., reconstruct the operations and transactions by means of which one can describe activities within the work process. The data thus obtained are qualitatively significant and profound and require a certain expert knowledge on the part of the interviewer and interviewee.

The mostly verbal data within qualitative surveys can be obtained through *narrations (narrative interviews)* or *guideline-asissted interviews*. *Narrative interviews* are also referred to as less-structured interviews because they often focus on a single case and its development and on the context of experience. Although researchers have much scope while making such narrative interviews, they must invest a lot of time in supervision. Narrative interviewing is flexible and without any guidelines, i.e., there are no defined, structured, or standardized questions, and no predetermined line of action to be taken by the researcher. Narrative interviews intend to describe cases, i.e., to assess interviewees' contexts and structures of opinions (Atteslander 2010, p. 134 et seq.; Mayer 2009, p. 37 et seq.). The *guideline-asissted interviews* is also referred to as partially structured

interview for being prestructured by a list of central questions that increase the comparability of the collected data. Guided interviews serve to obtain concrete statements on certain facts or objects. The guideline serves as orientation without obligation to be strictly used during the interview. *Group interviews* are special forms of guided interviews with several participants. Besides, there are face-to-face and telephone interviews which differ by the forms of personal contact and the time and effort of interviewing.

VET research, in particular, can use further interviewing methods, e.g., *expert interviews* or *specialist interviews*. *Expert interviews* are special forms of guided interviews where interviewees are regarded as experts in certain fields of action rather than as persons. The interviewee can be considered to be representing a certain group. The interview relates to only one clearly defined section of reality (Mayer 2006, p. 38). *Specialist interviews* are, among others, part of work analysis within VET research. Research focuses on work and working process contents by reflecting the latter and regarding the interviewee as a specialist in his field of work and domain. Since also in the case of specialist interviews, interviewees are considered experts whose subjective opinions and attitudes are asked, it is not always easy to differentiate between expert interviews and specialist interviews (Niethammer 2006, p. 595). According to Becker (2006), specialist interviews in VET research are used to gain expert knowledge, hence are often referred to as expert interviews or, for being dialogic, expert talks. Nevertheless, Becker understands the specialist interviews "as special forms of expert interviews or expert talks which by determining the universe of discourse and cognitive interest differ in significance and application from other research traditions" (Becker 2006, p. 601; Deeke 1995, Rauner 1998 in Becker 2006, p. 601).

Regarding the development of guideline-assisted interviews in general, Schnell et al. (2011) differentiate between different forms of questioning. Questions as to interviewees' *attitudes and opinions* intend to find out about ratings, expectations, facts, or circumstances. Questions asking after the *beliefs* of persons want to assess the perception and appraisal of realities in the past, the present, or the future. Questions asking after the *behavior* are related to the actions and behavior patterns of the interviewees. Besides, questions asking after the character traits of persons aim to determine personal and demographic properties such as age, gender, profession, biography, etc. (Schnell et al. 2011, p. 319 et seq.).

Prior to *implementation* of a guideline-assisted interview, attention ought to be turned to the training and behavior of the interviewer. Engagement of several interviewers means to precisely instruct each one both as regards content, realization, and objective of the interview and as regards the behavior of the interviewer (Atteslander 2010, p. 136 et seq.). Also qualitative interviews should be preceded by a pretest to assess the intelligibility and unambiguousness of questions and the duration of the respective interviews. *Documentation* of the data can be done using an audiotape or videotape recorder or tasking a second person with minuting the interview. Besides, recording should be preceded in any case by a notice emphasizing that the interviewee and the statements made are anonymous.

Data that are collected on audiotapes are transcribed and evaluated subsequently (Mayer 2009, p. 46 et seq.).

The *evaluation* of the guided interviews always depends on the type of interview. In the case of predefined answers, for example, "yes" or "no,", or questions asked to obtain personal or socio-demographic traits or data, encoding or categorization can be done by use of data analysis programs or systems (e.g., Excel, MaxQDA). In the case of interviews without predefined answers, the collected data can be categorized by means of text transcriptions and be evaluated, for example, by means of qualitative content analysis according to Phillip Mayring (2003 or 2006) (see Sect. 11.2).

The *advantages* of qualitative interviewing methods are in their adaptability during surveying. In contrast to written questionnaires, interviews allow the interviewer to intervene at any time in the case of comprehension questions. In addition, interviewing situations stand out by a spontaneity that allows direct contact without delays and a different depth of questioning as compared to written questionnaires. Information thus can be gained faster and much more directly and direct reactions such as reflection or communicative verifying validation or specific findings can be taken into consideration.

The *challenge* of qualitative interviews is the avoidance of subjective distortions and influences from the interviewer. It is important to consider qualitative interviews as reactive measuring methods that focus on the interaction between interviewer and interviewee. This, however, involves the risk that the interviewing situation is getting influenced by one of these two actors either personally or by content and that information gathered may be manipulated. Another objection arises from the considerable time and effort of implementation and documentation (in particular in the case of face-to-face interviews). Depending on the degree of structuring, the evaluation of the data takes much time and uses up resources. Since it cannot be assumed that "the same interview made with the same person at another time or with the same person by, e.g., another interviewer yields the same result" (Kromrey 1995, p. 301; cf. Bortz and Döring 2006, p. 237), a critical view is taken of the degree to which the criteria quality, objectivity, reliability, and validity are met as compared to quantitative methods.

In view of the above, interviewing methods are important instruments in technical education that by asking and by documenting personal assessments and opinions on different universes of discourse obtain qualitative statements, profound findings, or data on processes and interrelations.

11.3.3 Group Discussions as a Qualitative Surveying Method

Group discussions are a further qualitative surveying method used in empirical social research. Such discussions must be differentiated from group interviews or group talks. While group interviews are just time-saving variants of face-to-face interviews and group talks intend to collect information without considering the

dynamics of a conversation, group discussions are clearly defined by their methodology and objectives (Loos and Schäffer 2001, p. 12 et seq.). "Group discussions, being communication situations that resemble daily routine, are an excellent basis for determining processes related to the social constitution of opinions and attitudes as well as interrelationships related to interpretation and action. All of these can be made accessible via contexts and meanings attributed to them by the participants because the situational conditions of group discussions come close to reality" (Lamnek 2005, p. 58 et seq.).

VET research uses qualitative surveying methods such as group discussions to gather insights and information gained by skilled workers or by persons involved in technical training. All of these data are expressed and reflected in their group dynamics. This method does not ask about individual personal aspects but deals with the development of opinions or solutions in a particular process of formation within the group. Group discussion can be used whenever one wants to initiate, assess, or evaluate new processes, e.g., the implementation of information systems for skilled workers or trainees. In addition, they are suitable for analyzing and pursuing work organization measures or didactic methods.

In discussions, for example, in an expert talk with several experts, issues can be clarified that cannot be addressed in written questionnaires and that create added value through the dynamics of group discussion (Flick 2009, p. 248 et seq.). Group discussion can be defined as a method "which externally initiates communication processes whose course and structure at least during certain phases come close to a "normal" conversation" (Loos and Schäffer 2001, p. 13). Group discussion is essentially determined by the *assessment of situational group opinions* (Lamnek 2005, p. 58). It is important to avoid studying the attitudes, opinions, and behaviors in an isolated way and instead to make the group a means of reconstructing individual opinions more appropriately. Qualitative group discussion, in addition, can be used to *analyze common problem constellations* in the group by identifying or defining a concrete (personal or content-related) problem that the group can solve in different ways during discussion. The initiation of discussion and the dynamics developing as it proceeds provide the source of insight.

Like all other empirical research methods, group discussion requires adequate preparation which is both related to theoretical foregoing considerations (in spite of openness as required methodologically) and to the methodological, methodical, and technical implications resulting from them (Lamnek 2005, p. 98). Similarly, to the guideline-assisted interview, group discussion may be based on a strongly or partially structured list of central questions guiding the discussion.

Planning of all stages of research involves the recruiting of project participants, planning of implementation, planning of the analysis of discussions, and planning of the presentation of results (ibid.). Flick (2009) suggests the moderator to explain the formal procedure at the beginning of the group discussion. Preliminaries such as these should cover expectations, topics, and tasks to be solved by the participants as well as a short round of introductions. The discussion may start by giving an incentive, e.g., by outlining the topic in interrogative form or in the form of provocative theses. If the discussion stagnates, becomes confusing or unclear, the

moderator returns to the central questions and thus keeps the discussion going (Flick 2009, p. 255 et seq.).

To capture the full scope of information, recording can be done using an audiotape or videotape recorder or by taking the minutes. *Evaluation* of the audiotape can be achieved through transcription. Analysis of the data collected during group discussion may be performed based on the following questions: how much time is allowed for evaluation? Which information and data are available? How are the data organized and structured? What kind of results are expected and in which form will results be presented and published? (Lamnek 2005, p. 177). Depending on the cognitive interest, different analytical methods can be chosen for data evaluation. In line with the respective cognitive interest, be it in the content, topic, or in group dynamics, the discussion can be evaluated descriptively, reductively, or explicatively. Content analysis methods, e.g., qualitative content analysis (Lamnek 2005, p. 178 et seq.; cf. qualitative content analysis according to Mayring in Sect. 11.2) are the most commonly used methods of evaluating minutes and transcriptions.

Group discussions are characterized by the *advantages* of openness, flexibility, and proximity to everyday conditions and by the possibility of gathering behavior-related, i.e., realistic attitudes and opinions. Their communicative and discursive character suggests strategies for modifying attitudes and behaviors (Lamnek 2005, pp. 58, 88; Dreher and Dreher 1994 in Flick 2009, p. 251 et seq.).

The *challenges* of group discussions are in dealing with participants and in the effectiveness of the surveying method. Just like interviewing, group discussion is a very time-consuming method that requires much organization and implementation effort also when evaluating data. Dealing with participants of group discussions is very demanding because one must give one's attention to several persons at a time. Conflicts impairing the group dynamics or gaining of insight during discussion may seriously affect the quality of statements.

Group discussion *adds value* to VET research by the possibility of pursuing constitution processes and representing exchange processes in their dynamics. In the case of topics such as system quality or work process quality, group discussions can adopt different perceptions qualitatively and make use of them to gain more insight.

11.4 Observation Methods

Watching and observing are part of our everyday lives: We may watch some person repairing a bike or paving a road. In everyday life, such perceptions do not have any scientific background and we do not think about what we might have to pay particular attention to. Observation in everyday life "serves the purpose of our orientation in the world" (Atteslander 2010, p. 73). In contrast, scientific observation aims to gather information about social phenomena and, unlike naïve and unreflected everyday watching, scientific observation is a target-orientated,

controlled, and systematic process (ibid., p. 73). Scientific observation is a complex, thoroughly challenging process which needs to be reflected. It is among today's basic methods of empirical social research and can be defined as the "direct registration of facts and circumstances relevant to research" (Häder 2006, p. 297). Observation, hence, is understood as a systematic, controlled, active process of perceiving incident, processes, and behaviors in a social context with the objective of collecting and interpreting relevant data. The observer himself becomes an instrument of perception. The method of observation does not serve to clear up attitudes, opinions, feelings, and causalities but to identify behaviors and, thus, assess "sensible perceptions of behavior at the time it occurs" (Atteslander 2010, p. 73).

Technical education makes use of the research method "observation" to assess vocatioal competence to act, which means more than a description of knowledge, e.g. practical skills in addition to pure knowledge. Hence, it is the method of choice for gathering information about competences through a person's performance.

In view of today's increasing demand for social competences, especially in the technical domain, observation proves to be a suitable method. Social competences such as communicative and cooperative competences like working in a team can be observed quite well. But also individual and methodical competences can be determined by observation. These facts are made use of during an occupational training in the field of process automation. Using a structured observation method, the professional, methodical, social, and individual competences of trainees and students are observed as they put into operation training facilities in operation, which consider both manufacturing as well as procedural aspects. It must be mentioned, however, that observation alone does not yet provide data or information as to the respective person's underlying knowledge. To meet scientific demands, both the actual performance and the knowledge it is based on should be determined. This can be done, for example, by means of a common reflection of the observed (Fischer 2010b, p. 155).

Scientific observation can be carried out in different ways. Depending on the object, interest, and objective of investigation, there are numerous variants of observation. The situation of observation, among other things, decides on whether one uses quantitative or qualitative methods (see Sect. 11.2). Any situation of observation can be subdivided into four interrelated categories: *Observation field*, *observation unit*, *observer*, and *observed persons* (Atteslander 2010, p. 80 et seq.). *Observation fields* inform about the frame conditions of an observation by defining the spatial and social aspects of observations, for example, the number and characteristics of participants and the time and location (e.g., the trainee workshop of a company) of an observation (l.c., p. 80 et seq., and Friedrichs and Lüdtke 1973, p. 51 et seq.). Training situations in the focus of observation are referred to as *observation units*, hence the concrete objects of observation. "Who and what (e.g., interactions, processes) is observed at what time?" (Atteslander 2010, p. 82). Being the third essential element, the *observer* is defined by his or her status which, among other things, is determined by the respective degree of passive or

Table 11.2 Forms of observation (Ziegler 2010 according to Kleber 1992 and Kanning et al. 2004)

Category	Forms of	Observation
Motive	Everyday observation	Scientific observation
Direction	Self-observation	Observation by others
Location	Field observation (natural)	Laboratory observation (artificial)
Distance	Participating observation	Nonparticipating observation
Transparency	Open observation	Covert observation
Structuredness	Structured observation	Unstructured observation

active participation. A low degree of participation (passive participation) means that the activity of the observer is restricted to observation and that he or she mostly keeps away from the action. A high degree of participation is obvious from the observer's active participation in the action (l.c., p. 83 et seq.). The role of the *observed person* is mainly determined by whether that person is aware of being observed and if yes, if that person knows the purpose of being observed. In the case of covert participant observation, actions must be disguised. If the test persons have been informed about the observation, the observer can move freely, observation forms can be used openly or cameras can be applied (l.c., p. 84 et seq.). The degree of specification of the elements of observation plays a rather fundamental role. Relatively clearly fixed elements allowing only little openness and flexibility are referred to as quantitative observations. In terms of qualitative research, the elements are relatively unspecific and the object of research may influence the observation (l.c., p. 80).

Table 11.2 shows the different dimensions used for characterizing scientific observations.

Besides differentiating everyday from scientific observation, one distinguishes between observation by others and self-observation. Current research mainly relies on observation by others, i.e., observation of an external situation or of the behavior and acting of a person by an external person. During self-observation or so-called introspection, persons, in contrast, observe themselves, for example, by keeping a diary (Bortz and Döring 2006, p. 324; Häder 2006, p. 302).

Yet another distinction can be made by the naturalness of the situation of observation. Observation can be carried out in a natural (field observation) or even artificial (laboratory observation) environment. Observations taking place in the natural environment of the person (e.g., workplace) are referred to as field observations. Laboratory observations, in contrast, take place in environments that are not found in everyday life and are suitable for constructing situations that seem to be significant to research (Häder 2006, p. 301 et seq.; Schnell et al. 2011, p. 383). The distinctive criterion of distance refers to the extreme poles of participating and nonparticipating observation. The respective observation methods are between these poles in practice. Whereas, during participating observation, the observer himself becomes part of the field of study, the researcher, as the

nonparticipating observer, is not involved directly but watches the situation from a neutral position (Greve and Wentura 1997, p. 28 et seq.). However, it must be mentioned that also nonparticipating observers, if staying in the room or lab, are perceived by the test persons. Since this may influence the situation, it seems to make sense to differentiate between active and passive observation (Atteslander 2010, p. 83 et seq.).

The degree to which the researcher influences the research result depends on whether observation is open or covert. The advantage of covert observation, where the observed person is not aware of being observed, is that results are not falsified through the presence of the observer. This method, however, raises ethical-moral and legal questions (Borchardt and Götlich 2007, p. 40 et seq.). During open observation, where the respective person is being informed of being observed, awareness of being observed may have a decisive influence. In most cases, however, the test person soon gets used to the situation and the impact on results decreases (Kanning et al. 2004, p. 62 et seq.).

The distinctive criterion of structuredness varies from unstructured (nonstandardized) to strongly structured (standardized) conditions. Structured observation is based on a concrete observation plan that defines exactly the subject, time, and location of observation, and the recording method. The categories to be observed must be precisely defined in advance to avoid that the observer interprets the situation outside of the given observation plan. Unstructured observation dispenses with a strict observation plan. On the one hand, low structuring degrees allow consideration of the particular features of a situation. On the other hand, low structuring involves subjectivity. High structuring degrees try to curb the subjective influence on observation (Friedrichs and Lüdtke 1973, p. 60 et seq.; Atteslander 2010, p. 86 et seq.). The number of observers is another classifying criterion. Subjectivity, which cannot even be completely excluded in the case of standardized observation, can be normalized by comparing and evaluating the individual results obtained by several observers (Bortz and Döring 2006, p. 268).

Since the efficiency of the different observation methods depends on the respective research interests and objects of investigation, each study will choose its own approach. In practice, the above-described classifications do not occur separately but may be combined.

Observation hence is suitable for gathering first information and impressions in new research fields and for supporting first hypotheses. It has *advantages* if behavior, actions, and interactions are of interest as regards facial expression and gesture (Bortz and Döring 2006, p. 262 et seq.). In particular in (technical) education, skills cannot be always verbalized. Knowledge is not visible, hence not observable for otherwise we would claim to be able "to look inside a person's head". Since the behavior and action of a person, which, naturally, are only one part of his or her competence, are in the observable range, focus, indeed, is on that behavior and action and particular importance is attached to observation (Spöttl 2010, p. 165). Observation serves to assess the action and way of acting of test persons but cannot identify the reasons for a certain action or the motivators of behavior (Kaya 2007, p. 56 et seq.). Further *limitations* are set by research economy and psychology that

allow to capture but certain details of social reality. Besides, observation is very time and cost-intensive. Cost and benefit must be weighed in accordance with the relevant research interest (Häder 2006, p. 300 et seq.).

11.5 Case Studies and Studies of Work

Case studies and studies of work cover investigations of real-world contexts and mostly several methodical elements such as document analysis, surveying, and observation. Whereas case studies are methodical approaches used in many fields of science and social reality, studies of work are case study-oriented variants of work research. Both approaches are relevant to VET research because they strive to perceive work in its entire complexity and organizational environment. In that way, both real job requirements and real approaches made by the respective persons are represented. VET, in contrast, frequently deals with ideal requirements and approaches which arise from certain models but are not necessarily empirically founded.

In particular, studies of work are meant to contain as precise (as "dense") as possible descriptions of the spatio-temporal and material action of test persons or interaction of objects (Bergmann 1995, p. 270 et seq.). That type of analysis can contribute to gaining insight because differences between actual action and existing models may become noticeable. Since case studies, per se, are not based on immanent models and since it may be difficult therefore to, e.g., define a case, case study research may face problems in gaining insight.

Cases may be constituted of different social units (Lamnek 2010, p. 275): Persons, groups, institutions, companies, cultures, behavior patterns, etc. Since case studies are not regarded as surveying techniques but are considered research approaches, all surveying methods of empirical social research can be used.

There are different positions regarding the relationship between case studies and models (Hildenbrand 1995, p. 257):

- Position 1: Case studies help to generate hypotheses toward models.
- Position 2: Case studies are self-explanatory (social-reportage models).
- Position 3: Case studies are subsumed under a theory (subsumption model).
- Position 4: Case studies reveal relationships between particular and general features. These have to be reconstructed (case reconstruction model).

The mere fact that there are different positions as regards the relationship between case studies and gaining of insight forces the researcher to reflect: Even supporters of the social-reportage model would have to reflect on or, if necessary, explain the self-explanation capacity of a case study.

The "grounded theory" (Glaser and Strauss 1967) offers an elaborate approach to assessing the relationship between empirical data, in particular from case studies, and theory development. The method of "theoretical sampling" was

proposed for theory development. In contrast to "statistical sampling," "theoretical sampling" does not depend on the complete knowledge of a population. Whereas "theoretical sampling" serves to select analytical units, "theoretical encoding" helps to convert data into theoretical constructs. "Theoretical memos" serve to develop hypotheses and methodical considerations. The "development of basic concepts" condenses theoretical constructs into a theory. "Theoretical sorting" and "theoretical writing" bring about theories and their publication.

11.6 Experimental Methods

Experiments are understood as "reproducible observations under controlled conditions; one or several independent variables are manipulated in such a way that the underlying hypothesis, i.e., the claim of a causal connection, can be checked in different situations" (Zimmermann 1972, p. 37). Experiments in social sciences are considered particularly strict forms of hypothesis testing. They are among the research methods that allow to check causal hypotheses, hence are used to assess relationships between characteristics and, in addition, orientations of such relationships. Since a cause (c) always precedes the effect (e), the experiment can be used to make statements about cause-effect relationships (c → e) (Häder 2006, p. 337 et seq.). "How and how much does *X* (being the cause) affect *Y* (being the effect)?' (Kromrey 2006, p. 96).

In technical education, the research method "experiment" is applied for example to investigate receptivity or teaching–learning capacities that can be measured qualitatively. Within the framework of the BLK[1] experimental program "Neue Lernkonzepte in der dualen Berufsausbildung" (New concepts of learning in dual system of VET), the possibilities and limitations of more flexible educational models in vocational schools were investigated experimentally within the model experiment "Erprobung flexibler Unterrichtsorganisationsmodelle (FLEX)" (Testing of flexible educational models) carried out at the University of Bremen (Deitmer et al. 2004, p. 256 et seq.).

Experiments can be characterized by different features. On the one hand, although following equivalent structures, reference groups (control groups) are conceived and used differently from experimental groups. On the other hand, effects of changes made in the experimental groups are observed. Different measuring times within one experiment (at least one test prior to and one test after the change) are another criterion of differentiation of this research method (Häder 2006, p. 338).

The above-mentioned changes are limited to the experimental group while the conditions in the reference group remain constant. Test persons are assigned at

[1] Bund-Länder-Kommission für Bildungsplanung und Forschungsförderung (Deutschland)—Bund-Länder Commission for Educational Planning and Research Promotion (Germany).

random to the different groups (experimental group or reference group) (Bortz and Döring 2006, p. 54). Randomization is intended to ensure that "possible differences between the groups in the target variable can really be attributed to the stimulus (or the differences between the stimuli in the different groups) and not to other conceivable influences" (Ludwig-Mayerhofer 2003).

In social sciences, analyzing people and their behavior, experiments should follow strict ethical rules that are based on the voluntariness of participation and the observance of rights, human dignity, and self-determination (Klammer 2005, p. 280 et seq.).

Among the different types of experiments, *laboratory experiments*, *field experiments*, and *quasi-experiments* are the most common ones. During classic *laboratory experiments*, a controlled, artificial situation is created where, at best, all possible disturbing and influencing factors are known and can be controlled by the researchers (Häder 2006, p. 339 et seq.) to be able to "investigate situations or processes under simplified, pure conditions" (Atteslander 2010, p. 181). The possibility of controlling disturbing factors results in a high internal validity. Nevertheless, it is not clear whether the test persons behave as freely in the laboratory as they would in a natural environment. As a matter of fact, it is questionable whether laboratory situations can be generalized to other situations (Bortz and Döring 2006, p. 57). *Field experiments*, in contrast, are performed under natural conditions with test persons remaining in their natural environment, for example in a workshop. Whereas, in comparison to laboratory experiments, control over disturbing factors is limited, field experiments are much more realistic and experimental situations can be generalized more easily to other situations (Häder 2006, p. 339 et seq.; Schnell et al. 2011, p. 218 et seq.). Due to highly realistic conditions, field experiments have a high external validity. At the same time, however, closeness to reality results in a lower internal validity because it is difficult to control the possible disturbing factors (Bortz and Döring 2006, p. 57).

Partly, *quasi-experiments* do not observe the characteristic features of experiments in general. The effects of parameters, for example, are only studied at the end of the experiment and test persons are not assigned randomly to the relevant groups (Häder 2006, p. 340; Straka et al. 2006, p. 649 et seq.)

In the broadest sense, simulations and experimental games also are in the group of social experiments. Simulations can be defined as artificially constructed situations where the behavior of individual components is known. Investigation is done by manipulating the respective variables. Experimental games observe the behavior of different variables by simulating experimental situations without precisely defining in advance the behavior of protagonists. The behavior of the latter develops during the game (Atteslander 2010, p. 182 et seq.).

The *challenge* of experiments, among other things, is in the fact that external factors of influence cannot be excluded from the beginning. Changes in dependent variables often cannot be entirely attributed to those in independent variables. Further sources of error may be in effects of measurement, randomization, participants, or measuring instruments (Häder 2006, p. 343 et seq.). Besides, one needs to consider the difficulty of transferring experimental research results into

reality: Environmental factors, for example, are subject to constant change to which experimental situations are possibly not being adapted (Atteslander 2010, p. 189; Häder 2006, p. 343 et seq.).

The *advantage* of experimental research consists in the fact that due to the possibility of constructing extreme situations, hypotheses can be verified in an extremely controlled way. Further, benefits of experiments over observations or surveys are in the fact that test persons can be integrated in an 'artificially' designed process and experimental conditions can be kept constant so that social relationships can be represented or reproduced under controlled conditions. Besides, experiments do not only enable verifying the relationship between cause and effect but also the direction of effect (Atteslander 2010, p. 177 et seq.).

11.7 Designing and Developing Methods

Since VET aims to endow persons with working capacities that help them manage future job requirements after initial and continuing VET, VET research also has a prospective element: VET must be devised such that both future requirements of the learning individual and requirements of society are considered. These requirements consist in functions (e.g., integration, qualification, utilization) that a VET system is requested to fulfill for the entire society (cf. Greinert 1995, p. 147 et seq.).

Individual and social requirements may contradict each other, e.g., the function of allocation (covering the society's demand for skilled personnel) may involve that the entire society desires professions or professional profiles that are different from those wanted by young people who are just about to find or commence a job. The way these diverging requirements are being balanced out is not "in the nature of things" but has to do with the balance of social power, national cultures, etc., as is evident from the very different VET systems in countries with comparable conditions such as Germany, France, and England. The future of VET thus cannot be simply predicted but depends on which alternatives to act are chosen by the relevant protagonists.

11.7.1 Scenario Method

The scenario method deals with such alternatives to act. A scenario describes the future development of a prediction object under alternative frame conditions (Hansmann 1983, p. 18). When developing scenarios, objects, e.g., the construction of new professions in a selected country, have to be defined and structured in the first place. Subsequently, the relevant factors of influence are identified and adjusted, and development alternatives are worked out taking into account certain

preferences (cf. v. Gizycki and Gärtner 1982). So far, scenarios are "Idealtypen über Zukunft (Ideal Types on future)" (Grollmann 2005, p. 128).

By means of scenarios, different strategies and options for action can be concretized and anticipated as regards their effectiveness. In Germany, the scenario method was used to develop occupational profiles for the scenarios described in 1988 for the publication "Berufe 2000" (Heidegger et al. 1989).

The scenario method is suitable for integrating research results from different disciplines. Moreover, it offers experts or VET addressees the possibility of participation. Basically, different surveying techniques, e.g., secondary analyses or interviews, can be used for developing scenarios. The Delphi method, which suggests itself for integration of disciplinary research results and the participation of involved persons, is characterized by its iterative feedback loops. After having been confronted with the results of first interviews, the participants in Delphi have the option to take back, correct, or refine their answers. Often, Delphi closes with scenarios (Grollmann 2005, p. 127).

11.7.2 Methods of Curriculum Development

Curriculum development research methods do not only deal with *what people learn* but mainly with *what people are supposed to learn*. More precisely, they deal with strategies and methods of obtaining curricula that describe and give reasons for what people ought to learn in some field of activity. Curriculum development thus is both a field of VET research and a field of action of VET policy (Huisinga 2005, p. 360).

In view of the fact that in the German-speaking and some other countries, fields of activity of technical work are fixed in the form of professions, the latter are being constructed before curricula are developed. Fields of action are defined and distinguished from each other through job profiles. In countries where professions have a continuous function and are highly regulated, scientific methods are applied to develop job profiles. In Fig. 11.1, the following ideal typical procedure was proposed in Germany.

Although VET research obviously uses definitely scientific case studies or representative analyses, the construction of professions is also determined by the interests of the relevant persons or institutions (in Germany: Central government, federal states, trade unions, employers, etc.). Hence, professions are not purely scientific constructs (ibid.).

In countries where work is hardly or not at all bound to particular professions, research rather focuses on curriculum development and/or learning outcomes and is based on given descriptions and clear definitions of the respective learning fields.

This is also evident in the DACUM ('Developing A Curriculum') method that was developed by Norton, among others, in 1997 in the USA.

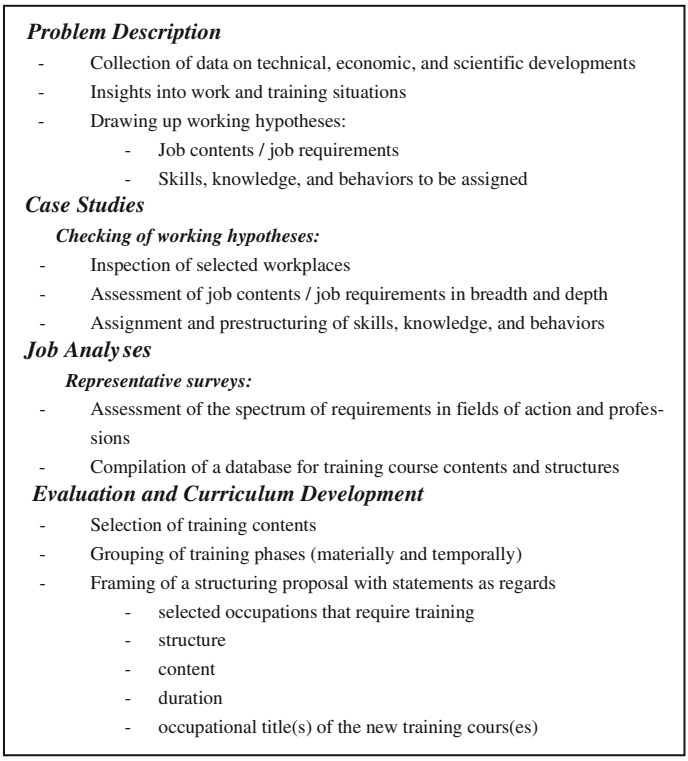

Fig. 11.1 Model for development of proposals for training regulations (Benner 1996, p. 59, according to Rauner 2005, p. 242)

The curriculum development method elaborated in Canada and in the USA in the 1980s and 1990s determines professional curricula on the basis of

(a) jobs, occupations, working processes, or working functions that are
(b) subdivided in duties which in turn are
(c) distinguished by tasks (see Fig. 11.2).

The DACUM method operates with tasks that are performed to obtain certain results: "Task—A work activity that is discrete, observable, performed within a limited period of time, and that leads to a product, service, or decision' (Norton 1997, Appendix C, 4, according to Röben 2002, p. 485).

"Duties" according to DACUM are "clusters of related tasks from a broad work area or general area of responsibility (area of competence)" (Norton 1997, Appendix C, 2, according to Röben 2002, p. 485) i.e., fields of functions for which a working person takes or is assigned responsibility.

In the DACUM process, curricula are developed by integrating so-called expert workers. In expert worker workshops, tasks are described and competences are

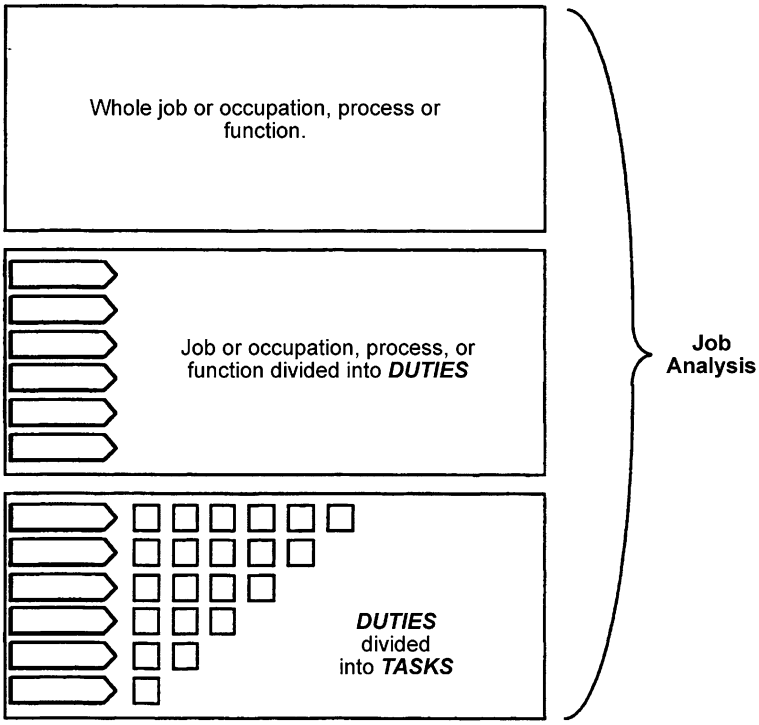

Fig. 11.2 Job analysis using the DACUM method (Norton 1997, A IV 30)

determined for performing them. These workshops are based on the following premisses:

- Expert workers are better able than anyone else to describe their occupation.
- An occupation can be described effectively in terms of the tasks successful workers perform.
- Successful task performance is directly related to the knowledge, skills, tools, and attitudes that workers must possess to perform the task correctly (Norton 1997 A-19).

In Germany and Europe, the instrument of expert worker workshops has been adopted for curriculum development based on professional task analysis (referred to as BAG analysis—Berufliche Aufgabenanalyse). Based on job analyses and executive workshops, expert workers identify characteristic tasks in their professions. Subsequently, these tasks are assigned to training fields to constitute the respective occupational profile (Fig. 11.3).

The difference between the above approach by Reinhold et al. and the DACUM method consists of the fact that

- a defined job stands at the beginning and end of curriculum development and that not any kind of occupation is considered,

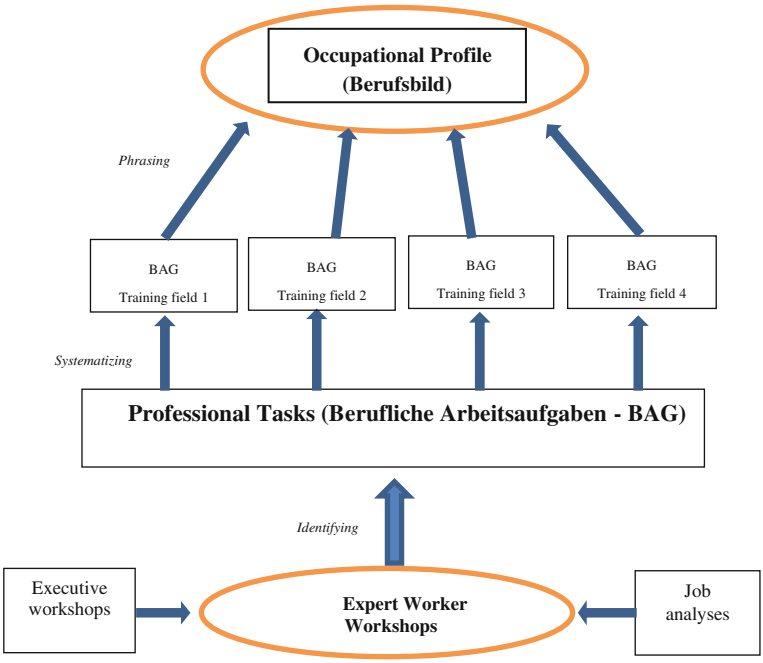

Fig. 11.3 From expert worker workshops through to professional tasks and occupational profiles (Reinhold et al. 2003, p. 1)

- the professional tasks need to fulfill certain criteria (they must, e.g., be based on learning objectives, see below) and that not any kind of task will be included in the curriculum,
- the professional tasks are structured based on educational fields and in accordance with the logical principles of development (i.e., they follow the logic of development that beginners undergo to become experts in a special field) (Dreyfus and Dreyfus 1986). This suggests a specific order of dealing with tasks in the relevant training courses.

The approach by Kleiner et al. (2002) refers to the "job-oriented turning point" (Fischer 2003b) in the German VET system. Instead of or in addition to systematic teaching–learning contents, professional situations to act were to be integrated more strongly into instruction to ensure that students and trainees would better understand the significance of theoretical classes for managing professional tasks.

The required relation of curriculum development to existing professional situations to act, however, creates a problem: Existing professional situations to act may be outdated within a short time, may be mere local phenomena, and may be of coincidental character. The solutions developed so far are geared to central and trend-setting professional tasks as identified (cf. Rauner and Spöttl 1995; Spöttl 1997) and refined (Howe et al. 2002), for example, for the European occupational

profile of motorcar mechatronics engineers where 17 central tasks (= 17 educational fields) constitute the curriculum.

The question as to which elements of professional situations to act are *central* and *trend-setting* and are *tasks that are based on learning objectives* cannot be answered satisfactorily without the help of scientific studies. Tasks to be integrated in curricula are requested to fulfill the following requirements:

> Professional tasks give concrete descriptions of skilled work based on typical meaningful contexts and characteristic orders that have a development potential for professional competences (Reinhold et al. 2002, p. 14).

This definition, among other things, is determined by the fact that

- professional tasks are no detail operations (such as e.g., "filing") but follow a structure that covers planning, implementation, controlling, and evaluation of operations in terms of a "complete action" (vollständige Handlung),
- professional tasks can be structured in accordance with the logical principles of development: They are related to different stages of the professional competence development and are assigned to areas of training that are based on each other.

Within that concept, the contents of teaching and learning are timed such that the overall contexts related to working processes can be considered. The "work process knowledge" (Arbeitsprozesswissen) has been structured and edited in accordance with the four areas of training "general knowledge," "contextual knowledge," "detail and functional knowledge," and "systematic and experience-based in-depth knowledge."

This implies the possibility for lecturers and students to tie in with practical work at individual workshops or companies, reflect the trainees' occupational experience, combine the latter with the relevant specific theoretical knowledge, and transform that knowledge into knowledge of working processes (Fischer 2000). Structuring of the contents of teaching and learning in accordance with the logical principles of development intends to integrate the traditional curricular professional training approaches in a curriculum development model based on theoretical curriculum development as demanded by Blankertz and co-workers and as tested as evaluation concept (Gruschka 1985).

How can relevant professional tasks be identified? The instrument of expert worker workshops relies on inviting experienced expert workers dealing with focal issues of operational innovation to determine, together with teachers and scientists, the tasks that are relevant to training in their profession (cf. Röben 2002). The selection of (10–12) expert workers, hence, is an important research-methodical criterion. To cover the aspect of prospectivity, these expert workers should have much professional experience and have insight into expected future concepts of professional work. Another difficulty to be overcome during workshops is in the determination of tasks that are suitable for the curriculum. Depending on the jobs they have, experts may tend to consider either only one task ("keep machines running") or an unmanageable number of tasks as being significant. Neither of

these attitudes fits the (normative) standard of 12–20 tasks (= 12–20 training fields) per curriculum.

The 8-h workshops are based on a so-called script that describes how participants identify professional tasks and establish expert status landmarks (Röben 2002). The workshops are documented in detail and are evaluated by project groups. The results (task lists for each profession) are evaluated by interviewing experts throughout the country.

Conclusion: Characteristic professional tasks such as those identified hereunder on the basis of expert worker workshops as basic elements of curricula have a strong empirical basis provided that they have been taken from and ascertained in operational reality. Besides, they have a normative component: They do not only represent operational reality but also the drawing up of tasks that are desirable from the point of view of VET ("conducive to learning," "future-oriented," "structurable in accordance with the logical principles of development" are not per se among the properties of professional tasks). Since the participating experts certainly live in the present, it is questionable how far the criterion of prospectivity can be considered and how far-sighted consideration can be.

Considering the fact that the acquisition of expertise so far has only been studied sufficiently for some comparatively well-structured domains such as chess, also vocational curriculum structuring in accordance with the logical principles of development still raises many questions from the point of view of science. The postulated stages of competence development have been extracted from empirical studies but have not been proven in a particular professional domain, especially as regards their different distinguishing characteristics. Even if the participating experts can allocate tasks to the given training fields, the latter (orientation, context, detail, and systematic knowledge) are not necessarily identical with stages of competence.

11.7.3 (Participative) Work and Technology Design Methods

The answer to the question of what people learn is not only determined essentially by the curricula of TVET. Also the systems they work in and the technical artifacts they use as working media have an influence on the possibilities of learning. Learning during work can be supported or impaired as working systems are designed.

In the case of Tayloristically oriented work system design, the entire range of factory activities at the central planning and decision making level is planned and controlled as perfectly as possible by factory computer concepts and components. The consequences for the workshop and administrative staff are foreseeable. Work then is reduced to the observance and performance of precisely specified steps, and workers are prevented from applying their competences and, in particular, their know-how to production processes. Competences once acquired get lost in the

long run because the workers employed in direct production do not reflect anymore on large parts of the production process.

Novel, non-Tayloristic production and service concepts (e.g., teamwork, work in manufacturing cells) shift parts of planning and control to the executing level. Learning within the process of work is being promoted and even expected and the question arises as to which competences experts should have. "Work process knowledge" is a term that in this context has been discussed for many years (Boreham et al. 2002; Fischer et al. 2004).

This discussion has been initiated, among other things, by the technological and organizational changes implemented in many firms in the recent years. Work flow rationalization obviously has become faster. However, the results obtained as regards job engineering and qualification do not reveal any clear trend toward leveling of hierarchies and more responsibility at the executing level. In view of these facts, sociologists speak of a "new complexity" (Schumann 2000) or "delayed transformation" (Huys and Van Hootegem 2002) as regards company labor policies. Nevertheless, most of the companies in Europe assume the knowledge to act accumulated at all levels to be an essential factor of economic success.

In addition to conventional automation strategies, concepts trying to justify "competence-oriented" (Seliger 1983), "anthropocentric" (Brödner 1985), "workshop-oriented" (Moll 1984) or "human-centered" (Corbett et al. 1991) approaches to computer use in production have been developed since the 1980s, also in China (Fischer and Rauner 1990), in the course of the transition from "debates on effects" to "debates on shaping." These concepts target at the competence of qualified workers as the basis of orientation for conceiving, developing, and applying computer-aided techniques. The basic idea of the "debate on shaping" is to take into account, e.g., factors that are "conducive to learning" already when developing production techniques and work organization methods.

Three main perspectives must be considered when shaping and designing work and technology:

The *task-oriented design perspective* discusses the question as to which tasks are to be dealt with using the technical system to be developed and as to which technical functionalities must be provided.

The issue of task orientation is embedded in the (desirable) *organization of social work*. This design perspective addresses aspects of, e.g., work organization, authority to give directives, and authority to control, division of work and cooperation through to workplace or private task design that must be considered or decided during system development. The term "organization of social work" reveals that the practical problems technology development and design are confronted with not only stem from the relevant field of application of the relevant technical system but rather also comprise the social requirements, conditions, and consequences of technology application (e.g., the practice of training and recruiting personnel).

Finally, the *information technology design perspective* discusses how a system's organizationally reflected functions can be realized as regards hardware and software.

Considering these three design perspectives during work system development, one encounters a two-fold contradiction (cf. Corbett et al. 1991):

Since the possibility of evaluating a technical system as being adequate or inadequate assumes a certain technique or method to exist, the question of whether technical support is adequate or practicable cannot be answered sufficiently at the beginning of the development process. Nevertheless, the technology developed should be of a high quality. This contradiction reveals the inadequacy of linear development processes to achieve certain project results.

In addition, it is not left to the developers alone to qualify techniques as being adequate or inadequate. Taken seriously, the aim of developing job-oriented technologies that are practicable for the expert is rather based on evaluations obtained from substantiated opinions of the users. Whereas experts who are qualified to develop techniques do not have the (exclusive) competence to assess the serviceability of their developments, those having the ability to evaluate a technology mostly are not qualified to develop it. This contradiction reveals the inadequacy of *one-dimensional* development exclusively controlled by engineers or information scientists.

Mainly in the 1990s, numerous publications gave their opinions on the principles and trajectories of technology development and design (cf., e.g., Coy et al. 1993; Rödiger 1993; Brödner et al. 1991; Ackermann and Ulich 1991). The respective positions can be assigned to the two opposite poles of the contradiction outlined above: One of these poles ideally postulates scientifically determined criteria as well as standards of the art of engineering, e.g., proven ergonomic findings and software-ergonomic principles, so-called style-guides such as the principles of dialog shaping (Hartwig 2007), that are to be considered in technology development.

The other pole reflects the demand for user participation: Real or potential users of technical systems are to be involved at an as early as possible stage in the development process, and the requirements that seem to diverge at first sight are to be combined.

By no means do scientific research and professional development become obsolete, as it were, by the stressing of participative technology development and design approaches. Besides, it is not true that technology developers just have to let future users tell themselves which properties the system to be developed should have. First of all, scientific analysis and design thus must be dedicated to investigating the problems and deficiencies in the organization and implementation of work. Subsequently, the results and suggestions for improvement are presented in a way allowing the respective persons to adequately reflect on their work experience and develop approaches based on it. Such a development process, among other things, involves the elaboration and presentation of principles (such as the above principles of dialog shaping) which from the scientific point of view should be considered in technology development.

Since these principles demand interpretation and since interpretations, as regards the technical support of professional tasks, can only come from the technology users themselves, it makes also sense to involve experts and other participants.

Corbett et al. (1991) have suggested four basic rules of a participative shaping of work and technology:

1. Any shaping process is based on an assignment that is clearly formulated in a manner comprehensible to all (employers, academics and users) and on which agreement has been reached.
2. At regular intervals, particularly at the end of defined work stages, the project group reflects upon the method employed and the quality of the intermediate result achieved, deciding form and content of the subsequent project stage.
3. The groups involved have the opportunity and are encouraged to contribute to the shaping process those forms of expression that correspond to their experience, their abilities, interests, and wishes.
4. Representatives of the people involved in the project with their specific abilities, experience, and interests make up a coordinating group which has two main functions:

(a) Integrating and systematizing the contribution to the project made by the groups involved
(b) Organizing "double loop learning" or meta-communication (Habermas 1981) in order to liven up the process of self-evaluation (Corbett et al. 1991, pp. 118–120).

Observation of these basic rules can be an important stimulus for the respective experts to participate in the development of work and technology and to take care that work systems are shaped such that they are conducive to learning (Fischer 2000).

11.8 Evaluation Methods

Evaluation can be generally defined as the assessment of objects or facts. According to the Federal Institute for VET (Bundesinstitut für Berufsbildung—BIBB), evaluation refers to the systematical and objective appraisal of a policy or current or completed program/project including its concept, implementation, and results. Such appraisal involves the assessment of the relevance and achievement of development objectives, of efficiency, effectiveness, effects, and sustainability (BIBB 2002, p. 3) and a verifiable method of assessment as a specific action in terms of a target-oriented information process. In empirical-scientific contexts, evaluation is understood as the design of a specific type of social research where emphasis is on information search through the process and results of a program of actions and measures and where explicit objectives are formulated and instruments are fixed (Kromrey 2001, p. 1 et.seq.).

Technical training uses evaluation methods for appraisal, assessment, or optimization of, e.g., VET programs, qualification programs, or innovation processes.

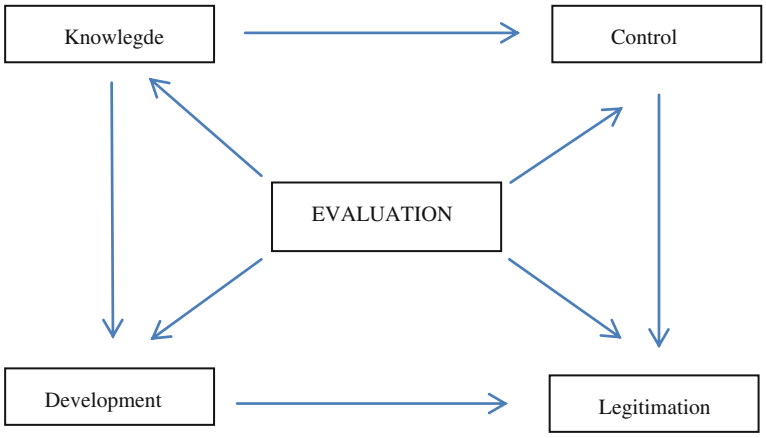

Fig. 11.4 The main functions of evaluation

For example evaluation methods can investigate the implementation of web 2.0-assisted training platforms in the automobile industry focussing the instructional design and practicability of the technical system and on the assessment of innovations among users as regards competence to act, learning skills, and conditions of learning (Fischer and Fleck 2011, p. 1).

Being an empirical-scientific research method, evaluation, thus, is a special form of applied social science. It is a methodically controlled application- and evaluation-oriented form of collecting and evaluating information. Evaluation processes are not only determined by the methodology of data acquisition or the logic of substantiating and corroborating the respective statements but are characterized by the possibility of selecting certain evaluator perspectives and by the contexts of application. The objective of evaluation is the optimization or rejection of processes and certain fields of knowledge in practice in which findings of theoretical science are applied to evaluate or to harness objects or the like (Kromrey 2001).

Different objectives of evaluation can be described in the above-mentioned context as well as in a scientific context. Evaluation may serve to gather knowledge, exercise, and implement control measures, trigger development, and learning processes or legitimate the measures, projects, or programs implemented (Stockmann and Meyer 2010, p. 73) (Fig. 11.4).

Likewise, three different forms of evaluation can be differentiated in accordance with empirical-scientific principles: formative, summative, and responsive evaluation.

11.8.1 Formative Evaluation

Formative evaluation is understood as an actively formative, process-oriented, and communication-promoting process that is aimed at the development and optimization of objects, facts, or concepts to be evaluated. The evaluator often is involved in the process of planning, development, and implementation. In this context, evaluation is considered a permanent process taking place within a defined period of time under predefined criteria. Since the findings gathered from the intermediate results are incorporated in the process, interventions or corrections can be made to modify the different methods. This approach allows direct feedback on the optimization of evaluated situations through external evaluators. Formative evaluations are investigative mainly for new measures being developed and implemented and besides aim at identifying dynamic responses, imparting action-relevant knowledge, and analyzing facts or objects (Schenkel and Holz 1995; Bortz and Döring 2006, p. 110). Formative evaluation is particularly practice-relevant due to its designing and forming programs. Its challenge lies in interpreting the results obtained through result checking and effectiveness evaluation because research itself continuously affects the object of evaluation. Formative evaluation can be applied to advantage as an instrument in quality development or quality assurance (Kromrey 2001, p. 11 et seq.).

11.8.2 Summative Evaluation

Compared with the above formative procedure, summative evaluation refers to the results of processes or projects. Whereas formative evaluation regularly provides intermediate results with the objective of modifying or improving, e.g., interventions, summative evaluation has a balancing and result-oriented character (Stockmann and Meyer 2010, p. 76) and, by way of summarizing, investigates the effectiveness of a given intervention, a program or concept, or checks the degree of fulfillment (Bortz and Döring 2006, p. 110). A summative evaluation is not carried out before processes are about to be completed or are completed. It explicitly dispenses with project-forming effects and aims to provide a summative judgment in the form of an expertise (Kromrey 2001, p. 12).

11.8.3 Responsive Evaluation

The responsive approach combines formative and summative evaluation methods and considers the evaluation of concepts, projects, etc., to be holistic development processes. According to Sloane (2006), it is a target- and result-oriented procedure that recognizes and communicates intervention and control demands at an early

stage and develops and implements measures together with participants. In contrast to distant or intervening research,[2] responsive research combines the aspects of gaining of knowledge and shaping of practice within collaborative development and reflection processes while involving external experts or evaluators. This evaluation or research approach considers the individual interest of participants and gives them the function of control criteria. Beywl (1991) outlines responsive evaluation as being constructivist by not only describing or analyzing reality but recreating it in a mixed scientific-sociopolitical process. Changes in the object of evaluation thus are no unwanted disturbances but are integral parts of the process.

11.8.4 Evaluation as a Process

Whereas formative and responsive evaluation can always be considered processes or prolonged procedures that include development aspects, summative evaluation is result-oriented and checks or evaluates specific measures shortly before or at the end of projects or measures. All three forms of evaluation can be assigned to an empirical-scientific research discourse and generally serve as a frame for surveying in empirical social research and, in particular, in VET research. However, evaluation as a process does not apply any singular research method that could be considered to be typical. The objects, purposes, criteria, evaluators, and methods of evaluation must be determined and discussed in the context of the respective methods of inquiry. To gather insight and obtain process results, both qualitative and quantitative research methods can be used or as well be combined (see Sects. 11.2–11.6) (Stockmann and Meyer 2010, p. 67). Evaluation thus is of advantage when representing, evaluating or optimizing entire development processes in technical training and serves as a frame for research that is capable of representing or reconstructing processes and of presenting comprehensive findings of whole processes.

11.9 Conclusion: The Purpose of Research in Science

Naïvely, one could assume research to be a tool for obtaining scientific results, i.e., for generating novel and assured scientific findings. This assumption has been adopted in the above discussions and explanations that introduced and presented research methods in the context of different objects of investigation in the field of TVET.

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[2] Distant research is characterized by being non-interactive, empirical-analytical, and phenomenological-textually scientific. In contrast, intervening research is interactive and is described as being a type of action research that is related to learning and change processes. Responsive research combines the characteristics of both approaches (Sloane 2006, p. 28 et seq.).

However, the naïve belief in these tools for obtaining scientific results gets shattered if one becomes aware of the fact that in public, research methods are discussed mostly without taking into account scientific theory construction and the issues that are related to it and, what is more, without considering the quality and significance of the research results obtained. The discussion of methodologies is a powerful weapon by the use of which one tries to attribute research approaches as being acceptable or unacceptable while segregating or constraining researchers.

It makes no sense at all but rather can give cause for skepticism to assure that one has at one's disposal the adequate methodical frame for VET research due to the use of one method or another or the application of empirical or hermeneutic, quantitative or qualitative, vocational-science, social-science, or educational-science methods:

"This is like going out after truth with spears and staves" (Hegel 1971, p. 333). According to the philosopher, it is important to recognize one's cognitive faculties before recognizing or, to put it differently, it is impossible to learn to swim without first getting wet.

The adequateness of the method still is revealed by the *quality of findings* that have been obtained about the object of knowledge.

In view of the above, it would be desirable that any scientific work be preceded by a methodological reflection to prove the adequateness of the selected method not only *before* but also mainly *after* investigation. As a matter of fact, little is read about the significance of the selected method as regards the *research results obtained*. However, it may be that mentioning these results would eventually help stimulate and enhance the discussion of the methodologies in VET.

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Chapter 12
Organisational Commitment Research: Past, Present and Future

Aaron Cohen

Abstract The concept of organisational commitment (OC) has grown in popularity in the literature of industrial/organisational psychology and organisational behaviour research. Of all the forms of commitment, the organisational form receives the most attention. Of all the individual characteristics and attitudes within the organisation, OC is a major focus for academic study. Much of it is due to the role it plays as an antecedent to other attitudes and behaviour. In this chapter, the author reviewed the main research streams of OC, their advantages and disadvantages. The approaches to OC are introduced concretely, which are constituted by the calculative approach, the attitudinal approach and the multidimensional approach. It also gave suggestions for future directions in the study of OC.

12.1 Introduction

The concept of organisational commitment (OC) has grown in popularity in the literature of industrial/organisational psychology and organisational behaviour (Mathieu and Zajac 1990; Cohen 2003; Meyer et al. 2002). Of all the forms of commitment, the organisational form still receives the most attention (Griffin and Bateman 1986; Morrow 1993). This interest is apparent from the numerous studies that have examined the relationships between OC and its antecedents and outcomes (e.g. Mathieu and Zajac 1990; Mowday et al. 1982; Cohen 2003; Meyer et al. 2002). This high degree of attention, it is argued, stems from the fact that OC 'is theory based, broad in focus, holds significant integrative potential and may be more manageable than other forms' (Griffin and Bateman 1986, p. 166). Another

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reason is the perception that OC can predict labour turnover better than other work attitudes, especially job satisfaction (Williams and Hazer 1986; Clugston et al. 2000). Moreover, it has been argued that organisations whose members have higher levels of commitment will show higher in-role performance and extra-role performance (Liu and Cohen 2010) and lower levels of absenteeism and lateness (Bateman and Strasser 1984; Morris and Sherman 1981).

OC is defined in terms of attitude as well as a set of intentions. Attitudinal commitment exists when 'the identity of the person is linked to the organization' (Sheldon 1971), a definition that re-emphasises the association between OC and identity. A different definition is 'when the goals of the organisation and those of the individual become increasingly integrated or congruent' (Hall et al. 1970). Of all the individual characteristics and attitudes within the organisation, OC is a major focus for academic study. Much of it is due to the role it plays as an antecedent to other attitudes and behaviours. A large number of studies address OC and its effects in employment relationship. This work will review the main research streams of OC, their advantages and disadvantages. It will end with some suggestions for future directions in the study of OC.

12.2 Approaches to OC

The growing interest in OC has probably contributed to the conceptual richness of its definition. This has correspondingly led to diverse approaches to measuring this construct (Griffin and Bateman 1986; Morrow 1983, 1993; Mowday et al. 1982; Reichers 1985). The differences among measures of OC have generally paralleled the distinction between two theoretical approaches to the construct: the side-bet or calculative approach, and the moral or attitudinal approach (Cohen 2003; Cohen and Gattiker 1992; Ferris and Aranya 1983; Griffin and Bateman 1986; McGee and Ford 1987).

12.2.1 The Calculative Approach

The calculative approach rested on the 'side-bet' theory of Howard Becker (1960), who used the term to refer to the accumulation of investments valued by the individual that would be lost or deemed worthless if he/she were to leave the organisation. Becker argued that over a period of time certain costs accrue which make it more difficult for the person to disengage from a consistent line of activity, such as membership of an organisation. The threat of losing these investments, along with a perceived lack of alternatives to replace or make up for them, commits the person to the organisation. According to this view, the individual is bound to the organisation by extraneous factors, such as income and hierarchical position and internal factors, such as 'knowing the ropes' and interpersonal

relationships (Cohen 1993; Cohen and Gattiker 1992; Cohen and Lowenberg 1990; Meyer and Allen 1984; Wallace 1997). The loss of friendships and seniority rights also can be a factor when employers are changed. Becker himself phrased his argument as follows:

> The man who hesitates to take a new job may be deterred by a complex of side-bets: the financial costs connected with a pension fund he would lose if he moved; the loss of seniority and 'connections' in his present firm, which promise quick advance if he stays; the loss of ease in doing his work because of his success in adjusting to the particular conditions of his present job; the loss of ease in domestic living consequent on having to move his household, and so on… (Becker 1960, p. 38–39).

The measure based on this theory attempted to reflect the basic arguments of this approach. They were first developed by Ritzer and Trice (1969), with some methodological modifications added later by Hrebiniak and Alutto (1972) and Alutto et al (1973). These measures question the respondents on the likelihood of their leaving the organisation, given various levels of inducement in pay, status, responsibility, job freedom and opportunity for promotion. The revised measure is used often, especially in research on the side-bet theory (e.g. Fukami and Larson 1984; Hunt et al. 1985; Wittig-Berman and Lang 1990).

Becker's approach sees a close connection between the process of commitment and the process of turnover. In fact, it identifies OC as a major factor in the explanation of voluntary turnover. This contention was supported by later research that operationalised Becker's theory (Alutto et al. 1973; Ritzer and Trice 1969). Commitment, according to these studies, should be measured by evaluating the reasons, if any, that would cause a person to leave his organisation. Becker's approach and the scales that were assumed to represent it were adopted by later research as the approach to conceptualise and examine commitment to the organisation and/or to the occupation. While the side-bet theory was abandoned as a leading commitment theory, the close relationship between commitment and turnover as advanced by Becker affected most of the later conceptualisations of OC and established turnover as the main behaviour that should be affected by OC. The influence of the side-bet approach is evident in one of Meyer and Allen's scales, the continuance commitment one. This scale was advanced as a tool for the better testing of the side-bet approach and is one of the three dimensions of OC outlined by Meyer and Allen (1991).

12.2.2 The Attitudinal Approach

The second approach sees commitment as affective or attitudinal, and has been called the 'organisational behaviour' (Staw 1977) or 'psychology' (Near 1989) approach. It regards the individual as identifying with the organisation, hence being committed to retaining membership in order to pursue his or her goals. The origins of this treatment of commitment perhaps lie principally in the work of

Porter and his associates (e.g., Porter et al. 1974; Mowday et al. 1982); it has also been termed affective commitment (Meyer and Allen 1984) and value commitment (Angle and Perry 1981). This approach developed the most commonly used measure of OC, the attitudinal Organizational Commitment Questionnaire (OCQ) introduced by Porter and Smith (1970).

The focus of commitment shifted from tangible side-bets to the psychological attachment one had to the organisation. The attitudinal approach advanced by Porter and his colleagues (Porter et al. 1974) attempted to describe commitment as a focused attitude, uncontaminated by other constructs such as behavioural intentions. Accordingly, commitment was defined by Porter and his supporters as '…the relative strength of an individual's identification with and involvement in a particular organization…' (Mowday et al. 1979, p. 226). The exchange theory was established as the main explanation for the process of commitment (Mowday et al. 1982). They advanced commitment as an alternative construct to job satisfaction and argued that commitment can sometimes predict turnover better than job satisfaction.

Commitment here was characterised by three related factors: '(1) a strong belief in and acceptance of the organization's goals and values; (2) a willingness to exert considerable effort on behalf of the organization; and (3) a strong desire to maintain membership in the organization…' (Mowday et al. 1979, p. 226). While offering a different view of commitment, Porter and his colleagues still continued with one of the basic assumptions of Becker's theory, namely, the strong ties between commitment and turnover. O'Reilly and Chatman (1986) argued in that regard that while the first component focuses on the psychological basis for attachment, the latter two are consequences of commitment rather than antecedents of it.

This scale is also known as the Porter et al. measure (1974), is 'the most visible measure of affective commitment and has enjoyed widespread acceptance and use' (Griffin and Bateman 1986, p. 170). It consists of 15 items (a shortened version has nine positively phrased items) reflecting the three dimensions of the definition of commitment suggested by Porter et al. (1974): a desire to maintain membership in the organisation, belief in and acceptance of the values and goals of the organisation and willingness to exert effort on behalf of the organisation. While Mowday et al. (1982) and Mowday et al. (1979) demonstrated the well-proven psychometric properties of this measure; they also noted that the relationships between their measure and some attitudinal variables such as job satisfaction and job involvement were too high for an acceptable level of discriminant validity. Later, in separate examinations of the OCQ characteristics, Morrow (1983), Blau (1985 1987) and Commeiras and Fournier (2001) supported the general conclusion that it contains good psychometric properties.

Despite the existence of alternative conceptualisations and measures of OC such as the side-bet approach (Becker 1960), the OCQ dominated the literature from the early 1970s to the mid-1980s. Most of the findings, conclusions and proposals for a future research agenda on OC are based on this measure. Furthermore, the many studies of OC and its relationships with antecedents and work

outcomes have meanwhile been subjected to several meta-analyses (Mathieu and Zajac 1990; Cohen 1991, 1992, 1993; Cohen and Gattiker 1994; Randall 1990; Gaertner 1999) that quantitatively summarised the findings on the concept. But recently some criticism has arisen regarding Porter et al. (1974) measure, the OCQ. The basic difficulty is that two of the dimensions of commitment of the OCQ, a strong desire to maintain membership in the organisation and a willingness to exert considerable effort on behalf of the organisation, overlap with intentions of outcome behaviours such as withdrawal and performance (Reichers 1985; O'Reilly and Chatman 1986; Bozeman and Perrewe 2001). The response to that criticism has taken two directions. First, researchers have tended to use the 9-item version of the OCQ more frequently than the full 15 items to avoid the 6 problematic negatively phrased items of the measure that dealt with withdrawal and performance (Beck and Wilson 2000; Iverson 1999). Second and, possibly of equal importance, a new trend has started to evolve in the definition and measurement of OC.

12.2.3 The Multidimensional Approach

Two leading multidimensional approaches were advanced in the 1980s, one by O'Reilly and Chatman (1986) and the other by Meyer and Allen (1984). There were some other multidimensional approaches, but these had much less impact than the two main ones (Meyer and Herscovitch 2001). O'Reilly and Chatman (1986) built their approach upon what they portrayed as the problematic state of commitment research, namely the failure to differentiate carefully among the antecedents and consequences of commitment on the one hand, and the basis for attachment on the other. They defined commitment as the psychological attachment felt by the person for the organisation, reflecting the degree to which the individual internalises or adopts the characteristics or perspectives of the organisation. They argued that one's psychological attachment may be predicted by three independent factors: (a) compliance or instrumental involvement for specific, extrinsic rewards; (b) identification or involvement based on a desire for affiliation; and (c) internalisation or involvement predicated on the congruence between individual and organisational values.

Conceptually, O'Reilly and Chatman made a clear distinction between two processes of commitment, the instrumental exchange one and the psychological attachment one. The compliance dimension that represents the exchange process leads to a somewhat shallower attachment to the organisation. The deeper attachment, according to O'Reilly and Chatman, results from the psychological attachment formed by the two other dimensions, namely identification and internalisation. This distinction will be applied in the theory suggested here. Another interesting contribution of O'Reilly and Chatman was their view of the relationship between OC and outcomes. While previous approaches (Becker 1960; Porter et al. 1974) emphasised commitment as an important determinant mainly of

turnover, O'Reilly and Chatman argued that the psychological attachment could result in other behaviours and pointed to organisational citizenship behaviour (OCB) as a relevant outcome of commitment. This argument will also be included in the conceptualisation suggested here.

Studies that have applied the O'Reilly and Chatman scales as is have pointed out some problems with them. Vandenberg et al. (1994) concluded that the identification scale contributed nothing beyond the explanations already captured through the OCQ. Others (Bennett and Durkin 2000) concluded quite correctly that internalisation and identification appear to be tapping similar constructs and that the compliance dimension does not really reflect psychological attachment to the organisation (Mathieu and Zajac 1990; Meyer and Herscovitch 2001). In summary, while O'Reilly and Chatman presented an interesting approach to commitment, for unclear reasons and because of its questionable operationalisation, few researchers have followed this approach. Instead, the approach of Meyer and Allen (1984) became the dominant one to the study of commitment.

On the argument that OC can be better understood as a multidimensional concept, Meyer and Allen (1984) proposed a two-dimensional measure of OC. Conceptually, their distinction between the two dimensions paralleled that between the side-bet calculative approach of Becker (1960) and the attitudinal approach of Porter and his colleagues (1974). The first dimension was termed *affective commitment*, and was defined as 'positive feelings of identification with, attachment to, and involvement in, the work organization' (Meyer and Allen 1984, p. 375). The second was termed *continuance commitment*, and was defined as 'the extent to which employees feel committed to their organizations by virtue of the costs that they feel are associated with leaving (e.g. investments or lack of attractive alternatives)' (Meyer and Allen 1984, p. 375).

McGee and Ford (1987) in their factor analysis found that the continuance commitment scale is itself a two-dimensional construct. One sub-dimension represented the sacrifices made by an employee in staying with the organisation, and was termed high sacrifice, and the other represented available employment alternatives, and was termed low alternatives. Meyer et al. (1990) replicated this finding. In a subsequent paper Allen and Meyer (1990) added a third dimension: this was termed *normative commitment*, and was defined as the employee's feelings of obligation to remain with the organisation. The factor analysis of Allen and Meyer (1990) supported the proposed three-dimensional scales. In their assessment of the scales Hackett et al. (1994) generally supported the existence of three dimensions. However, based on a LISREL model, a better fit with the data was found for a four-component model, with the continuance commitment being divided into two dimensions along the lines suggested by McGee and Ford (1987).

Criticism has been levelled against the approach of Meyer and Allen. Vandenberg and Self (1993) measured four forms of commitment—the affective and continuance commitment of Meyer and Allen (1984), organisational identification and OCQ—at three points in time (the first day of work, the third month of work and the sixth month of work). They found a strong instability in the factor structures, particularly in affective and continuance commitment across the three

time frames. The first explanation they provided for this important finding was that work experiences during the entry period altered the newcomers to such an extent that the items took on a different conceptual meaning from one period to the next. Another explanation was that it might be unrealistic to assume that during the first months of work newcomers develop the depth of understanding about the organisation and its constituent components required to relate to the items in a meaningful way. They concluded that respondents in different organisational career stages have difficulties in interpreting the items and assign different meanings to them.

A later criticism and perhaps a stronger one focused on the discriminant and content validity of the scales. Ko et al. (1997) examined the Meyer and Allen scales and argued that there are conceptual problems with the scales and that those problems may be responsible for the psychometric difficulties found in the scales. Ko and his colleagues contended that

> Meyer and Allen did not offer a precise definition of commitment that embraces the affective, continuance, and normative components. They simply noted that what is common to the three components is a 'psychological state' that links the employee to the organization, but it is not clear what is meant by this psychological state (Ko et al. 1997 p. 970).

More specifically, Ko et al. focused on two main problems they diagnosed in the approach. The first one was the continuance commitment dimension. They contended that

> Meyer et al. (1993) argued that Becker's (1960) concept of commitment represents a component of attitudinal commitment because he emphasized the awareness of the costs associated with leaving the organization. However, their argument is untenable. Becker defined commitment as a consistent line of activity (i.e., maintaining membership in the organization) and attempted to explain what causes this inconsistency…Therefore, Becker's view of commitment seems to be more congruent with the behavioral rather than attitudinal approach of Porter and his colleagues (Ko et al. 1997, p. 970).

Their second criticism focused on the relationship between affective commitment and normative commitment. Based on their findings that showed a lack of discriminant validity between the two concepts, Ko et al. (1997) concluded that

> The concept of NC (e.g. normative commitment) is troublesome because it appears that there is considerable conceptual overlap between NC and AC (e.g. affective commitment). As indicated above, the normative component of commitment is based on the belief that it is the right thing to remain with the organization and that AC is attachment to the organization such that the strongly committed individual identifies with, is involved in, and enjoys membership in the organization. It is unclear how NC can be conceptually separable from AC (Ko et al. 1997, p. 971).

They concluded that because of the above-mentioned problems considerable conceptual work needed to be done, and new measures should be developed that adequately assess the new conceptualisations. This chapter follows the first part of this recommendation. The authors performed the research mentioned above and

concluded that a new measure should be devised for continuance and normative commitment.

Meyer and Allen and their colleagues were aware of some of the problems associated with the three-dimensional scales. Throughout the years, some changes in the scales were proposed and tested. For example, a shorter 6-item version of the three scales was advanced, a revised normative commitment scale was also proposed, and a two-dimensional continuance commitment scale was also suggested (Meyer and Allen 1997). Subsequently, major revisions in the continuance commitment scale were advanced (Powell and Meyer 2004). While these changes did improve some of the psychometric properties of the scales, they posed a dilemma for researchers as to which version of the scales to use.

12.3 Where Do We Go from Here?

The Meyer and Allen's approach to OC is considered today as the dominant approach. However, as mentioned above this approach has several problems that need to be considered in the future research before any firm conclusions can be made about it as the right approach to OC. In addition, future research on OC should consider other issues mentioned below. First, of the three dimensions of OC only the affective one has strong validity (Cohen 2003). The continuance dimension of OC is two-dimensional (low alternatives and costs associated with leaving); and the normative is very highly correlated with the affective dimension of OC. This raises serious questions about the validity and reliability of two of the three dimensions advanced by Meyer and Allen. Second, the basic test to commitment as to any other constructs is its predictive validity. OC demonstrated modest relationships with turnover, and weak correlations with in-role performance (Meyer et al. 2002). It does show relatively high correlations with OCB, extra-role behaviours. This raises the question of whether the real power of OC is in prediction OCB and not any form of in-role performance. This also should be considered in the future research. Following the above-mentioned, one direction of future research is to improve the validity and reliability of the concept of OC based on some of the directions mentioned above.

Given the criticism (O'Reilly and Chatman 1986) that has been levelled at commitment typologies that have incorporated references to outcomes of commitment in their definitions and scales, a proposed conceptualisation of commitment should remain purely attitudinal to avoid such overlap. Adherence to attitudinal issues will prevent possible negative effects on the construct validity of commitment definitions. In terms of the outcomes of commitment, the benefits of commitment should go beyond turnover, as already suggested by O'Reilly and Chatman (1986). The strong relationship found between commitment and OCB (Meyer et al. 2002) supports the usefulness of commitment in explaining other valuable outcomes in the workplace.

Another direction for future research on OC is to give more attention to the notion of time in the conceptualisation of commitment (Cohen 2007). The instability of the factor structures of commitment across different time frames (Vandenberg and Self 1993) suggests that employees have difficulty understanding the meaning of the items typically included in measurements of commitment in different stages in their organisational career. Fourth, the role of normative commitment and continuance commitment should be re-examined in commitment conceptualisations. The high correlations between normative and affective commitment also found in meta-analysis (Meyer et al. 2002), and the bi-dimensionality of continuance commitment suggest the need for modifications of these dimensions (Ko et al. 1997).

Another consideration for future research is to adopt a multiple commitment approach. That is, to examine simultaneously several foci of commitment in the workplace such as group commitment, job involvement and occupational commitment (Cohen 1999a; Cooper-Hakim and Viswesvaran 2005). Several forces seem to advance this approach. First, there is a growing awareness that employees are committed to more than one focus in the workplace at the same time. For a real understanding of commitment in the workplace one needs to examine more than one commitment. Second, the changes in the work environments worldwide, particularly growing recessions in many economies led to a reduction in the workforces in many organisations and as a result to a decline in the importance of the organisation from the employees' point of view. It seems that in many occupations across many counties organisations do not want to be attached to employees and employees do not want to be attached to organisations. A possible reason is outsourcing that makes long-term commitment non-desirable and creates a non-commitment culture and climate (Baruch 1998).

Another force that pushes towards the use of multiple commitment s approach is the need to increase the predictive validity of commitment. The multiple commitments approach examines the interrelationships and the predictive validity of several commitments in the workplace: organisation, work group, occupation, union and the job. There is some evidence that this approach increases the predictive validity of commitment. However, one problem in a multiple commitment approach is whether employees really make the difference among the different commitment or are we researchers developing concepts of foci of commitments that do not have strong meaning for employees? This leads to problems of concept redundancy and measurement problems that are quite common in multiple commitments approach (Cohen 2003).

More work is required on the nature of the relationship between OC and outcomes. It seems to be more complex than a direct relationship; mediators probably exist between commitment and outcomes. For example, turnover intentions probably mediate the relationship between commitment and actual turnover. In addition, other commitment forms seem to mediate the relationship between OC and outcomes. Job involvement seems to play an important role in this process by mediating the relationship between OC and outcomes. Researchers should also look for possible moderators in the relationship between OC and outcomes. Career

stage or age shows promise of being such a moderator. Research evidence (Cohen 1991, 1993) showed the importance of this variable as a moderator in the relationship between OC and outcomes. Such moderation should be tested in the relationship between multiple commitments and outcomes. Other moderators should also be tested, such as occupation (Cohen and Hudecek 1993), gender, education and ethnicity. The moderation effect may prove stronger for some commitment forms than for others.

Most of what we know about OC is based on American theories and findings. These theories clearly need to be tested in other cultures for us to learn whether they are generalisable. Very little research has examined commitment in settings other than the North American. In this regard, most of what we know is based on comparisons of Japanese and American OC. Frequently, this research concentrated on data from the Japanese setting, not comparing them with any other. The findings of this research revealed very few differences between the two cultures. This finding contradicted one of the most anticipated differences in commitment literature, but in no way does it mean that commitment theories and findings can be generalisable across cultures.

Far more research is required to examine other cultures. First, different cultures should be compared by means of the same scales. Such activity contrasts with research that examined only one culture and from which only limited conclusions can be drawn. Still more necessary is a comparison of multiple commitments across two or three cultures in the same research design applying the same commitment scales. Such research will provide stronger data and more meaningful and generalisable comparisons.

There is a need for research on whether commitment scales are understood the same way across cultures. Do commitment items carry the same meaning in different cultures? Does a commitment item that is translated from English to Japanese carry the same meaning for Japanese employees as for American? Very little research has dealt with this important issue. More is needed to study similar conceptual models across cultures, which will clarify whether similar theories hold in them. In this regard, more research is required to probe the relationship between commitment forms and work outcomes. Besser (1993) pointed out the possibility that behaviours in the Japanese culture are not related to attitudes, as they are in the American culture. Cohen's (1999b) findings showed interesting differences in the multiple commitment-outcome relationship across two cultures, the Israeli and the Arab. All this showed the importance of testing the commitment-outcome relationship across cultures.

Future research across cultures should also scrutinise the difference between a cross-national and a cross-cultural comparison. Most research on commitment tested cross-national differences. Such a comparison might be misleading because it may overlook the possibility that a given country may encompass more than one culture, and that the cultural differences might be stronger than the national ones. Cohen (1999b), for example, found strong differences between Jewish and Arab nurses in Israel, a finding that supports the above contention.

Finally, in all the above research areas, research is needed that will apply longitudinal research designs. Such research is important because it will indicate whether and which OC forms are more stable than others and how a given OC form at one time affects another form at a later time. Research on the commitment-outcome relationship particularly will benefit from longitudinal designs. For example, which OC form is related more strongly to a given outcome at what point of time? How short should the interval be between the measurement of a given commitment and the measurement of a given outcome, for a stronger effect of that commitment form on the given outcome?

All the above are important research issues that should be examined in the future research of OC. OC is still a promising, and even fascinating research area. Research on commitment will thus continue, despite the global changes in the technology, economy and values in most Western countries. The findings so far have indicated many potential benefits from its study. This paper has set out the knowledge that has accumulated on this issue so far. It has also criticised it and signalled directions for future research. Much needs to be done in order to increase our understanding of this topic. This paper has illustrated some of the advantages of continuing the work on OC.

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