FROM HIGHER EDUCATION TO PROFESSIONAL PRACTICE

A comparative study of physicians' and engineers' learning and competence use

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Something that is not at all self-evident is when it is time to stop writing. It seems as though a text is not something that is ever finished or complete. However, there comes a time when it seems appropriate to just stop writing, and as I start writing these words I realise that this is apparently that time. The construction of a thesis is an individual project and responsibility for all that is written in the text, shortcomings and inconsistencies as well as everything that is lacking is solely my own. Nevertheless, it is also a collective effort and without assistance, support and encouragement from others I would not be writing these words.

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Staffan Nilsson, Linköping, September 2007.

Chapter 1: Introduction

Higher education is an important foundation for the allocation of people to different positions in society and a prerequisite for many professions. Institutionalised knowledge is generally considered central to the legitimacy of the professions. This thesis is concerned with some of the implications of the relationship between professional practice, knowledge and higher education; more specifically, what constitutes professional knowledge, and how the relationship between professional education and practice is understood by a group of physicians and engineers, respectively. Both physicians and engineers undergo a long professional education before they enter the world of work, but what is it that happens during this education, what is learned and what happens in the encounter with professional practice? What is the meaning of higher education in relation to professional practice? Do the professionals learn anything substantial or does their education rather constitute a symbolic ritual? Does their education have a use or exchange value? Does higher education promote generalist or specialist competence? Our understanding of how the knowledge presented in professional educational programs is meaningful in professional practice is incomplete. There is a need for comprehensive reflection on the interrelationship between the learners or the professionals, the knowledge base of professional education, professional practice, and the context in which the professionals are active (Daley 2001, see also Eraut 1994). The focus of this study is on the relationship between the professions, professional practice, knowledge, and higher education.

Classic theories about the professions are often concerned with the structure, historical development, and prerequisites for the development, organisation, and upholding of the professions. In this context knowledge and the relationship to higher education is generally considered central. Control of knowledge within a field of practice as well as claims of authority and jurisdiction through monopolising the knowledge as well as the work within the delimited territory of the professionals are some of the main characteristics of the professions according to professional theory. The professionals' authority and legitimacy is based on institutionalised scientific, academic knowledge, the expertise of the professionals and the institutionalised belief that they are the only actors competent to perform certain services in a specific field of practice. A central aspect of the modern professions is the delimitation of a territory in which they have a monopoly on exploring, planning, performing services, and controlling the members'

education and other formal qualifications. The delimitation of a territory and certain competence in turn strengthens the professionals' authority. The legitimacy of the professions is also dependent on public acceptance associated with ethics, morals, and trust (see e.g. Macdonald 1995, Castro 1992). However, the professionals' legitimacy and their claims of expertise have been questioned by the logic of the market where calls for formal knowledge and expertise have become subordinate to demonstrable results (see e.g. Alvesson 2006, Knight & Yorke 2004, Harvey 2001, Barnett 2000a).

However, there is still a close relationship between higher education, professional knowledge, and work. The professionals supposedly acquire scientific or academic knowledge in higher education, which then constitutes the basis for the professionals' claims of expertise and central to the legitimacy of the professionals and the public's acceptance and trust in the professionals' expertise (see e.g. Macdonald 1995, Sarfatti Larson 1977). Thus, higher education is assumed to provide credentials and to increase the professionals' formal competence. However, less interest has been paid to the relationship between professional education and professional practice, as well as to the substance of professional knowledge. It seems less clear whether and how actual competence is appropriated through higher education and how this competence is related to the professionals' work and the demands encountered or the qualifications required in professional practice, i.e. the competence-in-use. What professional knowledge consists of, how it is appropriated, and the relationship between the professional knowledge assumed to be appropriated through professional education, and professional practice are seldom of central concern in professional research. The focus should be shifted from the structure of occupations to the work that the profession actually does (Abbott 1998, Freidson 1970b). There is a lack of research on the content of professional development and work; that is what the professionals know, how this is learned, and what they do (see e.g. Parkin 1979). In research on the professions it is generally assumed that the professionals are socialised and trained through professional education and that education increases the human capital of the graduates. However, in previous research on the functions of higher education, it has been suggested that education may primarily increase the formal credentials of the graduates (rather than their actual competence) and thereby mainly has a sorting and allocating function (see e.g. Collins 1979, Meyer 1977, Arrow 1973).

Professional practice is characterised by increased complexity, unpredictability, and the rapid emergence of new knowledge and technology (see e.g. Barnett 2004, 2000a, Schön 1983), which has also lead to increased specialisation and differentiation within the professions (Hellberg 2002,

McGuire 1993). The changes create demands for new and different knowledge or competence in the world of work and higher education is generally presumed to accommodate these demands. It is however unclear how specialised or generalised the knowledge conveyed by means of higher education should be (see e.g. Abrahamsson 2002b).

Empirical studies suggest that the demands in work life have led to calls for more general or broad professional competence in work life as a prerequisite for handling complex situations. General competence or meta-competence, such as flexibility and the ability to learn, as well as socio-communicative competence may be given priority over specialised knowledge, subject-specific knowledge, or discipline-related knowledge that is perceived to become outdated more rapidly than in the past. There have been claims that there are deficits in the graduates' competence related to the demands for a successful professional practice and there is increased concern that the institutions of higher education do not ‘prepare’ the students for the increased complexity and the changing demands that characterise professional practice. It has been suggested that there is a widening ‘gap’ between higher education and the world of work, or between what is learned through professional education and the competence required in the workplace (see e.g. Burnet & Smith 2000, Hixon Cavanaugh 1993).

Different professional practices are characterised by different contextual factors and different demands, and it would be difficult to create a general picture of how higher education should be structured in order to meet the demands encountered by the graduates from different professional education programs. Thus, the relationship between higher education and professional practice is likely to vary, for example between different professional education programs and practices such as engineering and medicine, although there is little previous research to illuminate this.

1.1 Aim of the thesis

The aim of the study is to describe and analyse what the graduates consider to be professional knowledge, what they perceive they have learned through professional education, and what competence requirements they experience as a physician and engineer in information technology. This is broken down and reformulated in the following specific research questions that will be addressed in this thesis:

- What reasons do the physicians and engineers express for their educational and career choices?
- What do physicians and engineers in information technology learn through professional education?
- What demands are encountered by the novice physicians and engineers in the workplace?
- How do the professionals perceive the need and the opportunities for learning and further development in their professional practices?
- What differences and similarities can be discerned between the professional groups with respect to the aspects outlined in the first four research questions?

The empirical data have been analysed according to a comparative design. The data were collected by means of in-depth interviews and the results are based on the engineers' and physicians' experiences and perceptions of the transition from higher education to professional practice and the graduates' encounters with the professional practice.

1.2 Theme of the study

The dominant epistemology of both higher education and professional practice is characterised by a technical rationality and viewed as an instrumental application of knowledge grounded in theories, technologies, and techniques developed through science and disseminated through professional education (Schön 1983). This is related to a technological-functional perspective on learning, which also characterises the human capital theory where education is viewed as a rational and instrumental strategy for increasing individual competence and employability (see e.g. Ellström & Nilsson 1997). It is not uncommon that learning is equated with formal education and training. Work and learning are treated as two separate activities without overlap despite empirical studies that suggest the contrary, learning commonly occurs on the job (Eraut 2004, Helms Jørgensen 2004).

To handle the increased complexity and demands of professional practice, there is a need for continuous learning and professional development.

The relationship between higher education and professional practice is not unproblematic. The labour market is differentiated and different actors have different views regarding the functions of higher education and to what extent it is possible to regard higher education as a preparatory institution for the world of work. In the literature relating to the functions of higher education, there is a tendency in the rhetoric to create dichotomies between, for example, the extent to which higher education should enhance students' knowledge and cultivate their personality with little or no consideration of the tasks and roles in their future professional careers and to what extent higher education should prepare the students for the world of work more directly. In other words, whether higher education should lay a foundation for the graduates' future professional careers or have a direct preparatory function. Other recurring questions are whether higher education should prepare the students for a wide variety of occupational tasks and occupations or if it should be highly specialised (generalists versus specialists), and whether higher education should provide competence that is (or seems to be) in demand in the labour market today or, rather, strive to produce 'active agents of innovation and change' that transform working life (see e.g. Teichler 2000). The formal educational system is generally considered to be an important institution of learning and when it comes to providing the students and future professionals with competence relevant to their professional practice. However, the impact and purpose probably differ between different kinds of education programs.[1]

In previous research on higher education, different functions have been outlined related to alternative approaches or different views of knowledge and how learning takes place in a formal educational setting. A general distinction can be made between a human capital/qualification/socialisation approach and a sorting/selection/filter approach. From the former perspective, knowledge is perceived as something that is internalised by the individual (leading to cognitive change) and where the effects of education consist of changes in the knowledge that an individual holds in a direct causal sense. Education can be viewed as a qualifying system that conveys actual competence that has a bearing on or is relevant to the graduates' professional practice – or, rather, has a value on the labour market – and socialises individuals in a relatively unproblematic way (see e.g. Schultz 1977, Becker

[1] The motives for taking a liberal arts course at university, such as literature history, and the motives for studying a vocational educational program, are likely to differ, as the potential employability aspects certainly do.

1964).[2] On the other hand, the latter perspective is related to an institutional approach where the educational 'myth' has been institutionalised in society; the educational effects are a myth that is realised by the participants (see e.g. Meyer 1977). Whether the educational system actually conveys competence or not is less relevant from this latter perspective, the focus is instead on the credentials that educational system provides individuals with, i.e. the formal competence (see e.g. Collins 1979). The credentials or diplomas received through higher education are used by potential employers to sort and select appropriate employees.[3] The notion of what the effects of higher education are or should be, i.e. to convey knowledge, is represented and reproduced by the participants. In this sense education has effects or an impact as long as there is a belief in the effect.

Thus, a central question is whether professional education primarily has an institutional effect and acts as a system for legitimating or a formal meriting system where the credentials needed to enter the profession is of central concern and practising the profession is something learned in the workplace; or does higher education act as a socialising and qualifying mechanism where the professional educational programs lead to learning and increased knowledge among the professionals that is relevant to professional practice, i.e. lay a foundation critical for the ability to become an effective practitioner and for further development within the profession.

There is a shortage of studies on what knowledge recently graduated professionals have acquired during their education in relation to what opportunities they have to put them to use. Previous studies have also often been concerned with specific educational programs, and without the possibility of comparisons, problems related to the generality of the results arise (Teichler 2000). There is also a lack of longitudinal studies with a qualitative approach in previous research on the transition from higher education to working life. Most previous research is based on a quantitative

[2] Thus, the foundation in the human capital approach and socialisation approaches in educational sociology represents a technological-rational view of knowledge and education.

[3] In working life, organisations formulate certain criteria related to education and select those who meet these criteria, individuals with the appropriate attributes for certain positions. The attributes may reflect initial individual differences prior to entering the formal educational system. Historically, family relations were used in the same manner, i.e. the selection of suitable individuals for specific positions. Thus, education may not make these individuals more suited to occupy the positions. Sometimes, the individuals who occupy the positions may not be more efficient than individuals lacking the appropriate education. However, a major aspect may also be ensuring that education is profitable (Gesser 1985).

approach. Furthermore the problems graduates face when making the transition from higher education to work, the workplace as a learning environment, and how the graduates adapt to new learning environments have received little attention in previous research (Johnston 2003, Teichler 1996, Candy & Crebert 1991).

Thus, there is a need for a growing complexity of research approaches in the field of higher education and work and a broad range of factors has been called for (Teichler 2000, 1999, Brennan et al. 1996). Among other things, there is need for more knowledge about the substance of learning, the encounter with work (the initial period in the profession) and the nature of the tasks in the workplace. Without more extensive knowledge of these aspects, there is a risk that research on graduates' employment will lead to empty speculation.

1.3 Context and setting

The empirical foundation of the study consists of recent graduates' subjective experiences and perceptions of their education and their encounter with professional practice. My theoretical interest in the relationship between professional practice, knowledge and higher education stems from the question of the functions of professional education. As outlined in the aim of the thesis, the central concern is what bearing professional education has on the graduates' experiences of the transition to professional practice and if the competence acquired in higher education is related to the demands encountered in the workplace. In other words, the focus of the thesis relates to what competence (if any) is conveyed in higher education to the graduates and how this relates to the professional practice and the possibilities for further development and continuous learning in the workplace and in the profession. This is also associated with the specific conditions of professional practice, which are likely to differ between different professional educational programs and different professions. Accordingly, two different professional programs are focused on and will be compared in this study. This thesis is based on interviews with recently graduated physicians and engineers in information technology. Both groups have undergone a long vocational professional education. Medicine is considered to be one of the 'classic' professions characterised by homogeneity and a partly static professional knowledge base, whereas engineering in information technology is a new educational program related to a field of practice characterised by rapid and continuous change (although the knowledge base associated with the educational program can be perceived to have a static core). Engineering is also a more heterogenic profession than medicine both horizontally and

vertically (see e.g. Hellberg 2002). The two professional groups have similarities but are also in many ways very different, which is considered advantageous when selecting groups in comparative studies (see e.g. Denk 2002).

Physicians have a form of apprenticeship system incorporated in their education with practical training integrated with theoretical studies. The relation between theory and practice is more tenuous for engineers than it is for physicians. Furthermore, the physicians are generally employed by the state and work in professional human service bureaucracies (see e.g. Mintzberg 1983, Hasenfeld 1983), and all citizens are clients. The physicians are authorised by the state and other occupational categories cannot compete for claims to the same field of practice (see e.g. Einarsdottir 1997). The engineers, on the other hand, generally work in a broader labour market, subject to competition from other occupational groups, and are employed both in professional bureaucracies as well as in collegial and innovative organisations (see e.g. Lazega 2001, Mintzberg 1995). The most important actors for the engineers are the market and companies in the private sector (see e.g. Hellberg 2002). However, while the physicians can more commonly be found in process-oriented organisations, the engineers more often work in result-oriented organisations.

The respondents were interviewed on two different occasions. The initial interviews were conducted when they had graduated relatively recently from higher education and been working for about 9 months with their experiences of their education relatively fresh in their minds. The follow-up interviews were conducted when the respondents had been working for 3-4 years and thus had become more integrated as practising professionals and a clearer picture of what the demands related to working life entail had emerged. This study has been conducted within the framework of a larger research project with a focus on higher education, work, and lifelong learning.

1.4 Some concepts used in the thesis

In the following section some concepts considered central in the thesis will be introduced and briefly described. The concepts will be more thoroughly elaborated on and discussed later in the text.

Higher education

Education commonly refers to an interaction in which some form of learning is expected to take place. Education is incorporated in different social contexts and is associated to different institutions and practices. An individual may be expected to learn how to play music, speak a foreign

language, perform brain surgery, create computer programs, etc. Some education takes place within the family, other education takes place within the formal educational system and in the workplace. In this thesis, the concern is the formal higher education system; specifically, two professional educational programs at Swedish universities, i.e. for engineers and physicians. Here, higher education refers to education that takes place at universities or university colleges.[4] Professional education refers specifically to the higher education programs for professionals, i.e. for physicians and engineers. Medical education is relatively standardised. There are educational programs for engineers at different levels, but the engineers who are the focus of this study have attended an educational program at the master's level. Thus, engineering education, in this thesis, refers to educational programs at the Swedish master's level (Swedish: 'civilingenjör') and the results and discussions in this study may not apply to other, shorter educational programs.

Professional practice

Abbott (1992) argues that professional practice consists of three acts or modalities often performed together by the professionals; diagnosis, inference, and treatment or, in other words, 'to classify a problem', 'to reason about it', and 'to take action'. The professionals often combine the three acts, which are not necessarily temporally structured, and the professional may, for example, diagnose by treating. The acts are closely related to the profession's jurisdictional claims. Diagnosis entails colligation, meaning constructing a picture of the problem, and classification, referring the problem to the professional knowledge base and problems that shares similar treatments. Inference is relevant when the relation between diagnosis and treatment is considered obscure. Treatment includes a classification process and prescription.[5]

The concept of professional practice in this text refers to the work that the professionals actually do and the context within which the work is done. From a traditional perspective, professional practice is regarded as referring to applied science, technology, policy; applications of knowledge grounded in theories, technologies and techniques developed through science; or as instrumental problem solving, and to stable institutional contexts. A technical rationality has been dominant in both professional practice and in the curricula of professional education (see e.g. Rolf et al. 1993, Schön 1983).

[4] In Sweden, a distinction is made between university colleges and universities. This will not be further elaborated on here.

[5] For further elaboration see Abbott 1992.

This commonly entails a dualistic view of knowledge as a transferable product from one context to another, i.e. from education to practice (Rolf et al. 1993). However, professional practice is likely to be characterised by uncertainty and unpredictability, and problems may not be easily definable and solved by the application of knowledge acquired in higher education (Schön 1983). The production of knowledge and its application is, instead, not considered to be separable.

Learning

Learning is widely understood as changes that takes place in an individual during or through her/his interaction with the surrounding environment. Learning is generally viewed from one of two perspectives often considered to be mutually exclusive, a cognitive and contextual perspective respectively (see Ellström 1994).[6] In this thesis, the different perspectives on learning, that is, learning as a cognitive process or as something that can be internalised, versus a social constructivism or contextual approach to learning, is not viewed as though they rest on different ontological foundations and I do not view them as mutually exclusive, but rather as complementary. Kock (2002) refers to this as an 'eclectic positioning' and argues, based on Illeris (2001), that learning is made up of two integrated processes: an interaction between the individual and the context and an internal appropriation process where the individual is the bearer of competence, which leads to a definition of learning as "*the relatively enduring changes of an individual's or a group's /…/ competence that originates through the individual's /…/ interaction with the context, i.e. an interaction with different types of problems, work assignments, other people /…/ or technical systems.*" (the author's translation of Kock 2002, p. 43).

Knowledge

Knowledge is often considered to have a technical or theoretical component. This can be referred to as book knowledge, codified, declarative or propositional knowledge, and concerns knowledge about an object as separated from the subject or 'knowing that'. Propositional or theoretical knowledge is explicit by definition (see e.g. Eraut 2000, Abrandt 1997). Knowledge can also contain a practical component or 'know-how', as labelled by Ryle (1963), which is only expressed in practice and learned through experience and is thus inseparable from the action. Knowledge can

[6] Further developed in section 4.3.

also be tacit or implicit (see Polyani 1967).[7] Different professional practices involve varying extents of technical and practical knowledge. Eraut (1994) notes that the triad of knowledge, skills and attitudes is commonly used in the literature, where skills ought to refer to 'know-how' and knowledge as a concept is often confined to propositional knowledge. In this thesis, knowledge is seen in a wide sense as containing a theoretical and practical understanding that transcends propositional knowledge and also includes 'know-how' or being able to do and the process through which know-how is learned and updated through reflection (see Eraut 2004, 1994). Eraut (1994) suggests a definition of knowledge which includes 'procedural knowledge, propositional knowledge, practical knowledge, tacit knowledge, skills and know-how'. Thus, professional knowledge is understood in a wide sense, but this is, however, also associated with a number of problems as it includes tacit knowledge, which is not easily verbalised, and explicit knowledge, which is not used. These aspects of knowledge are not easily captured in empirical studies. This study is based on interviews and thus knowledge is for all practical purposes confined to the aspects of knowledge that can and is verbalised. In the empirical analysis, the theoretical and practical components of knowledge are separated.

Competence

Competence has its origin in the Latin word 'competere', meaning to be suitable. Usually, it refers to being suitable in relation to certain work (Nordhaug & Grønhaug 1994). Ellström (1994) defines competence as an individual's potential capacity to handle a task effectively according to specific predefined formal or informal criteria. Thus, competence is regarded as a wider concept than knowledge in that it includes an affective component, including attitudes, values, and motivational factors, personal characteristics, and social skills as well as perceptual motor skills and a cognitive component (Ellström 1998). Competence can be general or specific, related to a certain organisation and can be gained easily or may be more difficult to acquire as it may be complex or tacit. A distinction can also be made between actual and formal competence, i.e. as evaluated by means of examinations and certification procedures (Nordhaug & Grønhaug 1994). Competence is separated from qualifications that refer to requirements of a task and officially required competence, i.e. competence valued on the labour market

[7] Polyani (1967) exemplifies this with face recognition. People can identify familiar faces in a crowd, but have trouble explaining why or how they go about the identification.

and has an exchange value rather than a use value (see e.g. Ellström 1998, see also Andersson & Fejes 2005).

Knowledge base

Knowledge base refers to a common foundation or core central to a professional educational program and/or the professional practice. The knowledge base is associated with the central phenomenon in the education and professional practice, respectively; in other words, there is a separation between "*the body of scientific knowledge possessed by the profession from the knowledge used in applying knowledge to work situations.*" (p. 346 in Freidson 1970b). The knowledge base of the educational program is associated with academic and scientific knowledge whereas the knowledge base of the professional practice is primarily associated with the competence-in-use. The concept of knowledge base in this thesis refers to the personal knowledge of the practising professionals, including propositional knowledge and practical know-how.[8]

Eraut (1994) characterises the way the professions tend to portray the knowledge base as being associated with established scientific disciplines requiring a long period of training to learn and an exclusive or unique form of expertise since it is not shared with any other occupation. This is often associated with establishing an academic discipline, grounded in the established disciplines, in which the professional knowledge accumulated through practice is organised and codified and facilitates the import of 'concepts and ideas' from other disciplines in the expansion of the knowledge base. The close ties between higher education and the professions have strengthened the legitimacy of the knowledge claims.[9]

Profession

There have been numerous attempts to separate professions from occupations, but it is difficult to set up a definition that clearly separates the professions from non-professional occupations, or as Eraut argues: "*The professions are a group of occupations the boundary of which is ill-defined.*"

[8] Eraut (2004, 2000) suggests a distinction between cultural and personal knowledge where the latter refers to an individual's cognitive resources which the individual brings with her/him into a situation providing a foundation for thinking and performing. Personal knowledge includes both codified propositional knowledge and experiential procedural process knowledge, or 'know-how'. The propositional and experiential knowledge is closely integrated in the personal knowledge and may either be explicit or tacit.

[9] See chapter 4 for further elaboration of the concepts discussed above.

(p. 1 in Eraut 1994). Theories concerning the professions commonly revolve around and are modelled by ideal-types, such as medicine. The aim of this study is not to engage in this debate, but in any definition that has been set up, both medicine and engineering should most probably be included among the professions. The concepts of professions and professionalisation are somewhat indistinct and vague, and this can be attributed to the fact that they are used in everyday language at the same time as researchers are trying to fill them with a formal academic content. Goode (1957) has argued that a profession is a community (in varying degrees) characterised by the members' sense of identity that binds them together and usually membership is a permanent status.[10] The professionals are created socially through control and selection, in an adult socialisation process, through training and in the formal educational system. Professionalisation often refers to "*a general idea that certain white-collar occupations tend to move toward strong occupational control.*" (p. 355 in Abbott 1991).

A common understanding of what constitutes a profession today is summarised by Abbot (1998, 1988) as a group of experts who utilise some particular form of abstract knowledge in practice or as "*…an organized body of experts who apply some particular form of esoteric knowledge to particular cases.*" (p. 430 in Abbott 1998).[11] The professions are also associated with the formal educational system through which the professionals are educated and trained, which is controlled by some form of examination, in order to acquire the formal merits required to become a member of the profession. In addition, the professionals are generally considered to also embrace, some form of, a code of ethics, or rules of behaviour.[12]

Hellberg in her dissertation from 1978 defines a profession as "*an occupational group that monopolises certain knowledge that is useful or*

[10] The members share common values and have a common understanding of role-definitions in relation to both members and non-members and are the same for all members. There is a common language within the profession that is only partly understood by outsiders (Goode 1957).

[11] A similar definition can also be found on p. 8 in Abbott (1988). Furthermore, Abbott (1998, 1988) differentiates between full professionals (modelled by the classic professions: law and medicine) and semi-professionals (e.g. nurses) who are employed in bureaucratic organisations but do not employ knowledge that is as esoteric as that of, for example, law or medicine (see also Etzioni 1969).

[12] A main distinction in definitions of professions can be drawn between those based on a consensus perspective (naïve), derived primarily from the works of Parsons, and definitions based on a conflict perspective (cynicism), derived from Weber. See section 2.1 for further elaboration.

valuable and that constitutes the foundation of the group's monopolisation of a certain occupational positions. Professions are the occupational groups that, through an organised striving/ambition/aspiration, are allowed to institutionalise a knowledge or occupational monopoly." (the author's translation of Hellberg 1978).[13]

Based on a Durkheimian perspective Castro defines the modern professionals as "*highly educated social groups that based on their scientific authority and expert status have managed to create specific occupational jurisdictions and claims to be the only competent group to perform certain services.*" (p. 73 in Castro 1992).[14]

A common thread in these and most definitions in the literature (and what is relevant to this study), signifying the modern professions, seems to be a relationship to a certain mass of knowledge (related to problem-solving within a certain field of practice) that the group has more or less successfully monopolised through primarily higher education. Torstendahl argues that "*The theory of professionalism has to do, in one way or another, with how knowledge (and/or skill) is used by its owners as a social capital and not only for purposes connected with the immediate problem-solving to which the system itself may refer*" (p. 3 in Torstendahl 1990).

Hence, maybe the most central aspect is the relation to knowledge (primarily scientific or academic knowledge) and this often implies a relation to higher education. The relationship is generally not only associated with a single academic discipline but, rather, to different disciplines that are connected through a professional practice.

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[13] Hellberg (1978) notes that the three central characteristics of trying to define the professions are a foundation of specific and theoretical knowledge, a service ideal and autonomy, where the first is central for and common to most researchers in the field.

[14] Castro (1992) argues that there are six distinct characteristics that are necessary for an occupation to become a profession; 1) scientific authority or scientific expertise; 2) to have the public's trust in the services they have to offer and that the public and potential clients ascribes importance and prestige to the scientific knowledge on which the professionals' competence rests (which also implies trust in the state and the universities as guarantors for the professionals); 3) autonomy, which refers to independently planning and performing the tasks associated with the occupation; 4) jurisdiction (borrowed from Abbott) or closure strategies that are founded in the scientific authority, which implies that the professionals are the only ones competent to perform specific tasks and services in certain areas, 5) that the professionals are organised to collectively look after and utilise their interests; and 6) that the service ideology leads to some form of ethics code to protect the trust or authority that is given to them by public opinion.

It is also common (primarily from a consensus perspective) to emphasise the establishment of an ethical code with an ideal that, in essence, concerns serving the client and society in the best possible way.[15] Furthermore, a central aspect of theories about professionals and professionalisation is the relationship between knowledge and authority (and power). The modern professionals are located in a certain organisational context and their authority is rooted not only in the knowledge they control, but also in the organisation (see e.g. Freidson 2001, 1994, Benveniste 1987, Parsons 1963).

I do not intend to adhere to a particular definition of the professions in this study; rather it is probably more meaningful to discuss different degrees or the process of professionalisation. Of relevance to this study is to point to the central aspects of professional theory that are relevant as regards illuminating professional practice, what the professionals do, and the relationship between higher education and the world of work.

1.5 Outline of the study

In the introductory chapter, the study's aim and specific research questions of the study have been presented together with a general introduction to the study and some central concepts used in the thesis. The intention in the following three chapters is to present a background and theoretical framework where I intend to place the dissertation in a context and to present theoretical considerations, assumptions, and delimitations deemed relevant to the study.

In the first part of the theoretical framework, chapter 2, the relationship between the professions and higher education is discussed. The chapter includes a background description of research on the professions, the strong relationship between higher education and the professional legitimacy, an exploration of the relationship between higher education and professional practice as a preparation for the unknown, and the gap between higher education and professional practice.

In chapter 3, different theories of the functions of higher education are presented, and this leads to a presentation of two main ways of perceiving higher education; i.e. a human capital/socialisation approach versus a sorting/selection approach.

The focal point of chapter 4 is professional practice, more specifically, the context in which the professionals work, i.e. professional organisations, and professional knowledge, competence, and qualifications as concepts

[15] A typical example of this is that physicians should provide the best possible care regardless of if the patient's wealth, gender, or ethnical background.

central to the professional practice. The background and theoretical framework is concluded by a discussion of the implications of this first part of the study.

In chapter 5, the design and methods of the study are presented. This chapter includes a description of the design of the study and research process, procedures for the selection of respondents, data collection procedures, processing and analysis of the empirical data, as well as a discussion about the positioning and quality of the study.

Chapter 6 constitutes a 'case description' of the two groups compared in the study and includes a description of the educational programs and the work context for engineers and physicians in Sweden. The chapter also includes a brief description of previous research. In the following three chapters, the results of the study are presented and analysed.

The focus of chapter 7 is on the respondents' experiences and perceptions of what they have learned during their education. The chapter is structured around theoretical and practical knowledge, generalist or transferable knowledge and, finally, socio-communicative competence. The results for the two groups are presented separately under each theme. The chapter is concluded with a comparative analysis of the two groups.

In chapter 8, the respondents' perceptions of the demands encountered in professional practice are presented. The results for the engineers and physicians are presented separately in this chapter as there are no appropriate common themes to structure the chapter around due to the differing nature of the two groups' professional practice. The chapter ends with a comparative analysis.

In chapter 9, the focus is on the respondents' learning in the workplace and their professional development, including the professional specialisation and the development of a professional identity. The chapter is structured around themes based on the respondents' perceptions of their needs and opportunities as regards further learning and development, the substance of learning in professional practice, professional specialisation, and, finally, the development of a professional identity. The results for both groups are presented separately for each theme and the chapter ends with a comparative analysis of the two groups.

Chapter 10 includes a discussion of the results in relation to the aim of the study and the specific research questions, the background and theoretical framework of the study.

Chapter 2: Higher Education and the Professions - some basic issues and concepts

The aim or functions of higher education, and what competence higher education should convey, can be related to professional development as well as to knowledge and legitimacy aspects of research on professions. Higher education can be regarded as a fundament for the modern professions. Higher education is generally expected to convey specific and general competence relevant to professional practice.[16] Through higher education, the professionals become qualified, trained and socialised. Higher education infuses respect for academic or scientific knowledge and methods in increasingly wide groups in society by means of, for example, recurrent education in different occupational groups.

> The essence of professionalism is a thorough and up-to-date grasp of the fundamental knowledge base of an occupation; sufficient understanding of the underlying theoretical principles to be able to adapt to novel circumstances and to incorporate research findings into practice; and appropriate practical skills and professional values (p. 237 in Dearing 1997).

The relationship between knowledge and work is central in the literature concerned with the professions, that is, the relationship between academic knowledge (which is assumed to hold a privileged position as something universal and rational) and practising a profession. In most research on professions, the monopoly of knowledge and the jurisdiction of a field of practice are regarded as fundamental for the establishment of an occupation as a profession. The knowledge referred to is primarily specialised, discipline-specific knowledge, but as Dearing (1997) points out, socialisation of professional values and generalist competence can also be considered central.

The monopoly and control of knowledge associated with a field of practice seems to be one of the most important aspects of the process of professionalisation. The monopoly of knowledge rests partly on the

[16] The underlying epistemology of knowledge here is that of a technical rationality where knowledge appropriated through education is to be applied to the professional practice.

relationship to higher education, where advocates of the professions contribute to the reproduction of the profession since they are in a position to prioritise knowledge, they produce knowledge and teach. Bourdieu & Passeron (1977) argue that the educational system is a reproductive system for societal power structures and is not primarily a functional means to increase knowledge of the graduates but, rather, a way to exert power and uphold the structures that benefit the prominent groups in society, e.g. the professionals (see also Berner et al. 1977).

2.1 Professionalisation - from consensus to conflict

In a pioneering study of the modern professions, Carr-Saunders and Wilson (1933) presented an overview of the emergence of a completely new occupational structure and the new professions.[17] Perkin (1989) argues that the professions reached their peak during the 1960s and 1970s when the welfare state emerged both as an ideal and governing principle. Still, since the early 1970s, professionals and professional knowledge have been regarded as a central foundation of or driving force behind the division of labour in society.[18] With an increasing specialisation and division of labour, the credential society emerged (see e.g. Collins 1979). Education was becoming a decisive factor for the individual's opportunities on the labour market, opportunities that were reserved for occupational groups with increasingly longer education (Hellberg 1997).

The varying meanings of the professional ideal are reflected in research on professions. In the literature on professions, structural functionalistic approaches (primarily American) dominated up until the 1970s. An important work was Talcott Parsons' *The Professions and Social Structure* (1963). A central premise in these studies was that the professionals were not only perceived as important but also as necessary and vital for the continuing prosperity and balance of society. The professionals were the driving force behind development, and were regarded as guarantors for a peaceful and

[17] Independent of the capitalistic framework, the rise of the professions coincides with the rise of the industrial society and industrial capitalism. The division of labour and specialisation increased in all areas of working life and the demand for intellectual and qualified labour increased (Sarfatti Larson 1977).

[18] In the growing service-based economy, the demand for services and qualified professionals has increased while the production of goods employs a decreasing proportion of the work force (see e.g. Bell 1973). This is the case in both Sweden and other OECD countries. In the 1990s, the proportion of professionals in Sweden, Germany, and the United States increased by 10% (see e.g. Hansen 2001).

democratic society. There was an absence of a power or conflict perspective in these analyses of the systems of professions (see e.g. Hellberg 1997, Castro 1992).

In the 1970s, the structural functionalistic consensus perspective was criticised and it was argued that the professional rhetoric about altruism and service to the public was a disguise for creating positions of authority and wealth in society and on the labour market. It was, for example, argued that the professionals claimed to possess superior knowledge, based on scientific methods, and to be the only ones who could both formulate the needs of society and be the ones to satisfy them in an acceptable way. Thus, the professional self-serving interests were perceived as conflicting with societal and democratic interests. Theories about the professions based on Weber's general theory of exclusion and different groups' monopolisation of the limited resources of society were developed. A conflict-oriented perspective replaced the more harmony-oriented perspective derived from Parsons (see e.g. Collins 1990, Murphy 1988). Brante (1990, 1987) has described this change as a shift from the structural functionalistic view of the professionals as naïve towards a cynical perspective with a focus on the professional's strategies for power, authority, and monopoly.

From the former, consensus perspective, the professions are viewed as a stabilising force, with altruism and public service characterising professional practice. Professionalism tends to imply something good that rises above particular interests and that the ethical and moral dimensions are central. The professionals learn through education how to become good practitioners.[19] Ideally, the professional moral aims at protecting the client (individual, group, or society) and to provide the best possible service irrespective of economy and social positions. Durkheim (1995) argued that if moral is not rooted in an external authority, it needs to be anchored in reason, and education plays a central role in this. Professional behaviour is guided by moral considerations, i.e. concern and care for a patient, group, or society and not by aspects that are related to personal gain, financial profit, power, or social success. Durkheim (1992) emphasised the stabilising function of professions. The moral dimension can also be related to professional cohesion and professional socialisation. The foundation of this cohesion is the control or monopoly of knowledge. The moral dimension is needed so that the use of authority can be controlled.

From the latter, conflict perspective, the professions are occupied by securing power and status, education is a way of creating jurisdictional

[19] From this perspective the education system could be perceived to actually impart knowledge on the students and as a result can better society.

borders and controlling the practice.[20] From a conflict perspective, the development of the Weberian theory of social closure tends to be emphasised when studying professional strategies (see e.g. Murphy 1988, Parkin 1979, 1974).

2.2 Professional legitimacy, jurisdiction, knowledge, and higher education

Carr-Saunders & Wilson (1933) as well as others (see e.g. Freidson 1986, Abrahamsson 1985) have identified knowledge and its technical application as one of the most important distinctive characteristics of the professions. The professionals are occupational groups that have monopolised positions on the labour market based on their control of certain knowledge. Macdonald argues that "*professions are knowledge-based occupations and therefore the nature of their knowledge, the socio-cultural evaluation of their knowledge and the occupation's strategies in handling their knowledge base are of central importance.*" (p. 160 in Macdonald 1995). Abbot contends that "*the central tasks for professionalization lie in construction of a knowledge basis for an occupation, in which case, education and related "intellectual" institutions should arrive early in professionalization.*" (p. 357 in Abbott 1991).

The monopoly of knowledge refers to rational and approved knowledge that the educational system has as one of its main objectives to convey. To regard some knowledge as rational, or as necessary for acting rationally, implies subordination of some knowledge to other kinds of knowledge, which is often reinforced in society to include non role-specific behaviour. To consider some knowledge as approved or acceptable, whereas other knowledge is not, has implications for what is viewed as rational behaviour, and status, for how reality is to be defined and for how work and power, status, and influence is to be distributed in society (Gesser 1985).

The modern professions are associated with abstracting knowledge from different social practices and anchoring them in, primarily, higher education.[21] Scientific or professional authority is connected to formal

[20] This perspective is more in line with regarding the educational system as an institution where the belief in and public respect for higher education is more important than the actual competence that may or may not be conveyed, although it may still be important that the socialising effects in line with the professional ideal are strong both during education and in the professional practice.

[21] This neither implies that all knowledge of the social practice is abstracted nor that only knowledge collected from practice is anchored in higher education.

knowledge and certification through diplomas issued by universities. The formal educational system qualifies some individuals and excludes others in the practising of certain occupations or professions and this has been a central way for the professions to increase their status and decrease competition (see e.g. Collins 1979, Hellberg 1978).[22] Eraut argues that professional organisations "*…increasingly need university validation to confirm the status, worth and complexity of their knowledge base.*" (p. 8 in Eraut 1994). Higher education plays both a cultural and social role in legitimating the professionals' work in the public mind in that abstract academic knowledge is associated with a more effective practice. Academic knowledge is, in this sense, as symbolic as it is 'practical' since it legitimises the professionals' work by clarifying the foundation and relating it to major cultural values such as health and justice (Abbott 1988).

Durkheim (1995) has argued that society has faith in science and scientific knowledge derived from institutions of higher education, which essentially does not differ from religious faith and relies on the idea that we collectively, public opinion, form through the role of science in our lives. The members of society ascribe authority to science and the modern professionals through the connection between science, higher education, and the professions. However, authority can only be conveyed to the professions through public opinion and public trust (Durkheim 1995, 1984). This could, in Abbott's (1988) vocabulary, be called social jurisdiction, which is associated with the public's acknowledgement of a profession's claims of the legitimate control over a certain kind of work, gaining the public's trust and confidence that a profession is legitimate and that the professionals are the most competent to do the work. Thus, jurisdiction refers to the authority to practice in a certain field, and to the fact that others identify the group with the work it is organised by. The professions control not only technique, they also define and identify the problems as well as their solutions.[23]

Abbott (1988) maintains that controlling a mass of cognitive, abstract knowledge is necessary for upholding occupational jurisdiction. The use of abstract knowledge is the main differentiation between professions and other occupations that are anchored in skill (e.g. the engineer versus the mechanic).

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[22] To anchor knowledge in higher education does not automatically lead to an occupation becoming a profession, although anchoring the knowledge base in the occupation in higher education could be perceived to be a prerequisite for turning an occupation into a profession.

[23] Abbott distinguishes between different types of professional jurisdiction; full jurisdiction, subordinate jurisdiction, shared jurisdiction, intellectual jurisdiction, and advisory jurisdiction (see e.g. Abbott 1988 for further elaboration).

An occupation will have trouble claiming exclusive jurisdiction or monopoly of knowledge if the technical base consists of vocabulary familiar to the public, or if the scientific base is narrow enough to be an easily mastered set of rules so that anyone can claim to be an expert. The knowledge should be esoteric and theoretical and thereby difficult to routinize. The knowledge base of the profession should be neither too 'general and vague', nor too 'narrow and specific' in order to establish an exclusive jurisdiction (Wilensky 1964).

Analogue to how Abbot uses the concept of jurisdiction, Max Weber (1968, 1964) described the process of how different positions in society are monopolised by the concept social closure. Weber viewed social closure as the monopolisation the members of a group tried to establish in order to exclude others, and a clear and appropriate characteristic such as gender, religious beliefs, or diplomas is used to achieve this. Social closure was, for instance, used to analyse how the wealthy and the high-status groups monopolised different opportunities on the labour market and how different status groups achieved different forms of monopolisation.[24] A similar reasoning to Weber's views of how different positions in society are monopolised has been presented by Randal Collins in *The Credential Society* (1979). Collins has adapted and developed Weber's reasoning to include academic knowledge as a means for exclusion. Academic knowledge constitutes the content of a special status culture and the credentials constitute the grounds for exclusion.

Collins (1979) describes the credential society in which the credentials have come to be of greater importance than knowledge in the competition for positions on the labour market.[25] The credentials are the entrance ticket to the

[24] There are clear similarities between Bourdieu's & Passeron's (1977) concept of cultural capital and how Weber used the concept of social closure. Bourdieu & Passeron view cultural capital as something an individual can use to achieve different advantages and which has an interest value. They differentiate between different types of capital. Economic capital includes, apart from the monetary aspect, the ability to manage one's private economy/finances, for example, the ability to interpret the economic language, to handle interactions with financial institutions, etc. Empirical indicators of economic capital include, for example, capital, interest, gender and housing. Cultural capital constitutes an entrance ticket to the ruling classes and is related to culture and language associated with the educated class. A common empirical indicator of cultural capital is education. Social capital refers to contacts, the ability to socialise with the 'right' people, etc. Bourdieu & Passeron also discuss other forms of capital, for example, scientific and political capital.

[25] See also section 3.5 for a more extensive discussion of the symbolic use of credentials from an institutional perspective.

most sought after positions. Based on academic credentials the professionals at the universities have a monopolistic control over knowledge, work and positions on the labour market. The less educated occupational collectives are thereby excluded. One strategy employed by the professions is to claim the right to define problems and their solution.

Professional authority is often located in an organisational context and is associated with bureaucratic or legal power. The most far-reaching exclusion (closure or jurisdiction) of a field of practice is when the state legitimates or authorises the professional practitioners. For many professions, for example, within the health sector (as in e.g. medicine), the state has met the demands of the professions for exclusive rights to perform the work. Practising the profession without being authorised is then, in fact, a crime. The profession also guarantees that all physicians have the same competence. However, the assumptions of homogeneity within the professions and the replaceability of the professionals, i.e. that one professional is interchangeable with another (e.g. that the patient is indifferent to which physician is consulted), has been challenged (see e.g. Hellberg 2002).[26] Still, in Sweden the physician has the authority, monopoly, to advise on how to cure illness as well as the authority provided through the social insurance services.[27] Even if the patient has a legal right to refuse treatment, she/he might still be forced to comply with the treatment, as the advice given is associated with economical and even other sanctions (see e.g. Hellberg 2002).

2.3 Differentiation and specialisation within the professions

A number of different traditions in sociological research on the relation between education and the world of work can be discerned. The division of labour can be regarded as something functional and beneficial for society, as there are different tasks that need to be performed or actually are performed and the essence is, from this perspective, to adapt and match personal attributes and qualifications with the demands of the different tasks. The educational system acts as an intermediary mechanism between the individual and the labour market.[28] In sociological research, thoughts about

[26] Also see Eklöf (2000) for a more extensive account of the Swedish physicians' struggle for collective identity formation and legitimacy.

[27] In Sweden, in contrast to many other European countries, engineering does not have a corresponding certification or legitimating system.

[28] There is a need in society for physicians and engineers, but this does not mean that any specific individual has to train to be a physician or engineer. The problem of

the necessity of selection mechanisms in society to ensure that individuals with the appropriate abilities, knowledge or characteristics end up in the right positions have also been considered by, for instance, Pareto (1991) and Davis & Moore (1945).[29] Another, more common perspective on the division of labour can be related to control and rational production. The basis for this perspective is that it is easier to learn how to manage a simple and limited task than it is to perform more complex tasks. At the same time, it is easier to replace individuals and control the work. From this latter perspective, the educational system's primary role is to socialise individuals and to convey qualifications, both cognitive and moral. Most research on education and the division of labour can be located in this latter tradition (Gesser 1985).

An increased division of labour and specialisation has also led to considerable differentiation within the professions. The conditions for professional practice have come to differ more and more depending on, for example, what kind of service the professionals supply, in which sector the professional services are performed, and if the professional services are aimed at individual clients, groups or organisations. There are considerable differences in status, authority, and income between professionals active in the private and public sectors, and also between the traditional professions and the more recent. This has had implications for research on professions, where differentiation between professionals, not based solely on knowledge but also on different sectors and receivers, has been introduced. These distinctions cut across the traditional professional categories and borders. The

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society's internal production of positions due to the division of labour in relation to the individual perception of the freedom to choose an occupation and professional career has been addressed by e.g. Simmel (Wolff 1965).

[29] For further elaboration on functional stratification, see the debate in The American Sociological Review by Tumin (1953) and responses from Davis (1953) and Moore (1953), Buckley (1958), Wrong (1959), Moore (1963), Stinchcombe (1963). Collins (1971) relates Davis & Moore's general functional theory of stratification from 1945 to education in a technical-function theory of education. The foundations of this theory are that the requirements for knowledge on the labour market are constantly increasing due to technological change. Higher education provides the means for upgrading competence to meet the new requirements. Therefore, the educational requirements are continually increasing, and a larger proportion of the population has to spend more time in the educational system. Collins relates this perspective to a conflict perspective (derived from Weber) in which competence requirements for employment are a reflection of the competition between different status groups in society trying to monopolise or dominate jobs by controlling the selection process.

main distinction is between market and welfare professionals (see e.g. Hellberg 2002, 1997, Castro 1992, Brante 1990).[30]

One trend is that the professionals include an increasing proportion of the working population. This means, among other things, that the conditions regarding the authority to define and solve different societal problems have changed. Differentiation has also brought about hierarchies within the professional groups. Brint (1994) identifies the experts as the leading group within the professions, i.e. professionals active in the leading institutions in society (e.g. in civil service departments, government offices, and in official government reports). He differentiates the experts from the professionals who are active in their respective professional practices. The experts base their authority on specific knowledge, and are separate from the governing elite, which consists of individuals whose authority is based on the specific leading positions they hold in society. The distinction is upheld by the fact that an expert who takes a leading position ceases to be an expert and becomes a member of the elite. Brint's analysis leads to a distinction between three different roles within the professions, i.e. the practising professional, the expert and the elite, where the practising professionals apply the professional knowledge, the experts hold positions from which they organise the activities, and the elite are located in the highest positions in the public and private sectors.

In relation to each field of practice, an educational program has been built up that is characterised by a mental content (and a certain rationality) derived and separated from a manual or executive content (Gesser 1985). The differentiation within the professions leads to the formation of new specialisations and new professions, a more complex system of professions. The professions gather their knowledge from different academic disciplines and it is not possible to embrace the entire field of a scientific discipline (see e.g. Castro 1992).

Today, the professionals are forced to specialise in their professional field, as scientific advances have made the growing mass of scientific knowledge unmanageable for the individual professional. The different specialities or areas of expertise within the professions are also becoming new scientific disciplines and new occupational groups are being formed. It is thus difficult to maintain a professional identity. Specialisation and differentiation mean that maintaining both exchangeability and homogeneity within the professions is becoming difficult (Hellberg 2002).

The premises for the collective professional project are jeopardised by the specialisation of knowledge and differentiation of the professional

[30] This will be further explored in section 6.1.

groups. There is a process of individualisation where the unique position of the individual professional in working life conflicts with the interest in the common professional project. The professional cohesion is weakened (Jensen & Lahn 2005, Hellberg 2002). Einarsdottir (1997) has, for example, shown that the closure used against other professions is also applied within the professions and aimed at competing occupational groups within the profession – or, as is the case among physicians between, different areas of specialists – in the competition for power, status, and working conditions.

2.4 The expansion of higher education

The higher educational system has expanded parallel with the changes and increased complexity in the world of work. In 1950, the proportion of graduates was less than 5 percent in most European countries. This proportion doubled in many countries in the following decade. Since then, there have been several periods of rapid growth followed by periods of slow growth or stagnation, but in 1996 the proportion of people enrolled in higher education exceeded 40 percent in each respective age group in the OECD countries (Brennan et al. 1996).[31]

In a world where half of all individuals in an age group enrol in higher education, there has to be a broader range of competence (Skillbeck & Connell 1996). Furthermore, government agendas have led to the 'massification' of higher education as a solution to all kinds of social and economic problems and a more heterogeneous higher education in many countries; i.e. broader participation and an emphasis on key skills, employability and lifelong learning (see e.g. Lloyd & Payne 2002, Jackson 1999). The rapid expansion of higher education in the last fifty years has led to the transformation from an elite to a mass university, higher educational levels in the population, and unemployed academics[32] (see e.g. Scott 2002, Kehm & Teichler 1995, Teichler & Kehm 1995).

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[31] In Sweden, the expansion of higher education has stagnated since the end of the 1960s and the number of graduates has increased moderately. The number of graduates in economics increased, whereas there was a drop in the number of graduates in the liberal arts. Nevertheless, higher education continued to expand as post-secondary educational programs, e.g. nursing, were incorporated into the universities. Higher education has also increasingly focused on providing vocational education (see e.g. Rolf et al. 1993, Svanfeldt 1993).

[32] Over-education is a concern and this raises questions related to whether this is leading to the individuals becoming better equipped to tackle change and new and unexpected situations in the world of work or whether the effects are more of a negative nature (Abrahamsson 2002a). However, it is somewhat unclear whether

In the 1960s, the focus was on increasing the number of students in secondary and higher education. The number of students in higher education increased and new educational institutions in adult education were created. There were demands for more highly educated youths which lead to an explosive increase in financial support for the formal educational system, which eventually resulted in the mass university. In the 1990s, the debate shifted towards lifelong learning and learning in the world of work was emphasised. In addition to this, the relevance of the formal educational system to the world of work was focused on. An important difference between the debates on the expansion of the educational opportunities that took place in the 1960s compared to the 1990s is that in the first generation, the discussion was rooted in a social as well as an economic context. In the 1960s, it was argued that, in addition to a correlation between investments in education and economic growth, the investments in the educational system should and would lead to smaller differences in individual income. This assumption was central as it linked the legitimatization of the reforms of the educational system with demands for social equality (Gaskell & Rubenson 2004, Rubenson 1996).

In the 1990s, the economic perspective totally dominated policy documents and the social perspective and demands for equality disappeared. This is a consequence of not only the development of information and communication technology and the increased global economic competition but also a result of an economic-political perspective where the market is highly celebrated and governmental involvement is viewed as negative. Evaluation, control, relevance to the needs of the economy and cost effectiveness have become key issues on behalf of issues related to social equality. There are demands for different, rather than more, competence when it comes to the workforce. The more idealised utopian view of the 1960s has been usurped by a more narrow view (or notion of the concept of human capital) closely tied to the demands for competent and qualified labour with relevant competence (Rubenson 1996). Education is seen as an investment and learning becomes consumption (Coffield 1999). The second generation of human capital theory resulted in demands for the higher education curriculum to adapt to the demands and needs of the world of work (Gaskell & Rubenson 2004).

There are several possible explanations for the trends of a rapid expansion of the formal educational system. The world is becoming more complex, technical developments, increased quality demands and division of

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over-qualification is also relevant in the traditional professional groups (such as physicians and engineers).

labour, have led to requirements of more abstract knowledge being required and the knowledge requirements have increased. This means that the world of work is unable to offer the learning opportunities required. Furthermore, education does not solely prepare students for their future professional practice, it also promotes democracy, creates active citizens, social equality and general socialisation. Moreover, higher education can be regarded as system of justification of inequality in the distribution of resources that is more legitimate than inheritance and biological ties. From this perspective, education is a way of acquiring sought-after social positions and legitimising a social elite. There is also a dimension of education which concerns a form of personal development, identity searching, and self-realisation (Helms Jørgensen 2004).

Viewed from an historical perspective, the distance between education and the world of work has increased because the form of integration between training and work in the apprenticeship system, with training and socialising in the workplace, has changed into a system where the preparations for work were lifted out of the world of work and became external preparation through the formal educational system. Today, the requirements for formal education are higher at the same time as there are more jobs requiring formal education (FAME Consortium 2007, Helms Jørgensen 2004).

2.5 Learning to prepare for the unknown

Professional practice is characterised by increasing complexity and unpredictability, which has consequences for the individual (see e.g. Sennett 2006, 1998). Due to, among other things, increasing internationalisation and technological developments, the graduates from higher education are confronted with more information, facts, evidence, arguments and tasks than they can handle. In a rapidly changing world, it is difficult to foresee what competence will be needed in the future and what demands tomorrow's graduates from higher education will face (see e.g. Barnett 2004). Nevertheless, higher education is assumed to prepare students for a largely unknown future by helping the students to appropriate what is known. The objective is to prepare the students for novel situations based on the knowledge we have today.

Bowden & Marton (1998) argue that in the current higher education curriculum, the world of work and knowledge are treated as stable (individually and in relation to each other). Furthermore, it is assumed that specific discipline knowledge, or learning about concepts and developing skills, is conveyed to the students in higher education and that that this can then be applied when new problem situations arise in the professional

practice.[33] However, today it is not possible to "*…specify exactly what skills and knowledge are needed to be a competent worker or that learning the discipline as it now exists prepares a graduate for the workplace*" (p. 115 in Bowden & Marton 1998).

There is a growing need for adaptability and flexibility to cope with the new and changing demands. Harvey (2001) maintains that graduates' attributes are becoming increasingly important on behalf of the subject studied. Barnett (2000a) refers to performativity, i.e. what an individual can do, the 'demonstrable skills', becomes more important than what they know. In order to remain competitive the graduates must be adaptable and constantly prove themselves to be assets (Sennett 2006). Generalist competence is often emphasised as an important foundation for lifelong and life-wide learning and further development in the workplace (see e.g. Abrahamsson 2002b, Bowden & Marton 1998). Graduates' abilities to handle complex information and communicate it effectively, as well as the ability to cooperate, be analytical and solve problems along with leadership abilities, are more important than the specialist subject or discipline-related knowledge (see e.g. Knight & Yorke 2004, Warn & Tranter 2001). Bowden & Marton argue that "*…the curriculum for any university programme needs to be developed around the idea that students are being prepared for a future which is largely unknown… If you do not know what the future situation will be, then teach students some fundamental skills which they can apply to any situation*" (p. 94-95 in Bowden & Marton 1998).

There are several concepts used in the literature to describe the general competence required to function in the world of work; some of them are transferable, key, core, common, general, or generic competence (see e.g. Atkins 1999) and the concept of employability, which is related to human capital theories of innovation and economy (see e.g. Moreau & Leathwood 2006, Hillage & Pollard 1998).

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[33] Today, the curriculum is based on the principle of practising on solving a particular problem or issue repeatedly until that particular kind of problem has been mastered. This process is then repeated with a new problem or issue and so on. When a novel problem or issue is encountered, the students then try to sort it into one of these predefined sets, if they are unsuccessful in identifying a similar problem they know how solve they do not know how to tackle the problem. This is, however, often the case in the real world and the students are therefore unprepared to deal with new kinds of problems and issues. Also, there is concern that university education places too much emphasis on book knowledge instead of promoting the ability to apply knowledge in a workplace situation, the ability to put the knowledge into action (Bowden & Marton 1998).

Generic skills commonly refer to universal knowledge, necessary knowledge or as a kind of lowest common denominator in different kinds of competence that can be a part of some specific competence or a general competence, portrayed as e.g. adaptability, flexibility or learning how to learn. All the above-mentioned concepts, in one way or another, connect to this line of reasoning. The reports and papers urging the higher education sector to focus on the broad competence needed for successful professional performance come from governmental representatives, industry and education practitioners.[34] This also relates to the question of the function of higher education, i.e. whether higher education aims at supplying the students with facts, subject knowledge and understanding or generic skills such as learning how to learn; whether it should supply employers with the future workforce or, rather, provide the students with educational stimulation or both (Morley 2001).

Employability essentially refers to the individual being able to be employed, hold on to the job and, if necessary, get a new job.[35] However, employability is a complex and multidimensional concept and there are some difficulties in clearly defining it. There is a need to distinguish between factors that are relevant to obtaining work and those relevant to preparation for work (Little 2001). Employability entails the individual's assets in terms competence (including knowledge and attitudes), the way in which these resources are 'marketed' to the employers and are finally put in use (Harvey 2003, Hillage & Pollard 1998). Coopers & Lybrand (1998) define employability according to four main areas: 1) traditional intellectual skills, such as critical evaluation, logical arguments; 2) key skills, communication, IT etc; 3) personal attributes – motivation, self-reliance; and 4) knowledge of organisations and how they work. It is the individual's employability that determines the value of her/his human capital and it can be perceived as the

[34] See e.g. Coffield 2002, Bennet et al. 2000, 1999, Gibbons-Wood & Lange 2000, James 2000, Nabi & Bagley 1999, Stasz & Brewer 1999, Tait & Godfrey 1999, Shepherd 1998, Whitston 1998, Humphreys et al. 1997, Kemp & Seagraves 1995, Kivinen et al. 1995, Bridges 1993, Capelli 1992, Smith & Hazel 1992.

[35] The employability debate can be traced back to the Robbins report from 1963 in which the importance of higher education providing the graduates with competence that is relevant to work is emphasised. This has also been followed up by the Dearing report (1997), which also underlined the importance of employability, with a focus on the development of key skills and work experience (see also Blass 1999). In Sweden, the National Agency for Higher Education has produced several reports in which the notion of employability is based on a human capital reasoning where increased investments in higher education leads to higher levels of competence and economic growth (see e.g. Högskoleverket 2004:36).

basis for economic opportunity, occupational status. It has been suggested that this is the only way individuals can better their own welfare today. This has also been associated with ideas of individualism and democratic participation that characterise the West (Brown et al. 2001). In the rest of the text, I will refer to the general or generic competence described above as generalist competence.

There are tendencies towards knowledge being viewed as a product or commodity rather than as a process (Barnett 1993, Scott 1984). Government policy in many countries focuses on the growth of human capital and views this as central to economic growth since it is assumed to increase productivity and efficiency. One main way of increasing the human capital is by investing in higher education. Higher education is also steered towards placing greater emphasis on the employability of the graduates (Knight & Yorke 2004, 2003, Jackson 1999). Furthermore, through increased individualisation and 'insourcing' responsibilities for risk management and individual development has been shifted from the professional collective to the individual. This has also led to changes in the construction of the professional identity, risks for lower organisational commitment, demands for increased levels of self-initiative and individual agency related to increasing the individual employability, and thus also has consequences for the interplay between professional education and practice (Brown et al. 2007, Nerland & Jensen 2007a, 2007b).

Thus, there is a growing demand for higher education to supply the students with generalist knowledge rather than highly specialised knowledge, which is outdated increasingly rapidly. This is one of the reasons why the concept of lifelong learning and learning in the workplace is emphasised more today than it has been in the past when education was more of a pre-career affair. At present there are also more occupations in which a broad range and diversity of knowledge and competence is required and it is difficult for higher education to prepare the students for these kinds of professional careers (see e.g. Evans et al. 2006). However, the demand for general knowledge should not be overestimated, in many areas highly specialised labour is still sought after (Teichler 2000).

2.6 A gap between higher education and professional practice

Ample research has been conducted on the relationship between higher education and work and the impact of higher education from different perspectives (with an individual or societal focus) and with different methodological approaches. Some very ambitious overviews have been

presented by Feldman & Newcomb (1969) and Pascarella & Terenzini (1991). In these it is apparent that most of the research that has been presented in this field is concerned with measuring the impact of higher education in different ways, for example, achievement tests, aptitude tests and other ways of assessing students and graduates, and their future careers. There have, however, been fewer interview studies and studies of a qualitative nature conducted in this research field.

A substantial number of studies published have concerned an alleged 'gap' or 'mismatch' between higher education and work, between the competence the graduates possess and the qualifications needed to perform successfully on the job (see e.g. Harvey et al. 1997, Lesgold et al. 1997, Harvey 1993). There is a concern that higher education institutions do not provide graduates with the competence and lifelong learning skills needed in order to be successful in the world of work (see e.g. Burnet & Smith 2000, De la Harpe 2000, Harré Hindmarsh 1993).[36] Hixon Cavanaugh (1993) argues that professional education fails to prepare the future professionals for their practice in a satisfactory manner and that the discontinuity between education and practice can be ascribed partly to forces outside education, but also to the unresponsiveness of education to the different nature of non-academic and service-oriented environments.

Helms Jørgensen (2004) refers to a widening gap between the knowledge expected or required in the world of work and the knowledge that can be developed in the workplace as a reason as for why formal education and learning outside the workplace has expanded. Higher education is no longer capable of preparing the students for the work and specific work tasks in professional practice. The work has to be learned in the workplace.

Helms Jørgensen (2004, 2002) argues that there is a discrepancy between learning in the formal educational system and learning in the workplace due to different rationales, which he refers to as a 'school rationale' and a 'production rationale', respectively, and in addition to these there is a subjective rationale of the learner. Whereas the school rationale is "*founded*

[36] Primarily there are concerns related to the graduates' communicative skills, abilities to cooperate and leadership abilities. Graduates also face demands on analytical thinking abilities, problem-solving and reasoning skills, having a diversity of generalist skills in an interdisciplinary manner and being knowledgeable in areas that constitute the basis of different professional skills, e.g. new technologies. Graduates from higher education are among other things expected to be flexible, creative, self-reliant, and willing and able to contribute to innovation. A number of studies have also dealt with how different skills are to be assessed, the content of the curriculum in higher education and the relationship between educational and job performance (see e.g. Blackstone 2001, Hassall et al. 2001, Rajai & Johnson 2001).

on the propagation of accumulated knowledge that is institutionalised in a symbolic (mainly linguistic) form … [the] production rationale is based on the logic of the market economy and [has] severed the links to the rest of society" (p. 457 in Helms Jørgensen 2004). Education and work are two "*different knowledge settings characterised by various concepts, intellectual tools, assumptions and practical solutions.*" (p. 320 in Abrahamsson 1999)

The educational system promotes theoretical, subject-based knowledge, and the students advance through the different levels as they pass examinations based on the internal criteria of the academy. Although, the aim of the formal educational system is to convey knowledge applicable in other contexts, there is often a focus on passing the formal examinations, and learning is focused on the educational system rather than on the world outside (Helms Jørgensen 2004).

The formal educational system is expected to convey knowledge applicable in work, and prepare students for future work tasks. From the world of work, there are expectations that the formal educational system will produce potential employees who can contribute to organisational development and increased efficiency, and the graduate expects to be able to apply the knowledge acquired through education in her/his future job. Different kinds of knowledge are valued in the educational system and the world of work. In working life, knowledge that is practically applicable is valued whereas the educational system validates knowledge based on scientific criteria of correctness (Helms Jørgensen 2004). However "*the gap between education and work cannot be resolved only by making school knowledge more similar to everyday experience. The challenge lies in a dynamic interface between school-knowledge, experience based knowledge and practical applications at work.*" (p. 321 in Abrahamsson 1999).

Furthermore, it has been argued that there is a lack of common understanding and language of skills between higher education institutions and employers (Dunne et al. 2000). Part of the problem is the assumption that skills have the same meaning in the higher education context and in the employment context, which is not necessarily the case (Holmes 2001). The gap between the competence graduates acquire in higher education and the expectations of employers can partly be explained by language and cultural differences between educational system and the workplace, which can lead to disparities between educational objectives and employers' expectations. There are differences in the perceptions of what constitutes generalist knowledge and the transferability of this knowledge. This leads to different perspectives on what the purpose of higher education should be and what the students should learn (Leveson 2000).

However, there seems to be no consensus on whether there exists a gap between employers' demands and the graduates' assets when they enter the workplace, exactly what the gap consists of, how big it is or where and in what ways it constitutes a problem (Atkins 1999, Dearing 1997). As Atkins (1999) points out, there is no reason as to why there should exist a common set of competences that all employers need or demand as this could very well vary according to country, company, sector, organisational structure, region, size of business, type of business, and market orientation. Furthermore, different generalist competence is likely to have a different impact in different professions.[37] Thus, in what ways the universities should or even could change their curriculum is still very unclear. The type of institution and program (e.g. applied programs versus more traditional) from which the students graduate is one of the factors that has an impact on the experiences of the transitional process from education to work (Teichler 1998).[38] The demands encountered by an engineer differ from the demands faced by a physician as do the structure and organisation of the educational programs. Thus, the knowledge and attitudes the educational program is intended to give the graduates also differ between different educational programs.

2.7 Concluding comments and reflections

Scientific and academic knowledge is central to the professionals, and the modern professions have come to anchor their practice and their legitimacy in academic knowledge and the higher education institutions (see e.g. Wilensky 1964). The professions originally anchored their practice in science and in academia in order to strengthen and consolidate their position. However, the professionals have also consolidated the view of academic knowledge and higher education as having high status since higher education has become more or less a prerequisite of attaining important positions and becoming successful in society, enjoying a high income, security and other benefits. A profession is a community of competent workers, whose expert knowledge is founded on scientific methodology anchored in the institutions of higher education. This ensures that the professionals advocate strictly meritocratic criteria for access to the professional practice, as well as performance-based criteria for the evaluation of professional competence, and general or universally applicable norms as a basis for professional

[37] See e.g. Brennan et al. (1996) for an international comparison.

[38] There are also substantial international differences in how the transitional phase is experienced and what is expected of the graduates and their perceived competence (Manninen & Hobrough 2000).

service to the public.[39] Thus, the professions initially depended on higher education and academic knowledge, but eventually higher education also benefited from being closely tied to the classic professions since the professions have helped ensure the importance of higher education in society.[40]

However, there are some central aspects that tend to appear in many definitions of the professions and which are relevant when illuminating the relationship between higher education and professional practice. There are strong ethical and cognitive elements in the notion of professionalisation, the relationship to the client is also central (whether it concerns an individual, a group, or an institution), and the relationship to knowledge is another central point (see e.g. Eraut 1994). Two other main characteristics of the process of professionalisation seem to be the control of knowledge within a field of practice and the striving for jurisdiction and to conquer rivals with claims on their work, their territory, on the authority over knowledge and work (see e.g. Macdonald 1995, Abbott 1988, Wilensky 1964). Another important aspect illuminated above is the increased differentiation and specialisation within the professions. An increasingly complex world and labour market is resulting in an increasing mass of knowledge and increased division of labour. The differentiation in the professions has brought about hierarchies within the professional groups and the professionals are forced to specialise in their professional fields since scientific advances have made the growing mass of scientific knowledge unmanageable for the individual professional (see e.g. Hellberg 2002).

In the research on the professions, there is often an underlying assumption that the competence acquired through education is relevant to the requirements of work and leads to increased productivity (related to the

[39] Professionalisation (and referring to an occupation as a profession) could be conceived of as an ideology to justify the status, privileges, and authority of the professionals. There may be a trend in modern capitalistic societies where occupations which have traditionally had an exceptional position are losing much of their status and are gradually becoming equal in status with other occupations. It has been argued that this is an important argument for abandoning the concept of professions and the search for distinctive characteristics of the professions, and to instead focus on the attempts to link formal education to different occupations, or the 'academisation' of different social practices (see e.g. Abbott 1988, Gesser 1985).

[40] This, however, leads to the professionals losing a degree of control to the universities over the preparation of the new professionals since the professional knowledge base becomes 'academicized' and broadened and the professional practices are challenged and tension arises between the institutions of higher education and the profession-oriented perspectives (Eraut 1994).

human capital approach). This implies that the requirements associated with all positions and work tasks are clearly defined and that the cost of the labour can be related to productive outcomes. This is controversial and, for instance, the institutional theory[41] contradicts this assumption and associates the professionals' esoteric knowledge with a ritual procedure rending the professional status and authority where the usefulness of the knowledge in practice is regarded as uncertain. The educational rituals and knowledge content can be arbitrary in relation to a certain occupational practice. The knowledge can be viewed as a resource that is transformed into social and financial rewards. This transformation is also more successful if the market is exclusive (Svensson & Östnäs 1990).

Professional practice is characterised by complexity and unpredictability. Higher education is assumed to prepare the students for a future working life that is largely unknown. There are concerns that there is a 'gap' between higher education and professional practice, between the graduates' competence and the requirements faced in professional practice.

To prepare for an unknown future higher education, it has been suggested that higher education needs to promote a wide range of generalist competence, which will provide a foundation for further development in professional practice, thus making the graduates adaptable and flexible (see e.g. Abrahamsson 2002b, Warn & Tranter 2001). Generalist competence (such as adaptability, flexibility, problem-solving abilities and analytical thinking), socio-communicative competence, cultural competence (such as foreign language skills) as well as attitudes or personal characteristics (such as the ability to cooperate, willingness to learn, being responsible) are commonly considered more important than specific discipline-related theoretical and practical knowledge, which rapidly becomes outdated in many fields of practice. Work is instead learned experientially in the workplace.

Thus, both the qualifying and socialising mechanisms, or functions, of higher education are emphasised through generalist competence, societal skills, and personal characteristics. Elements of education act both as a direct preparation and as a foundation for further development and for lifelong learning. However, although general knowledge seems important, the need for specific skills should not be underestimated, especially in certain professional practices (such as medicine).

[41] Discussed in section 3.5.

Chapter 3: The functions of higher education

There are different theories on the functions or the purpose of higher education, which does not easily fall into any classification (see e.g. Bills 2003). In the following chapter, I will focus on two main perspectives of the functions of higher education that approach the relationship between higher education and professional practice in different ways. The first perspective presented is one in which education is viewed as a way of conveying and promoting competence in order to increase individual opportunities for participation in society, and to increase individual effectiveness and productivity in the world of work. Education is viewed in terms of an investment in human capital or as a way of qualifying or socialising individuals. Parallels can be drawn between the economists' view of education as a way of increasing human capital and sociological theories of the socialising function of education. From this first perspective, higher education is associated with increased substantial values. As an alternative view or perspective, education can be regarded primarily as a filter or as a way of sorting, selecting and allocating individuals certain positions in society. From this perspective, higher education has instead a symbolic function. Thus, the training function of education or whether education actually conveys knowledge and attitudes is deemed less relevant. Representatives of both sociology and economy also advocate this perspective. The concepts of socialisation and selection are frequently used in sociology and economics and the aim in this text is not to create a complete account of the previous research, but merely to introduce the concepts when they are considered relevant to this thesis.

3.1 Human capital theory, knowledge, and higher education

In the human capital framework, an underlying assumption is that there is a causal relationship between human capital and economic productivity. Furthermore, individual productivity is assumed to increase as a result of educational achievements. Education is regarded as the most important part of the investment in human capital as it conveys competence, which increases the individuals' economic potential and can be transformed into production. Human capital theory focuses on the productivity effects of education, and

the individual is viewed as a production factor[42] (see e.g. Sohlman 1996, Tight 1996, Schultz 1977,[43] Becker 1964[44]).

A central question, in the human capital hypothesis is what qualifications the educational system imparts and how these are related to productivity. However, there is little empirical evidence for exactly how or in what way education increases the individual's productivity (which should involve the individual's capacity to produce goods and services in an economic system) and vocational success (Wolf 2002, Mayhew 1972). Education is presumed to change the individual, increase her/his productive capabilities, and ensure that she/he can perform the same tasks with greater efficiency or be able to perform more complicated tasks and solve new problems.[45] Education is assumed to make individuals more flexible and adaptive to novel circumstances and technical change. Furthermore, education increases the individual's abilities to find and absorb new knowledge, and convey their knowledge to co-workers. However, what it is that students learn that increases their productive capabilities and what is actually learned through higher education or what knowledge higher education conveys is rarely addressed from this perspective. Education is viewed as an investment in productive workers and differences in individual income are a direct result solely of the individual investments in human capital. It is a materialistic perspective and the world is viewed as a meritocracy where social structures and power relationships are subordinate. In this perspective, education is reduced to preparation for the labour market and the benefit of education is

[42] The origin of the human capital hypothesis has been attributed to several authors, but Adam Smith is often viewed as an important fore-father, with *The Wealth of Nations* from 1776 where the increased and more complex division of labour was regarded as the driving force for economic growth and prosperity. Another important person in introducing the human capital theory was Theodore W. Schultz (see e.g. Schultz 1977). The human capital hypothesis was introduced into the Swedish educational policy debate in the form of an official document from 1968 called *Samhällsekonomiska kalkyler för längre utbildning* (1968 års utbildningsutredning). Despite the fact that human capital theory seems to be less relevant in modern economic theory, and that the formal theory has been modified and abandoned by many theorists, the human capital hypothesis seems to still be influential in public policy related to higher education and work.

[43] President of the American Economic Association, awarded with the Nobel memorial prize in economy in 1971.

[44] Awarded the Nobel memorial prize in economy in 1992.

[45] Also Marxist oriented qualification research accentuates the role of the educational system in increasing the individual's productive capability (see e.g. Altvater 1976).

seen solely in economic terms[46] (see e.g. Babtiste 2001, Brown et al. 2001, Morley 2001, Bagnall 2000, Sohlman 1996, Ståhl 1974).

The human capital perspective is concerned with qualifications and is characterised by a technological-functional perspective based on a rationalistic and instrumental view of education. Education is a means of conveying knowledge and increasing competence among the participants, which, in turn, leads to increased productivity and prosperity. A fundamental premise of human capital theory is that the demands in the world of work are constantly increasing on account of technological developments and organisational change. Education then serves as a way of accommodating these demands. Education is perceived to, in a relatively unproblematic way, convey knowledge to the participants through learning, and this causal process can be steered by means of educational planning and evaluated by measuring educational effects. However, when the technological-functional perspective is applied to the development of the competence of the employees in organisations, the focus is on specific rather than general qualifications and involves an adaptive perspective on qualifications; learning is perceived as a passive process where the object is supposed to solve specific problems according to prescribed procedures and reach expected results (Ellström & Nilsson 1997).

Economic determinism and the human capital theory have had a significant influence on educational policy and the higher education curriculum. There is still a predominant notion (among both politicians and representatives from the world of work as well as from academics at different times) that higher education should primarily be viewed in economic terms and as a preparation for the world of work, where the educational system should adapt to the demands from the employers, and that the curriculum should by based on the potential economic impact and cost effectiveness[47] (see e.g. Babtiste 2001, Morley 2001, Bagnall 2000).

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[46] It has also been argued that human capital approaches are too focused on knowledge and intellectual skills and do not consider the non-cognitive aspects of competence such as attitudes and motivation, which are included in the socialisation approaches (Ellström 1998).

[47] Education is regarded only as an investment factor in the economic system and education only has a value in relation to the labour market. It has also been argued that an increased influence of the human capital perspective could be regarded as threatening to the autonomy of higher education. Furthermore, the investment in education is considered to be the responsibility of the individual and the individual is stigmatised if she/he does not take advantage of and utilise the opportunities that society has to offer. In the human capital hypothesis, it is also assumed that the educational choice is solely based on economically rational aspects in a market

Human capital theory is part of a systematic theoretical context in which increased investment in human capital represents a trend in the development of society. Consequently, society should invest specifically in education that increases individual productivity and not in just any education in general. All forms of education, which are not presumed to directly increase the productive capabilities of workers, are regarded as consumption.

3.2 The socialising function of education

In human capital theory, the focus is on the qualifying or educational and training functions of education. According to Teichler (2000) the educational function concerns the stimulation of cognitive, intellectual and systematic abilities as well as conveying broad and general cultural knowledge. The training function refers to higher education providing the students' with specialised knowledge and competence that will prepare them for their future professional roles in different areas of expertise. The educational and training perspective on education refers to the qualifying aspects of education. Education should impart technical and vocational knowledge applicable in the world of work.

Teichler (2000) argues that higher education in addition to the training and educational function, also has a socialising function that refers to the higher education system constructing and shaping values, attitudes social and communicative competence pertinent in different socio-communicative contexts.

The socialising function of education refers to non-cognitive attributes and personal characteristics, such as particular status cultures, i.e. values, attitudes, vocabulary, aesthetic taste, and manners. These attributes are considered more important than technical knowledge when it comes to allocating individuals societal positions. Productivity may be considered less important than maintaining the social structures within the organisation. Here, increased production is a result of stability in the social structures, which leads to, among other things, a lower risk of conflicts in the workplace (e.g. strikes), less absence due to illness, and fewer other interruptions in production, rather than resulting in increased productivity due to vocational knowledge appropriated through education (Jonsson 1988). The socialising and qualifying function of education does not necessarily have to be viewed as conflicting. Rather, they can be regarded as complementary since education is, from both perspectives, viewed as a means of increasing the

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where the individual has access to perfect information (see e.g. Bagnall 2000, Jaménez & Salas-Velasco 2000).

individual's ability to perform successfully in the world of work and in society by imparting enduring effects on the individual in the form of knowledge and attitudes.

Socialisation generally concerns the processes through which an individual is fostered to become a member of a group or community (see e.g. Hall 1994). The concept is present in anthropology and social psychology, and has been given a more or less precise meaning. Giddens (1993) defines socialisation as the process by which an individual, through interaction with others, alters her/his consciousness and acquires knowledge and adjusts to the culture and context. It is not about passively absorbing, but is an active process. One of the most important socialisation agents is the formal educational system, which systematically conveys knowledge and attitudes, but there is also a 'hidden curriculum' through which attitudes and values are conveyed. The reactions of others, for instance, the teacher, also influence the students' self-perception in a way that has an impact on what they bring with them into the world of work.

Thus, some form of socialisation presumably takes place in formal education. When education is viewed as a socialising mechanism, the educational system mediates competence (including attitudes and values) that is sought for in society and industry, and can also be important with regard to what kind of work the individual can manage and hold on to (Brennan et al. 1996).

Parsons (1991) views education as a tool by means of which individuals are trained in motivation and knowledge to perform roles and functions later in life. The socialisation process in school gives the students the abilities to embrace fundamental societal values and to function in a professional role.

> Thus from a variety of points of view in our society experience in the course of formal education is to be regarded as a series if apprenticeships for adult occupational rules, even apart from the degrees to which the actual content of instruction, e.g. arithmetic and linguistic skills, can be directly used there. Thus, to a much higher degree than in the family, in school the child learns to adjust himself to a specific universalistic-achievement system. (pp. 239-240 in Parsons 1991)

Parsons (1991) has argued that education has two socialising aspects, the cognitive ability to learn and take in information; skills related to empirical knowledge and technical skills (related to qualifications); and the moral aspect concerning discipline, appropriate behaviour, and work ethics. In Parsons' theory about socialisation, there is a causal relationship between education and the ability to function in a professional role, which is

manifested in a higher position in the labour market. Also, Durkheim accentuated the fundamental role of education in the continuing existence of society. In his theory from the late 19th century, the socialising function of education was central for continuance and change (see e.g. Durkheim 1992, 1984).

3.3 The socialising and qualifying function of education

Parallels can be drawn between the socialising function of education and the qualification aspect outlined in human capital theory. In both theories, education is regarded as an investment that leads to increased merits that presumably increase the individual's ability's to perform satisfactorily in the labour market and is therefore rewarded accordingly.

> From the viewpoint of economic theory, the socialization hypothesis is just as much a human capitalistic theory as the cognitive skill acquisition hypothesis. Both hypotheses imply that education supplies skills that lead to higher productivity. (p. 116 in Arrow 1973)

Arrow (1973) argues that it does not matter how or in what way productivity is increased, but it is implicitly assumed that education conveys improved cognitive skills. In educational theory, the socialisation aspect of education is as important as conveying information. Socialisation entails the acquisition of skills such as carrying out assigned tasks, getting along with co-workers and superiors, punctuality, and flexibility.

Gesser (1985) also relates the human capital framework to how the concept of socialisation is used in sociological theory, primarily within a functionalistic framework, and suggests that parallels could be drawn with how the relationship between education and work is perceived. Central in both human capital theory and the theory of education as a socialising mechanism is that education conveys competence (including knowledge and attitudes), and develops the students' cognitive abilities in some way. What is learned through education is also perceived to be relevant to the students' future professional practice. In human capital theory, the connection between education and productivity is a direct one, whereas from a functionalistic perspective, education is regarded as a mediator or an instrument for socialisation and the connection is an indirect one, by means of a moral dimension which acts as a prerequisite for productivity.

In educational sociology, education is often considered to socialise individuals by imparting attitudes and values. In contrast to the economic

theories of human capital, non-cognitive attributes, personal characteristics, come into focus and are considered to be the primary means of allocating individuals societal positions. When the focus is on the socialising function of education, the acquisition of technical and vocational knowledge that leads to increased productivity is often less emphasised (see e.g. Jonsson 1988, Collins 1971).

Still, it is hardly provocative to claim that education has socialising, educational and training effects, although to what extent they are and should be relevant to the world of work or society is a question that is debated.

From a traditional socialisation perspective, the formal educational system prepares the students for how to act in society by conveying knowledge and attitudes. Furthermore, the socialisation process leads to the individual increasing her/his personal qualities and thereby being able to achieve more in society and also to be entitled to make more demands. As the competence of the individuals increases through direct socialisation by means of the educational system, they contribute to the development and sustainability of society. Socialisation theory focuses on the educational outcomes for those undergoing education, and ignores the effects the formal educational system may have on the distribution of positions (economical, political and social) in society. Here, socialisation is used in a broad sense and refers to qualifying individuals for their future professional practice by instilling knowledge, attitudes, and values in the students as well as training them. The concept of socialisation in educational sociology is closely related to the human capital approaches in educational economy and shares the rational technological view of knowledge and learning (see e.g. Gesser 1985, Arrow 1973).

3.4 Education from an individual perspective

Education does not entail only a more passive socialisation, the students' active choices and attitudes are also central to how education changes the individual and what is learned during their education.

Brint (1994) argues that the choice of educational profile is one of the most important choices an individual makes and that education today is the most important determinant of how far an individual will advance in society. However, it has been shown that in Sweden during the 1970s, education did not become an increasingly important criterion for allocating people social positions. Furthermore, the impact of education on wages and working conditions decreased during the same period (Jonsson 1988). However, it is not clear if this still holds true. Nevertheless, higher education is a prerequisite of being able to acquire certain positions in society and

practising many professions. It is, for example, not possible to practise medicine without being an authorised physician, and it is probably easier to obtain qualified highly paid work with the formal credentials of an engineer than without.

The students in higher education today have changed their attitudes and reasons for choosing to participate in higher education programs (Hellberg 2002). Today, knowledge is seen as more shifting or 'fleeting', as the 'bildung' (Swedish: 'bildning') perspective has been replaced by specialised educational profiles directed at certain target groups. Also Barnett (2000b, 1990) claims that we today can see a shift from education as a liberating process, which should promote critical enlightenment and active democratic citizenship, to a university that primarily acts as a preparatory institution for the world of work, producing human resources for the labour market. Today, higher education institutions and other actors offer continuing education trying to meet the demands of continuous development of the competence of the workforce. There is increasing institutionalisation of the continuing education and it has been argued that credentials are needed as a ticket to enter the labour market (see e.g. Collins 1979), whereas the knowledge required to perform the work is acquired in the workplace (see e.g. Helms Jørgensen 2004).

From an individual perspective the motivational driving force to complete a certain education is likely to influence performance during the education, how the students approach their studies and the way in which the education is completed. If education on an individual level is perceived as primarily a meriting experience, the acquisition of knowledge is secondary to performing well in examinations, and cue-seeking, etc. comes into focus. If the individual instead adapts a 'training perspective', if the focus is on the acquisition of knowledge in a broad sense and increasing competence in the professional field, the training and socialising effects ought to be greater. Reid & Petocz (2004) have proposed the concept professional entity to describe the relationship between students' approach to learning and their perceptions of professional practice on an individual level. A narrow or broad perception of the future professional practice is associated with a corresponding view of the discipline and how they approach learning. Professional entity is divided into three levels where an extrinsic technical approach refers to professional practice being associated with technical components that are utilised when required by the work situation and relates to an atomistic approach to learning. An extrinsic approach is associated with developing meaning 'inherent in discipline objects', where learning is related to understanding and developing objects central to the profession. An intrinsic approach refers to the professional practice being integrated with the

personal and professional being, where the professionals' learning is integrated with their own personal life (see e.g. Abrandt Dahlgren et al. 2007, Reid & Petocz 2004). Abrandt Dahlgren et al. (2006) have proposed a distinction between a ritual and a rational relationship between higher education and work, respectively. A rational nature of an educational program relates to educational program or discipline that promotes knowledge that has a usefulness or preparatory value in relation to the graduates' professional practice. The ritual aspect refers to knowledge with a less applicable nature in relation to working life. Abrandt Dahlgren et al. (2006) also suggest a distinction between substantive and generic or generalist knowledge, which refers to knowledge that is specific and context situated or transferable between different contexts, respectively. The authors suggest that all educational programs have both a rational and a ritual component where one aspect may be more or less dominant.

3.5 An institutional perspective on education

From an institutional perspective, the formal educational system has a role in defining and classifying knowledge and sets up rules according to which individuals are allocated different categories and status positions based on the knowledge they possess, which is represented by their formal credentials. Education also has a role in the structure and organisation of society, as well as in constructing professions and professionals.

In an article entitled *Higher Education as an Institution* John W. Meyer (1977) presented an allocation theory of education, which he views as a special application of a more general institutional theory or legitimation theory. In this theory, the formal educational system not only sorts individuals and allocates them certain positions and roles in society, it also constructs and changes the structures and roles in society themselves. The educational system creates new competence, defines how individuals are to act as well as how others are expected to act towards them. Whether or not something is learned in the educational system or if anyone actually knows anything is less relevant. Meyer & Rowan argue that "*To maintain ceremonial conformity, organisations that reflect institutional rules tend to buffer their formal structures from the uncertainties of technical activities by becoming loosely coupled, building gaps between their formal structures and actual work activates.*" (p. 340 in Meyer & Rowan 1977). Thus, a consequence may be that, for example, the formulation of curriculum requirements for students is only loosely linked to the requirements the graduates from professional education actually face in the workplace.

From an institutional perspective, institutional environments, i.e. rules, belief systems, and relational networks that are constituted by rational myths, play a central role in determining organisational structure as well as behaviour. The myths depend on being widely shared as well as being disseminated by influential actors in order to be effective. Professional groups are important bearers of the rational myths. However, the professional groups vary greatly when it comes to their practices and unity in communicating their interests (Scott 1992a).

In contrast to the technical organisation that focuses on the technical core rather than its environment, the institutional organisation (e.g. a university), which entails a decoupling[48] of the technical work from the organisational structure by means of, for example, certification and rituals, instead focuses on conforming to its institutional environment and is less concerned with the technical core. The administrators are occupied with conforming to external requirements, but have little control over activities pertaining to the technical core. The institutional model of organisation is relevant primarily to educational organisations and other service organisations. An educational institution, for instance, has to conform to institutional rules while it is less important that the learning activities are efficiently coordinated (or even in line with the institutional rules), which makes a technical perspective less relevant.[49] The educational institutions are characterised by a low level of control, such as a weak internal collegially-based professional control, over work processes (especially those related to the central educational purpose) and low levels of coordination of institutional activities as well as a limited capacity to protect their activities from the environment. A manufacturing organisation, on the other hand, depends on the development of a well-defined process that is capable of producing at a competitive cost level (Meyer et al. 1992).

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[48] The educational activities or instruction, i.e. the main activity of educational institutions, is separated from, or 'loosely coupled' to, the coordination and control of the organisational structure (bureaucratically and collegially) or, in other words, the "*structure is disconnected from technical (work) activity, and activity is disconnected from its effects.*" (p. 71 in Meyer & Rowan 1992).

[49] Thus, in research, educational institutions have often been described as weak and ineffective organisations, lacking rationalisation of their work and having limited abilities to protect themselves from external interference. However, according to many important criteria, the educational institutions are still considered to be very successful. This could be attributed to the models applied in the evaluation of the educational institutions rather than the organisation of the institutions (Meyer et al. 1992).

Socialisation and allocation approaches are not altogether inconsistent, and allocation theory can even be viewed as an extension of the socialisation approaches. Individuals are affected and adapt to their experiences and to the expectations they experience that others have on them. Students as well as professionals experience the rules and they way they are treated and expect to be treated and act in society and adapt to the expectations associated with the educational program and, later on, the social status position they are assigned through the allocation that takes place in the educational system (see e.g. Meyer 1977, Meyer & Rowan 1977).

It is difficult to empirically separate the direct socialisation effects of education from the indirect socialisation in allocation theory as it is often not clear to what extent socialisation can be directly attributed to education and to what extent socialisation effects are produced by the 'institutional authority' of education.[50] However, Meyer argues that "*the most powerful socializing property of a school is its external institutional authority, derived from the rules of educational allocation, rather than its network of internal socializing experiences.*" (p. 61 in Meyer 1977) and "*If education is a myth in modern society it is a powerful one. The effects of myths inhere, not in the fact that individuals believe them, but in the fact that they 'know' everyone else does, and thus that 'for all practical purposes' the myths are true*" (p. 75 in Meyer 1977). The myth is periodically affirmed and reinforced through ceremonies that constitute symbolic actions, such as certification, accreditation, and graduation (Meyer & Rowan 1977).

From an institutional perspective, knowledge is not viewed as something that is internalised by an individual, and that can be transferred from different contexts to be applied in a dualistic sense. Learning is viewed as a social process, where the professional competence is developed in combination with the development of the professional identity (Ellström & Nilsson 1997). Knowledge is contextually situated and learning can be understood as individuals appropriating knowledge and attitudes by active participation in a community, which could be, for example, a place of work or a profession (for further elaboration, see e.g. Wenger 1998).

Meyer (1977) arranges the sorting hypothesis into what he refers to as allocation theory, which is regarded as a part of a more general macro

[50] However, Meyer argues that impact studies have not been able to show that there are any significant variations between schools that differ in structure and resources (see e.g. Feldman & Newcomb 1969). Furthermore, the direct effects of education also do not seem to be long lasting. This is more consistent with regarding the socialisation effects of schools as "*ritually chartered organisations…rather than as organised collections of immediate socialising experiences*" (p. 60 in Meyer 1977).

sociological institutional theory of education as a system of legitimatisation. Education is regarded as a means both for constructing and changing societal roles and allocating individuals these roles. Modern educational systems are large scaled systems of classification within which new roles are constructed. These classifications are new constructions in that newly defined individuals are expected and allowed to behave and be treated in new ways. Not only new individuals, but also new competence is created in authoritative ways. This alters people's behaviour regardless of their own experiences of the educational system. In this legitimacy theory, also knowledge can be included. Another starting point for societal effects of the kind Meyer discusses can be found in different theories of professionalisation.[51]

According to Meyer (1977), among others, higher education should be seen mainly as a selecting, sorting and allocating system. When personnel offices select future employees, the most important criterion is credentials or meriting variables (see also Collins 1979). Whether or not the students have learned something during their education is less important. Education has little to do with the changes that occur with and within the individuals (the socialising and qualifying aspects of education), or it is at least irrelevant. Higher education should be viewed as an institution that changes societal views on occupations. If higher education does not primarily lead to the socialisation of the students or to the development of the individual or her/his knowledge base, then the only result is an increase in meriting and this will merely lead to society reproducing itself and the reproduction of social and economic inequality (Meyer 1977).

3.6 Education as a filter, sorting or selection mechanism

The educational system provides credentials such as grades, degrees, and diplomas of different kinds, i.e. merits that are required in working life and society (see e.g. Collins 1979). By meriting individuals, education in this sense sorts and labels individuals and serves as a screening or filter device by classifying and stigmatising individuals (see e.g. Stiglitz 1975, Arrow 1973). When adopting this perspective, it is less relevant whether the students acquire knowledge through education and what they learn. However, from an employer perspective, the fact that an individual has managed to pass through the higher education system implies that the student has displayed the presence of important characteristics for managing to also successfully perform in the world of work, e.g. endurance, motivation, dedication, and self

[51] See chapter 2 for further elaboration.

discipline. Although the educational system may not actually convey knowledge or attitudes, according to this latter perspective, educational success can still constitute a rational criterion for employment (see e.g. Brennan et al. 1996, Collins 1979).

In 1973, economist, Kenneth Arrow[52] published an influential article called *Higher Education as a Filter*. In this article, he proposed an alternative to the, at the time, dominant 'human capital orthodoxy'. He argued that diplomas from higher education serve "*…primarily as an (imperfect) measure of performance ability rather than as evidence of acquired skills.*" (p. 115 in Arrow 1973). Arrow claimed that education does not (primarily) contribute to developing cognitive abilities or to socialisation, but instead acts as a filter, sorting out individuals with different abilities and conveying information to employers.

Arrow (1973) does not feel that the filter hypothesis contradicts the human capital hypothesis, since from an employer's point of view, a certified employee is more valuable than an uncertified employee. Education has positive effects in that it sorts out different types of workers. From an individual perspective, the filtering process adds to productivity, but it is questionable whether the same could be argued with respect to the societal productivity of higher education. If higher education in fact acts primarily as a filter, there is no efficiency or productivity gain, and higher education leads to unjustified inequalities in incomes.[53] However, Arrow (1973) does not exclude the possibility that education also conveys knowledge that is in demand in the labour market. This primarily concerns vocational schools and professional education, although he considers it more questionable that education in the liberal arts leads to any market value. "*Clearly professional schools impart real skills valued in the market, and so do undergraduate courses in the sciences. The case is considerably less clear with regard to the bulk of liberal arts courses*" (p. 116 in Arrow 1973). Lindbeck (1975) has also argued that primarily vocationally oriented professional educational programs do, in fact, convey competence and qualifications, with a market value in the economic system, which are in demand on the labour market. However, the direct relationship between higher education in the field of

[52] Awarded the Nobel memorial prize in economy in 1972.

[53] The sorting hypothesis is part of a wider perspective of the economical system, where the actors have deficient or inadequate information. The employers have insufficient information about the productivity of potential employees, who are offering their services, and the function of the educational system is therefore to sort the individuals according to specific qualities that are thought to be associated with their productivity and, furthermore, to inform the employers (Arrow 1973).

liberal arts and working life is considered to be limited. Hence, the filter function of education is considered to be of greater importance than the socialising function, especially when it comes to educational programs oriented towards the liberal arts, social sciences and the humanities. Thus, both Arrow and Lindbeck argue that there are two functions of education or, rather, two types of education, one in which qualifications with a market value in the economical system is conveyed and one associated with the sorting of individuals.[54]

Obvious parallels can be drawn between the filter hypothesis introduced by economists and the concept of selection and sorting as it is used in educational sociology. According to the sorting hypothesis, education is regarded as a sorting mechanism to distinguish the talented or apt from the less apt or to sort out individuals with an aptitude for certain tasks in society and to inform employers about individuals' qualifications or capacities. Matching a job applicant to an appropriate job takes place during a job application procedure in which information from the educational systems is used to sort potential high-productive individuals from low-productive individuals. The educational system produces credentials or diplomas that are perceived to be indicators of individual productive capabilities and relays this information to potential employers. From a sorting perspective, the assumptions of the profitability of education are questionable (Ståhl 1974).

Gesser (1985) summarises the sorting hypothesis, derived primarily from the influence of Pitrim Sorokin (see e.g. 1964) in the following way. There is an occupational stratification in society, which is principally based on higher strata performing more important functions than lower strata. The individuals who perform the most important functions are also better equipped as regards talents and abilities to perform the tasks associated with the specific occupation. There is a correlation between the status or place in the hierarchy of a function, based on its importance for sustaining society, and the talents of the individuals (who hold these positions). The primary role of the educational system is to sort individuals for different positions in society (the individuals' routes to these positions rather than the positions in themselves tend to be problematised). The educational level attained by an individual correlates with her/his future productive capacity or ability to function in a social system. The individual's productive capacity primarily correlates with genetically inherited abilities. In order for the educational system to uphold the sorting function, admission has to be based on equal opportunities and the

[54] Also Wolf suggests that "*returns to education partly reflect its use to sort people, and serve as a proxy for ability, and partly are a recognition of concrete skills.*" (p. 30 in Wolf 2002).

educational system has to be constructed in such a way that sorting is based on abilities that are important in relation to the individual productive capacities relevant to the work. The formal educational system then provides the individual and possible employers with information regarding the individuals' ability to function in a certain position. This interpretation of the sorting hypothesis is very similar to that of the economists' (presented above). Education acts as a filter for talents for appropriate positions, at the same time as information is relayed to individuals and employers.[55]

Theories of selection and sorting are connected in that individuals are arranged according to certain attributes or achievements in the educational system. Individuals allowed to enter post-secondary education are assumed to have some attributes that those who are not selected lack. These attributes presumably make these individuals more suitable to hold certain positions in society or in the labour market. The sorting or selection process is beneficial for society as the educational system brings individuals with the appropriate attributes together with the suitable position, where these attributes are necessary. What are lacking in the theories presented above are pedagogical theories of what actually happens within the educational system. The hypothesis places little emphasis on the individuals' opportunities to learn and develop, and instead accentuates the role education has in insuring that people end up in the right positions and that they are appropriately rewarded in the form of income. At the individual level, education leads to increased formal competence, regardless of whether it results in increased productivity or whether it is mainly a way of sorting individuals and ensuring a higher income and better opportunities for attaining more privileged positions in society. The sorting hypothesis lacks a theoretical foundation, but if it is a correct analysis of the educational system, a far-reaching rationalisation of higher education could be beneficial.

[55] There are alternative interpretations of the sorting function that focuses on the educational system's role in the reproduction of economic, cultural and social differences between generations rather than the individuals' future productive capacity. From this point of view, education is primarily a marker of membership of a certain group or class and only secondarily a certificate that the individual possesses certain knowledge, competence or qualifications. The demand for education in a society supposedly reflects the interests of the groups that have the authority to define that demand. This may in some respects be understood as contradicting the interpretation above.

3.7 Concluding comments and reflections

A distinction can be made between perspectives on education where education contributes to some kind of change within the individual, through qualification or training (cognitive or vocational knowledge) and socialisation (non-cognitive personal attributes), and perspectives where education is not considered to have any enduring effects on the individual or that these effects, i.e. what is imparted through education, are at least irrelevant when it comes to allocating individuals positions in society. The latter view could be regarded as an institutionalised educational ideology. The educational system is organised as though it conveys the intended socialising and investment effects, which make the 'qualified' more suitable to hold certain positions in society and in the labour market (Meyer 1977).[56]

Education is translated into different forms of capital (e.g. economic, cultural or symbolic) and at least from a human capital perspective, education becomes property. According to an institutional perspective, the legitimising function of education leads to reproduction of social positions in society. The reproduction of positions and social order is symbolic rather than being associated with the content of education as an indoctrinating effect on the students. System-preserving ideologies are disseminated via the educational system. It is not participation in the educational system that has an effect; rather, this is associated with the public acceptance of the function of the educational system in society. As a result of the sorting that takes place via the educational system, individuals are perceived to be sorted and allocated appropriate positions based on objective criteria (i.e. talents, diligence, etc.), and this is assumed to have positive and functional societal effects. In part, the students are socialised and qualified for a profession and prepared for a position in the social structure, and in this way they adapt their expectations to their expected position in the social structure (Jonsson 1988).

From both the viewpoints presented above, education is commonly considered to have allocating effects in that it constitutes rational grounds for sorting individuals into appropriate positions in the societal structure and in the labour market. The difference lies in the view of, or the importance placed on, what is learned in higher education and the relevance this has to the professional practice. The distinction between the two alternative approaches may be summarised as a ritual or rational approach to education or as education for competence and qualifications or credentials.

[56] There have been many studies published where the sorting hypothesis is empirically tested and compared to the human capital hypothesis (see e.g. Lang & Kropp 1986).

Both the hypothesis of education as a sorting mechanism and the hypothesis of education as a socialising and qualifying mechanism (as an investment in human capital) are concerned with how an adaptation between the educational system and the world of work could take place, i.e. they are concerned with a practical sphere. The societal structure is in a way given, and concepts are constructed to describe the individual's adaptation through the educational system to this structure.

According to the sorting or filter hypothesis, it is a premise that the most suitable individuals seek out the appropriate educational programs. The students need to be informed about the, for them, most appropriate educational programs and be informed about the existing relation between education and work. The hypothesis of human capital also presupposes that the individuals are informed and that they tend to act rational from an economic perspective. The system also needs to be associated with a certain predictability. It seems unlikely that the individual's educational choice is solely based on financial benefits, that it is based only on rational economic considerations, or that the graduates are completely informed about the prerequisites of acquiring a job. There are other reasons or motives such as interest, consumption, education for its own sake, motivation, talents, and natural abilities or aptitude that are likely to influence the educational choice. From previous research on educational choices and career patterns, it is evident that these processes are very complex and rarely exclusively based on rational aspects related to economy. The labour market is also in a state of constant change and all predictions of future needs, shortages and surpluses of graduates in different disciplines, are uncertain even in a best-case scenario. It is difficult to empirically separate the hypotheses of education as a filter and education as an investment in human capital without answering the question of how education increases productive capacity and thus how and what (if anything) learned during higher education is related to professional practice.

The structure of education and the educational choices are probably more complex than is assumed in both human capital theory and in the filter hypothesis (Bowman et al 1978). The educational system both sorts and socialises, even if one of the functions is emphasised to a greater extent and usually in relation to different kinds of educational programs (e.g. socialisation according to Parsons). Gesser (1985) observes that the selection function of education tends to be emphasised when a macro perspective is adopted, especially in relation to social class, mobility or stratification, and if the educational curriculum is considered to be constant. The socialising process, on the other hand, tends to be focused on in studies with a micro perspective, such as classroom interactions, how learning takes place and

what is learned. How values and attitudes are socialised tends to be emphasised rather than how knowledge is conveyed. What constitutes professional knowledge, competence and qualifications (in the formal educational system) is less frequently focused on.

Chapter 4: Professional knowledge, competence and qualifications

Professional practice is based on the competence of the professionals, which is associated to the knowledge base of the professional practice. Professional practice is fraught with complexity and uncertainty, and is not just associated with a standardised application of knowledge, and the knowledge base of the educational program may be more or less closely associated with the demands actually encountered in professional practice. Furthermore, competence is task and context-related, for instance, formal demands can be regarded as an aspect of contextual factors (e.g. associated with the pursuit of status). It is therefore very important to conceptually separate different aspects of knowledge and competence, such as the professionals' competence, from qualifications.

The relationship between professional knowledge and professional practice, between what the professionals know and what they do, has not been very thoroughly explored in the historical and sociological research on the structural form of the professions. Psychological research on professional expertise, on the other hand, focuses "*situational perception, interpretation and decision-making, and the processes by which novices turn into experts [and] while this does throw up interesting questions about how professionals learn to do what they do, it does not directly address the nature of professional disciplines as disciplines.*" (p. 128 in Squires 2005).

Thus, the concepts of knowledge, qualification, and competence are seldom discussed in the economic or sociological educational or professional research to any greater extent. Qualifications are often treated as a general increase in the information or knowledge an individual has accumulated, the acquisition of appropriate attitudes and values as well as the internalisation of motives. According to Ellström (1998), there is also considerable confusion regarding the definitions of the concepts of knowledge, competence and qualification in the literature in general.[57] Delamare Le Deist & Winterton (2005) describe competence as a 'fuzzy concept' due to the inconsistent usage of the concept and claim that it is impossible to identify a coherent theory or definition capable of including all different ways in which the

[57] For an elaborate discussion of the different meanings and definitions of competence in the literature see e.g. Delamare Le Deist & Winterton (2005) or Stoof et al. (2002) for a constructivist approach to competence.

concept is used.[58] Nevertheless, it is a convenient concept to use when approaching the relations between education and job requirements.

The following chapter is concerned with concepts illuminating the demands or requirements the professionals face in professional practice, that is, different aspects of the concepts of professional knowledge, competence and qualifications.

4.1 Theoretical and practical knowledge

In this thesis knowledge is considered to have a technical or theoretical component (book knowledge, knowledge about an object separated from the subject) and a practical component, 'know-how', that is only expressed in practice and learned through experience.[59] This explicit knowledge can also be referred to as declarative or propositional knowledge, which can be verbalised and communicated to others, or knowing what (see e.g. Svensson 2006). Certain theoretical knowledge is necessary but insufficient for successful professional practice. Another aspect of knowledge is a practical or procedural component, 'know-how', that is only expressed in practice and learned through experience. This is also often associated with implicit or tacit knowledge that is difficult to verbalise and communicate to others, but can be developed into explicit knowledge to the extent that it can be codified or formulated (see e.g. Eraut 2000).[60]

Based on a rational technological view of knowledge, founded on positivist notions, theoretical knowledge is viewed as a product, which is transferable from one context to another. Professional competence is based

[58] Weinert (2001 according to Delamare Le Deist & Winterton 2005:30) presents nine different interpretations of the concept of competence: 'general cognitive ability; specialised cognitive skills; competence-performance model; modified competence-performance model; objective and subjective self-concepts; motivated action tendencies; action competence; key competencies; meta-competencies'.

[59] As discussed in section 1.4.

[60] Informal learning entails more flexibility for the learner, recognises the social significance of learning in the interaction with other people (emphasising individual agency to a greater extent than socialisation), focuses on learning activities outside activities with a clear formal purpose, and takes place in wider variety of settings than formal learning activities. Formal and informal learning should, however, not be viewed as dichotomous, rather, learning may approach one or the other end of a continuum of formality, where the informal end is characterised by implicit, unintended, unstructured learning without a teacher (which can be contrasted to mentoring, coaching, etc.) that may not as easily be captured in empirical studies (see e.g. Eraut 2004).

on research or science and disseminated via education and the scientific knowledge is applied to specific definable problems in professional practice. However, Eraut (2000) argues that the learning context is central to the process through which codified knowledge is acquired. Using the codified knowledge in another context will require additional learning. The personal use of codified knowledge is related to its personal historical use, in one or a range of various contexts, and the integration with other knowledge. Theoretical knowledge is appropriated through academic scholarship (Rolf et al. 1993). According to Abrandt, theoretical knowledge:

> encompasses book knowledge and formal relationships between concepts or constructs and formal statements concerning interactional and causal relationships between events. The characteristic of the theoretical knowledge tradition is dualism; knowledge is knowledge about an object, separated from the subject. Typically, the theoretical knowledge tradition includes primacy of theory, which is achieved through thinking, observation and experimentation. The generation of knowledge is, thus, separated from its application in practice. (p. 12 in Abrandt 1997)

While theoretical knowledge is associated with academia, practical knowledge is associated with practical experience (Abrandt 1997). Rolf et al. (1993) distinguishes between two different kinds of practical knowledge; elementary knowledge and qualified practical knowledge. The elementary knowledge is associated with strict and distinct rules and the ability to solve simple and routinized tasks in a stable and predictable context. Knowledge can be conveyed by means of information that covers most possible scenarios, by a central authority that alone is assumed to hold the knowledge and authority to interpret and innovate. Individual knowledge is associated with adapting to the rules. Qualified practical knowledge is related to indistinct, vague and ambiguous rules that vary with the situation, and require independent thinking. Furthermore, qualified knowledge is associated with unpredictable and instable contexts. The knowledge is conveyed by way of practical examples and a general authority consists of individual coordination. Knowledge and authority to innovate and criticise are spread among the practitioners and rest on the professional values (Rolf et al. 1993).

4.2 Reflective practice

One important dimension when trying to portray skilled performance or expertise in different domains is the distinction between explicit theoretical knowledge and implicit experience-based ‘know-how’ or tacit knowledge (Ellström 1998). Another important dimension is the relation between

knowledge (theory) and practice (action), and the character of the problem-solving and learning process involved. Research is scarce, but the importance of developing and maintaining innovative competence has been underlined by many, see, for instance, Donald Schön's reflective practitioners (1987, 1983).

In professional research, knowledge is viewed as applied sciences and specialisation on specific theoretical and applied knowledge. Although specialised knowledge is an essential aspect of professional practice, practical aspects of reflection and reflective practice have been emphasised since many important problems in practice are associated with complexity, uncertainty, and conflicting values and many situations are unique. An essential aspect of knowledge used in practice is 'know-how' (Harris 1993).

Ryle (1963) argues that action is not necessarily preceded by reflection. Often, we reflect before we act and reflect in order to act properly, but Ryle separates knowing how from knowing that, as action is not always a direct result of theory. Ryle points to an inherent paradox in the assumption that theory always precedes practice, i.e. if execution is always preceded by a theoretical operation, it would lead to circular reasoning and it would not be possible to ever execute a task. We do not, for example, always plan arguments before constructing them; *"…if [we] had a plan what to think before thinking it [we] would never think at all; for planning would itself be unplanned.*" (p. 31 in Ryle 1963). Ryle argues on the contrary that:

> Efficient practice precedes the theory of it; methodologies presuppose the application of the methods, of the critical investigation of which they are the products. It was because Aristotle found himself and others reasoning now intelligently and now stupidly and it was because Izaak Walton found himself and others angling sometimes effectively and sometimes ineffectively that both were able to give their pupils the maxims and prescriptions of their arts. It is therefore possible for people intelligently to perform some sorts of operations when they are not yet able to consider any propositions enjoining how they should be performed. Some intelligent performances are not controlled by any interior acknowledgements of the principles applied in them. (p. 31 in Ryle 1963)

Also, Schön claims that *"…although we sometimes think before acting, it is also true that in much of the spontaneous behavior of skilful practice we reveal a kind of knowing which does not stem from prior intellectual operation.*" (p. 51 in Schön 1983).

The professional is viewed as an active agent of change (a 'good unstable force') by Schön (1987, 1983), not tied down by experience or routine, and always changing or trying to change. The professional practitioner learns

through experience. Schön (1983) argues that the dominant epistemology of professional practice is characterised by a technical rationality (associated with positivism and hypothetic-deductive view of science) in which professional practice is regarded as instrumental problem solving, and clear and unambiguous applications of formally learned knowledge grounded in theories, technologies, and techniques developed through science, to stable institutional contexts. There is an assumption that there is a clear and general application of scientific knowledge in practice. This rationality is also found in the curricula of professional education in which students learn first the basic and then the applied sciences after which they are expected to apply this knowledge in their professional practice.

However, Schön argues that professional practice is characterised by "*…complexity, uncertainty, instability, uniqueness and value-conflict – which do not fit the model of Technical Rationality.*" (p. 39 in Schön 1983). Furthermore, in professional practice, problems are not easily definable and self-evident, but are constructed from problematic and uncertain situations characterised by uniqueness, which professionals cannot easily be prepared for. As an alternative to the epistemology of the technical rationality, Schön presents reflective practice. In order for a problematic situation to be transformed into a problem, the practitioner first has to try to make sense of a bewildering situation. The professional acts in an environment fraught with insecurity that can easily erupt and be transformed into an unstable situation characterised by overwhelming changes. Most of the actions of the professional are unique, which transforms the work into an art, which could be taught if it were constant and well known, but the problem is that it is not.[61] The professional therefore needs reflection-in-action, differentiated from reflection-in-practice, as the reflection takes place during the action, i.e. 'thinking on one's feet'. Schön distinguishes this from just following routines, 'know-how'. He suggests three competences needed for reflective practice, which the practitioners 'bring with them' into complex, unique and value conflicted situations, and how they are to be acquired: knowing-in-action, reflection-in-action and reflection-about-action (Schön 1983).

Knowing-in-action is associated with tacit knowing (knowing more than we can say) linked to specific activities, which are implicit in the actions in everyday situations of professional practitioners, seemingly spontaneously. This can be connected to Ryle's know-how; a practitioner may recognise a phenomena (e.g. a physician recognises the symptoms associated with a particular disease), but may still not be able to provide a particularly complete and accurate description. Knowing-in-practice is developed "*…as a*

[61] See also section 2.5.

practitioner experiences many variations of a small number of types of cases, he is able to 'practice' his practice. He develops a repertoire of expectations, images, and techniques. He learns what to look for and how to respond." (p. 60 in Schön 1983). Knowing-in-practice is associated with relating unique situations to previous experiences regarding differences and similarities, "*The familiar situation functions as a precedent, or a metaphor, or - in Thomas Kuhn's phrase - an exemplar for the unfamiliar one*" (p. 138 in Schön 1983) and becomes more spontaneous and tacit with increased experience. Reflection-in-action occurs while the action takes place, while reflection-about-action occurs later and concerns problems that evade the practitioners existing knowledge and seem to be unique or unstable. The practitioner reflects on, criticises, and restructures the knowledge implicit in the action, features of the problematic situation, the frameworks she/he has constructed for solving the problem, criteria on which judgements are based, or on the roles they have constructed in institutional contexts. The problems associated with reflection in different professional practices vary with the situations of practice and systems of knowing-in-practice. Schön (1983) argues that reflection is a prerequisite of the development of professional practitioners. Reflective practice is essentially about improving or developing professional competence (Bright 1996).

Some theorists argue that the view presented by Schön is not always realistic or desirable. The theory is sound, but only applies in areas where change is desirable or where insecurity cannot be absorbed by a centralised organisation, but instead must be delegated. Furthermore, it has also been argued that Schön exaggerates the uniqueness of the professional's situation. It has been claimed that if it were as unique as it is argued, then a professional education and 10 years of professional experience would not give any guidance to being a lawyer. Knowledge use must be context specific (see e.g. Bright 1996). Only if the future in part carries the same characteristics as the present, would an actor be able to use knowledge based on the past. The uniqueness is probably also not something that exists only in professional practice. 'Know-how' is not necessarily upgraded to competence if it works, even if the reflective tools are available. If reflection does not noticeably improve the 'know-how', there is no reason to reflect. Professional competence is, according to Rolf et al. (1993), a social process in which know-how is appropriated and updated through reflection in the professional practice. Know-how can be the ability to solve problems or perform a task and is a result of socially anchored rules and values. Know-how is dependent on the context in which the individual acts, if the context changes, the know-how can become useless (Rolf et al. 1993).

4.3 Professional competence and qualifications

Ellström (1994) suggests that learning can be viewed from two main perspectives. Learning can be viewed from a cognitive perspective or as contextually situated.[62] From a cognitive perspective, knowledge is something that is internalised by the individual and learning implies transference, internalisation, and application of knowledge. From a contextual perspective, knowledge is imbedded in a social and cultural context and learning is a social process through which the professional competence is developed as an integrated part of the professional role or identity. From a cognitivist perspective, learning primarily takes place through formal education and verbal instruction. In a contextual perspective, informal and experience-based learning through practice and active engagement in a community is instead emphasised. Eraut (2004, 2000) has also made an analogous distinction between two alternate perspectives on knowledge: individual and social (as an extension of situated learning). From an individual perspective on knowledge and learning, light can be shed on differences in what and how people learn and differences in how they interpret the learning. The social perspective makes it possible to explore the social construction of knowledge and learning contexts as well as cultural practices that constitute knowledge resources for learning.

However, Ellström argues that both the cognitive and contextual perspectives are limited as empirical studies suggest that theoretical education is difficult to transfer or apply in practice at the same time as situated experiential learning that is context bound may be difficult to generalise and less useful in new contexts. Thus, he suggests that integration or some form of combination of the perspectives may be necessary. The perspectives should not be regarded as mutually exclusive but, rather, as complementary.[63] Ellström instead suggests that an intuitive-contextual perspective is valid in "*…the work of: experienced employees; working under pressure; in complex situations; and handling unstructured, rarely occurring, and poorly understood problems*" (p. 46 in Ellström 1998), while a cognitive-rational perspective relates to "*…the activities of: less experienced employees; using abstract information; handling more structured, well-defined tasks that can be more fully analysed onto their components; in situations where there is a strong pressure to justify the decisions made to*

[62] See e.g. Wenger (1998) and Lave & Wenger (1991).

[63] Eraut (2004) suggests that the individual and social perspectives on knowledge and learning are analogous to the particle and wave theories of light, i.e. complementary rather than contradictory.

significant persons not directly involved in the problem solving efforts (e.g. the management)." (p. 46 in Ellström 1998).

Ellström (1996) also proposes a distinction between an adaptation and development perspective on knowledge and learning. From a functionalist, adaptation perspective on knowledge, occupational competence is defined and evaluated in relation to the successful performance of certain given or predetermined tasks, i.e. tasks that the individual is neither allowed nor expected to change or improve. The adaptation perspective thus to a large extent fails to recognise the active modification and subjective redefinition of the work task that occur continuously and, by necessity, during the performance of a job. The developmental perspective on knowledge, on the other hand, strongly emphasises that people have a capacity for self-management and that they are also allowed and expected to exercise this capacity. Individual competence is defined as a capacity to reflect and act on the work environment and thereby shape it into what he or she wants it to be.

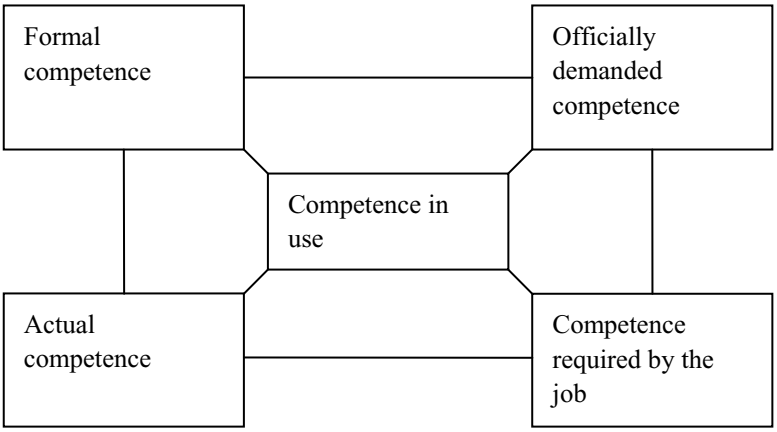
Ellström (1998) argues that competence is commonly viewed in one of two ways, either it refers to an attribute of the individual or human capital that can be transferred into productivity or it concerns the requirements of a task (competence valued in the world of work that has an exchange value rather than use value). Ellström suggests that the first view be labelled as competence, while the latter view should be referred to as qualifications. According to the definition adopted in (the introduction to) this thesis, competence entails knowledge and intellectual skills as well as non-cognitive factors (perceptual motor skills, personality traits and social skills as well as cognitive and affective factors). Thus, competence refers to a relation between an individual's capacity and the requirements of a task or the individual's potential rather than an actual capacity (or a capacity that is actually used), while qualifications refers to that which is actually required by the job or that which is (implicitly or explicitly) prescribed by the employer.

Salling Olesen (1994) also makes an analogous distinction between competence and qualifications. Competence or capabilities refers to all knowledge a person has acquired regardless of whether it is used or not and qualifications refers to the competence that is considered relevant for work.

Furthermore, different meanings of occupational or professional competence can be identified (see figure 1 below). Formal competence refers to the formal education and merits, while actual competence is the individuals' actual capability to perform the work (Ellström 1998). Formal competence may in certain cases be a legal requirement such as an authorisation procedure. Formal competence is regarded as an indication that the individual masters a certain level of competence relevant for certain work

tasks and acts as a basis for recruitment selection and as a filter[64] (Nordhaug & Grønhaug 1994).

Figure 1: Ellström's (1998, p. 42) division of different meanings of occupational competence. The left hand side refers to competence and the right hand side to qualifications.



In the figure above, three different views of occupational competence are represented. Competence can be seen as an attribute of the job; competence as a job requirement or officially demanded competence; as an attribute of the individual, formal or actual competence; or as an interaction between the individual and the work; competence-in-use. Competence-in-use refers to the competence that is actually used by the employee in the work, i.e. the focus is on the interaction between the employee and the job, that is, the competence of the worker and the characteristics of the work (Ellström 1998).

The characteristics of the work may facilitate or impede the individual's opportunities to actually use his or her competence in the daily work. Individual factors such as self-confidence and previous experiences, and work related factors such as the organisation of the work and the workplace (e.g. autonomy, participation, characteristics of the tasks, and feed-back) are of importance when it comes to what competence the individual uses (Ellström 1998).

These different aspects of competence are often ignored[65] as the focus is often on individual aspects and generalist competence among the workers.[66]

[64] See also section 3.6.
[65] For example in the employability debate, see section 2.5.

The competence typology, by Ellström, presented above can be viewed as holistic, integrating aspects of functional (associated with certain professions) and cognitive competence. A holistic typology is beneficial for reaching understanding of the competence necessary for particular professions. Delamare Le Deist & Winterton argue that "*The competences required of an occupation include both conceptual (cognitive, knowledge and understanding) and operational (functional, psycho-motor and applied skill) competences. The competences more associated with individual effectiveness are also both conceptual (meta-competence, including learning to learn) and operational (social competence, including behaviours and attitudes).*" (p. 39 in Delamare Le Deist & Winterton 2005). Another attempt at presenting a holistic model of professional competence, how professionals acquire and maintain competence, has been presented by Cheetham and Chivers (1998, 1996) drawing primarily on the reflective practitioner and competence-based approaches. The four key components in this model are knowledge/cognitive competence, functional competence, personal or behavioural competence, and values/ethical competence. Each of these components is in turn made up of a number of constituents. Knowledge/cognitive competence is, for example, composed of a technical/theoretical component (related to the knowledge base of a profession, including the generation, transfer, and application of knowledge), a tacit/practical component (knowledge related to specific functional or personal competence or knowing-in action), a procedural component (related to how, what, and when of the more routinized tasks of the professional practice), and a contextual component (related to general background knowledge specific to a particular practice, i.e. working environment or organisation). The functional competence includes an occupation-specific component (tasks specific to the profession), organisation processes (e.g. planning, implementation, delegation, and evaluation), a cerebral component (e.g. literacy and numeracy), and a psychomotor component (e.g. manual dexterity). The personal or behavioural competence comprises social/vocational competence, such as self-confidence, thinking on one's feet, control of emotions, intrapersonal listening abilities, and task-centeredness as well as intra-professional competence such as collegiality, sensitivity to peers, and conforming to professional norms. Values or ethical competence includes a personal

[66] Employability actually concerns the individual's ability to get and hold on to a job, getting a job should largely concern formal competence and the ability to market that competence. How successfully the job is performed could be related to the competence-in-use and the relation between the individual employee and her/his work.

component (e.g. adhering to the law and to a personal moral code) and a professional component (e.g. adhering to professional codes and client-centeredness). As a complement to the four core components, the model of professional competence includes transcending meta-competences or trans-competences related to learning, reflection and the ability to cope with uncertainty, i.e. generalist competence such as socio-communicative skills, creativity, problem-solving abilities, and self-development.

4.4 Concluding reflections and comments

In the knowledge and competence typology that will be applied in the thesis, knowledge is defined in a broad sense including theoretical propositional knowledge, practical knowledge or 'know-how' and skills as well as tacit and implicit knowledge. The last aspect is, however, difficult to empirically capture and is thus in some respects outside the scope of this interview-based study. The main aspect of knowledge focused on in this study is the division between theoretical, declarative, propositional knowledge or, in Ryle's vocabulary, 'know-what', and practical knowledge or 'know-how'.

Competence is understood as a broader concept than knowledge, including knowledge (the aspects described above), but also an affective component, including attitudes, values and motives as well personal traits, such a self-efficacy and self-confidence, and social skills (also referred to as socio-communicative competence here). Qualifications refer to what is actually required by the work or is stipulated by the employer. Competence is also divided into a formal aspect (i.e. formal merits and credentials) and an actual aspect (i.e. the individual's capacity to sufficiently handle a situation or complete a task).

Ellström (1998) suggests three alternative views of competence: as an attribute of the individual (competence), as job requirements (qualifications), or as a combination of both, the competence that is actually used at work in the interaction between the individual and the work. In this study, the focus is on the last aspect, the competence-in-use (as experienced or portrayed by the respondents). The way learning knowledge and competence is viewed in this study is derived from both the cognitive tradition, where knowledge can be learned in one context and then be transferred to and applied in another (e.g. knowledge can be acquired through higher education and then be applied in professional practice), and from the situated or contextual perspective. The cognitive perspective in some ways becomes inherent in the design of the study and through the respondents' statements since the focus is on the relationship between formal and informal learning in higher education and the demands encountered in professional practice (and hence transferability

of knowledge is implied). However, another aspect of the study is the learning and development that takes place in the workplace and the interaction with the context through different types of problems and work assignments. Thus, the interaction between the individual and her/his work, i.e. the context in which competence is used, also becomes central.

4.5 Implications of the theoretical framework

In the first part of the text, a background and theoretical framework for the thesis has been presented, with the aim of presenting previous research and theories relevant to the present study, in order to place the study in a research context. In the background and theoretical framework, some assumptions, premises, delimitations, and choices are also outlined. In the following, section the intention is to describe the implications this has for the analysis of the empirical data in this study.

A widening gap between education and work has been described in previous research and this has led to increased demands for education and more general education. The demands for formal qualifications have increased, while it is less certain whether the demands for actual competence have also increased. Education and control of knowledge is central to the professions. Still, little attention has been paid in previous research to the work the professionals do and the actual competence required of the professionals. Freidson argues that professional knowledge or expertise provided through higher education is "*extremely limited as a reality: it is locked up in books or heads, and as it is defined it has no link with the activities of consulting, treating, advising, or otherwise working at being an expert. A practicing or consulting expert engages in activities, and activity is not, after all, knowledge.*" (p. 339 in Freidson 1970b).

Abbott (1998, 1988) and others have suggested that the focus be transferred from the occupational or professional structures to the actual work of the professionals and the competence that is used in professional practice (i.e. the relationship between the actual competence and the qualifications or what is required on the job). The focus of this study is the link between formal professional education and the work that the professionals actually do, i.e. relating the competence imparted by higher education to the demands encountered in professional practice. Furthermore, there is a dominant epistemological assumption in professional education and practice of the technical rationality of knowledge and the close connection between education and work. There is also an increasingly instrumental attitude towards higher education. From the human capital perspective, there is an underlying assumption that the professionals unproblematically appropriate

competence that is relevant for the professional practice through higher education (although e.g. the debate on the benefits of practical training and apprenticeship or internships contradict this). Conversely, several authors argue the opposite, that the transfer is not a rational but a complex, dynamic and non-linear process where individual reasoning and motives are influential (cf. Schön 1983). There is a need for qualitative studies of the transition process from higher education to professional practice.

There is a close relationship between formal education and professional practice. However, a central question is whether the knowledge acquired in professional education should be viewed in terms of human capital, symbolic capital, cultural capital, etc. Few studies have explored if and how the content of the professional education actually is relevant to the professional practice (i.e. what is learned in professional education and how this is related to the work tasks encountered in professional practice) (Svensson & Östnäs 1990). Svensson & Östnäs (1990) argue that in order to understand the role knowledge has in society and whether it constitutes a basis of control and dominance, it has to be related to, and cannot be regarded as, a system beyond the individual actors. It is not possible to understand the role of formal knowledge in society without studying the character of those individuals who develop and exercise it.

The empirical and theoretical focus, phenomenon, of this study is the relationship between higher (professional) education and professional practice, more specifically, the relationship between what is learned (competence) through higher education and the demands encountered or what is required from the individual in professional practice (qualifications). Thus, the focal point of the study is the intersection of two social practices rather than learning per se. I will not attempt to create individual contextual descriptions of the respondents. The engineers and physicians are not homogenous collectives (though they share a common educational background and many prerequisites of the professional practice), but the descriptions of the groups in the empirical analysis will be on a group rather than an individual level. Variations and commonalities in the respective groups will be described. However, special interest is paid to the inter-professional commonalities and differences.

My intention is to illuminate the results by drawing primarily on two fields of study with rather distinct histories, but which are strongly related: educational research (educational sociology) and research on professions (professional sociology). The emphasis in the research on the functions of higher education or in the educational sociology lies within the domain of higher education (the socialising, qualifying function of education, i.e. human capital theory, and the sorting, legitimatising, or institutional function of

education, i.e. institutional theory). However, the relationship between the functions of higher education is closely tied to the world of work and in research on the professions the emphasis is mainly on professional practice or the world of work, although there is a close relationship between the professions and higher education. The two parts of the theoretical framework illuminate the relationship between higher education and professional practice from different perspectives. However, of central interest in both these parts, and especially in the intersection between them, is what is learned during higher education and how this relates to job requirements or the demands encountered in professional practice and the work the professionals actually do.

Thus, the theoretical framework is an attempt at combining theories of the professions and professional competence with theories of higher education to provide a basis for framing the phenomenon that is the focus of the study, i.e. the relationship between higher education and professional practice. The theories of professionalisation and theories of higher education approach the phenomenon from 'opposite' directions.

The theories of education and the professions presented in the theoretical framework mainly concern problems and concepts that are related to processes at a macro level. The thesis is an attempt at contributing to the development of the understanding of the micro processes, i.e. to illuminate the processes of professional education in relation to practice on an individual level, which constitute the foundation of the macro theories of education and professional practice. Hence, this study is concerned with the professionals' experiences of everyday work, primarily related to the competence acquired in higher education and the utilisation of this competence in professional practice.

In order to illuminate the relationship and what bearing higher education has on professional practice, a knowledge and competence typology has been formulated. Central concepts in the analysis are: knowledge (theoretical and practical), formal and actual competence (including meta-competence and generalist competence such as reflection, creativity, analysis, flexibility, problem-solving, learning how to learn, self development and related learning skills as well as socio-communicative competence), qualifications (primarily the requirements of the professional practice and the officially demanded qualifications), and knowledge base (of the educational programs and the professional practice, respectively). Generalist competence refers to general and transferable non-context bound competence.

Chapter 5: Methods

In the following chapter, the design and methods of the study are described. The chapter contains an account of the methodological choices and delimitations that have been central during the progress of the study. A description will be given of how the empirical data on which the study is based have been collected and analysed, as well as a description of the context and design of the study. Furthermore the methodological positioning of the study as well as a discussion of criteria for assessing the quality of the results, i.e. the validity and reliability of the study, are presented.

5.1 A brief description of the research process

This thesis is based on empirical data collected within the framework of a more extensive research project. The empirical data on which the study is based consist of interviews with recently graduated physicians and engineers in information technology, conducted by two interviewers. The respondents were interviewed relatively shortly after graduation from higher education and follow-up interviews were conducted when the respondents had been working for 3-4 years. The interviews were relatively standardised and followed a semi-structured disposition in order to ensure that the interviews conducted by two separate researchers included the same questions and covered the same topics. The data were then analysed separately in relation to the research questions in this thesis.

The general research design and the general aim of the project were described in a research plan drawn up before I joined the research project. However, I was given a relatively high degree of freedom as regards carrying out my part of the research project. The details of the design and implementation were planned in the project group, and primarily in co-operation with my fellow doctoral student involved in the project. This included the selection of medical and engineering programs to specifically focus on in the study, the procedures for selecting respondents, gathering contact information for the respondents, construction of interview guides, carrying out pilot interviews and, finally, making initial contact with the respondents in the form of letters which was then followed by contact over the telephone. The interview guides were constructed so that they included questions that would cover the general focus of the research project, as well as questions more focused on the doctorial students' separate research interests.

In conjunction with the initial interviews, the respondents also filled out a small questionnaire in which they were asked to briefly describe or state their educational backgrounds and previous experience of the labour market.

5.2 Research design

The focus of the study is on describing and analysing recently graduated physicians' and engineers' experiences and perceptions of the transition from higher education to work. The study has been conducted according to a comparative approach and the respondents have been interviewed on two different occasions. At the time of first interviews, the respondents had recently graduated and a selection of the respondents was interviewed after a couple of years in professional practice.

It is a comparative study since the perceptions and experiences of the two groups are compared and related to each other, and differences and similarities between the two groups focused on in the study are discussed.

A substantial number of the questions are similar in the interview guides from the initial interviews and the follow-up interviews. Changes in the respondents' perceptions of and attitudes towards their education and their professional practice, that take place during the first years in professional practice, can thus be followed up in the interviews. The interviews were semi-structured and the interview guides for the initial and follow-up interviews were not completely identical. The initial interviews were focused to a larger extent on the respondents' experiences from their educational program and in the follow-up interviews, the emphasis is more on professional practice. Thus, this is not a longitudinal study in the sense that the main focus in a strict sense is on the change between two different points in time. However, the study is not only cross-sectional as the follow-up interviews are partly a 'measurement' of change and partly have a different focus. However, the follow-up interviews facilitate reasoning about change and causality as the time variable can be included. The follow-up interviews have also made possible renewed illumination of certain themes from different angles and have given the opportunity to 'validate' the answers to certain questions provided by the respondents. Another aspect of recurrent interviews is the opportunity afforded to deepen, nuance, and clarify different aspects that arise in the analyses of the initial data collection.

In a comparative study, neither the differences nor the similarities between the groups that are compared should be too significant (see e.g. Denk 2002, Philips 1999). The professional groups included in this study display similarities, but also considerable differences. The health care system is characterised by relatively static and hierarchic organisation. The

physicians will encounter a relatively clearly defined professional role and future career and their employment is mainly in the public sector. Physicians are in many ways, mainly as a result of the clinical training during their education, more prepared for the substance and organisation of work. Their education can be described as having a clear vocational character.

The engineers, on the other hand, have to be prepared for a wide variety of work tasks and organisational structures and they mainly work in the private sector. They can end up in a large, inflexible organisation as well as in a small, flexible organisation with a flat organisational structure that might allow for greater responsibility and more possibilities to utilise a wider range of their competence after a short period of time. The engineers' education is broadly structured. There is no practical training incorporated into the educational program and no formalised apprenticeships system is associated with the transition to professional practice.

This is, obviously, a crude simplification, as the physicians also have to be prepared for a diversity of work tasks and potentially differing organisational structures. Nevertheless, the concern is two professions, in some ways alike (long professional educational programs with the prospect of a relatively high salary and 'status'), but the physicians and engineers are in many ways, if not each others' opposites, very dissimilar when it comes to aspects such as closeness to individual clients, orientation, and labour market.[67]

5.3 Selection of respondents and data collection

The dissertation is based on data collected in interviews with physicians and engineers in information technology, working in different parts of Sweden and who had recently graduated. The respondents had been studying at one of four universities in Sweden; Göteborg, Linköping, Stockholm and Uppsala. They were selected randomly (stratified by gender and age within the respective groups) from lists that were obtained from the administrators of the educational programs. The only criteria for inclusion in the study was that the graduates were employed (in an area relevant to their education) at the time of the initial interview.

The professional groups to be included in the study were decided on in the original research plan. To attain an overview of similarities and differences in content and organisation of the curriculum of different educational programs, information about every educational program in medicine and engineering, with a specialisation in computers, information

[67] The groups will be further described in chapter 6.

and communication technology in Sweden, was collected from official course documents and through contacts with educational administrators.

These considerations led to the choice falling on the educational programs for physicians and engineers with a specialisation in information technology in Linköping. At the time of the data collection, the program for engineers in information technology was only available at Linköping and Uppsala University and thus the choices were in a sense forced. Respondents who had graduated from different institutions of education were chosen in order to achieve a variation in experiences from different educational programs with varying pedagogical structures and avoid constructing an evaluation of specific educational institutions and programs as well as falling into a strict comparison between two different educational institutions. Thus, the professional education in medicine is also represented in the study by the educational programs at Karolinska Institutet in Stockholm and Göteborg University. Factors contributing to the final choices were practical considerations, geographical availability, communications and the pedagogical structure.[68]

An unanticipated problem that arose once contact with the respondents was made was that the engineers turned out to be a very heterogeneous group. Whereas the physicians' transition from higher education to

[68] In the research project, within which the data on which the thesis is based were collected, one of the main concerns was exploring whether the pedagogical structure, the degree of student-centeredness in the pedagogical organisation of the program, in different professional educational programs had a relation to the experienced relevance of the education to professional practice. Accordingly, it was decided that novice engineers and physicians who had graduated from educational programs based on problem-based learning and more 'conventionally' organised programs, respectively, were to be included in the study. Medicine and engineering with a specialisation in information technology in Linköping were chosen as they were the only educational programs in the respective fields with a pedagogical structure formally oriented towards problem-based learning. As a contrast to the problem-based program in medicine, programs with a more 'conventional' pedagogical structure, e.g. with cathedral lectures, at other universities were chosen. Consequently, about half of the graduates in each group, physicians and engineers, had graduated from educational programs formally based on a problem-based pedagogy and the other half in each group had attended programs that, formally, are more conventionally designed. However, the program that the engineers from Uppsala University graduated from is characterised by a project-based structure. The pedagogical structure of the educational programs will be further described in chapter 6. For further elaboration on problem-based learning, see also e.g. Abrandt Dahlgren (2001), Fenwick & Parsons (1998), Boud & Feletti (1997), Wilkerson & Gijselaers (1996), Rahimi (1995).

professional practice was relatively predictable, the engineers were at different stages in the transitional process when we contacted them, although the graduates began the last semester of their studies simultaneously. We only had information about when the graduate should officially have graduated, but some engineers had started working parallel with their studies and thus had a longer work experience behind them than others. Furthermore, the IT sector has been turbulent and after a prosperous period in the 1990s, it receded. Later it regained momentum, based perhaps on more realistic assessments of the market potentials. Due to a recession at the time of the initial interviews, a considerable number of the engineers had trouble getting employment in line with their education, and were therefore not included in the study. There were also some respondents from both groups who were unwilling to take part of the study.

The respondents have been interviewed on two different occasions and the initial interviews were followed up by interviews with the same respondents. The study is based on interviews with 43 recently graduated students, 23 physicians and 20 engineers in information technology, and follow-up interviews with 29 of the respondents, 14 physicians and 15 engineers. In both groups, half the respondents were male and half female in the initial interviews, i.e. 12 male and 11 female physicians and 10 male and 10 female engineers were interviewed. A decision was also made that not all respondents would be included in the follow-up study and there were some dropouts between the interviews as some respondents were unwilling to participate in or unavailable for the follow-up interviews. During the initial collection of empirical data, it became apparent that the data had become saturated before all the planned interviews had been conducted. Hence, it was decided that not all the respondents needed to be interviewed a second time. For the second interviews, respondents were selected by considering the variation in experiences from the first interviews while still maintaining a variation in gender, age, and educational institution. Eight male engineers, 7 female engineers, 5 male physicians, and 9 female physicians participated in the follow-up interviews.

Table 1: The table includes a presentation of the number of respondents in the respective groups by the university from which the professionals have graduated. The distribution in the follow-up interviews is marked by parentheses.

	Physicians	**Engineers**	**Total**
Linköping	12 (8)	10 (9)	22 (17)
Göteborg	5 (5)	-	5 (5)
Stockholm	6 (1)	-	6 (1)
Uppsala	-	10 (6)	10 (6)
Total	23 (14)	20 (15)	43 (29)

The physicians (with an average age of 29.6 years) in this study were slightly older than the engineers (with an average age of 27.1) and the engineers also constituted a somewhat more homogenous group with regard to age (the standard deviation among the engineers was 3.4 years compared with 4.7 years among the physicians). The age dispersion and the average age were similar between the male and female physicians, while the male engineers were slightly older and had a larger age dispersion than the female engineers.[69]

The age variation was thus relatively large in both groups and this also resulted in a variation in previous experience of both higher education and the labour market.

[69] The male physicians had an age dispersion of between 25 and 42 years, and the average age was 30.0 years (the standard deviation was 4.8 years) in the first interviews. For the female physicians, the age dispersion at the time of the initial interviews was between 24 and 40 years, the average age was 29.1 years (with a standard deviation of 4.7 years). The male engineers' age varied between 23 and 37 years with an average age of 27.7 years (standard deviation of 4.2) and the youngest female engineer was 24 and the oldest 32, with an average age of 26.5 years (the standard deviation was 2.5 years) at the time of the initial interviews. In the follow-up interviews, the male physicians' ages varied between 28 and 39 years and the average age was 31.4 years (the standard deviation was 4.4 years) and the age of the female physicians ranged between 27 and 36 years with an average age of 30.1 years (the standard deviation was 3.2 years). At the time of the follow-up interviews, the male engineers were aged between 27 and 34, with an average age of 30.1 years (the standard deviation was 2.6 years) and the corresponding age interval for the female engineers was 26 and 35 years, with an average age of 29.9 years (the standard deviation was 3.0 years).

5.4 The interviews

The first interviews took place between May and December, 2002, and at the time of the initial interview, most of the graduates had been working between 1 month and 9 months. The follow-up interviews took place between June, 2004, and April 2006, 3-4 years after the initial interviews.

The interviews were held at locations designated by the respondents, which included the Department of Behavioural Sciences and Learning (Institutionen för beteendevetenskap och lärande) at Linköping University, the respondents' workplace, public places (such as a café and a library) or the respondents' homes. The interviews were recorded on a tape-recorder and thereafter transcribed. The interviews generally took about an hour to complete, but there was a variation of between 45 minutes and 2.5 hours, which resulted in texts that were between 15 and 30 pages in length.

The interviews followed a relatively standardised and semi-structured interview guide as the conversation with the respondents was guided by questions constructed beforehand and the aspects that were to be addressed during the interviews were also decided on beforehand (the interview guides can be found in appendix A and B in Swedish and translated to English). However, the respondents' stories were also allowed to guide the conversation. Two different persons, the author and a fellow doctoral student involved in the project, conducted the interviews. The fact that the interviews were conducted by two interviewers is associated with both advantages and disadvantages (see e.g. Kvale 1996). The empirical data have been collected by two, closely collaborating, interviewers who had frequent meetings throughout the whole data collection process in order to syntonize and check with each other for possible problems with the interview guide and how the interviews had proceeded, and to reach an understanding of each other's specific fields of interest. After a couple of pilot interviews and the first couple of interviews included in the study, the interview guide was fine-tuned and some small adjustments were made, the order of a couple of questions was changed as well as the wording of one question. The same procedure was applied during the follow-up interviews, where the order of some questions was altered after the first couple of interviews in order to allow the flow in the conversation with the respondents to become more harmonious.

Before the interviews, the respondents were informed of the general aim of the research project, that the interviews were confidential and how the empirical material was to be handled, the nature of the interview questions, i.e. about experiences related to their educational background and their present work, to not discuss any areas that could be considered very sensitive in relation to the respondents' personal integrity. They were informed that the

interviews are confidential and that the relatively large number of interviews would make it difficult to discern and identify any specific individuals among the respondents.

During the interviews, the respondents were asked to talk about their conceptions and experiences of the transition from higher education to work and their first period in the workplace. The interviews contained questions related, to among other things:

- How the graduates perceived and described the transition from higher education to work and their initial period in the workplace (including the introduction).
- What they had learned from their education and how this is related to their current work (what they had 'brought with them' from their education in order to prepare them for the world of work).
- What they perceived as the most and least, respectively, valuable parts or aspects of their education.
- How well their education had prepared them for the world of work.
- How their expectations prior to their entrance in the world f work relate to the reality of practising the profession.
- What type of competence requirements they have experienced in professional practice.
- The needs and opportunities for further learning and professional development.
- What it was like to be new in the workplace.

The main aim of the questions in the interview guide was to create a structure and the respondents were encouraged to talk generally about these issues.

5.5 Analysis of the empirical data

The analysis of the empirical data was conducted in several steps. The interviews were first read individually or separately in order to get an overall view of the interviews, and a concentration and categorisation of meaning was performed (Kvale 1996). The individual interviews were then condensed and summarised into smaller themes in order to reduce the mass of text. In the next step, the themes from the different interviews were extracted and read together for the two groups separately, first the themes from the interviews with the physicians and then the themes from the interviews with the engineers, in order to find variations and essential perceptions and experiences relating to the different themes. The themes consisted of questions in the interviews relating to education, the relationship between

education and work, and the professional practice. The empirical data within the themes were then categorised. The categorisations were discussed with colleagues in the project with an insight into the empirical material in order to validate the reasonability of the interpretations. From the categorisations, narratives at the group level were constructed in order to facilitate a group-wise comparison of both essence and variation in the perceptions of education and professional practice in the two groups. Thus, the results are portrayed on a group level constructed from individual representations of the graduates from the respective disciplines. As the intragroup or within-group variation in experiences and perceptions of the phenomena in focus is considerable, it is essential to also focus on the essence within each group, in terms of the characterisations, in order to get a picture of the between-group variance in perceptions. The interviews with the physicians and engineers were first analysed independently to try to uncover the graduates' views and experiences of the transition and their first period at work as well as their perception of their education, retrospectively, and its relation to their present work. After analysing the interviews independently, the findings from the two groups were compared with each other. The comparison was made by searching for similarities and differences between the physicians' and engineers' experiences. Central in the analysis and interpretation of the empirical data is reflexivity in the interaction between empirical material and the interpretation through abduction (see e.g. Alvesson & Sköldberg 1994). A qualitative approach is used in the analysis, characterised by an 'open', flexible and ambiguous view of reality, and the interpretations aimed at finding diversity in experiences and conceptions. The main interest is to reach an understanding, rather than to seek the truth', and the method is also intended to be dynamic and changeable (see e.g. Alvesson & Sköldberg 1994, Patton 1990).

The interview data were analysed by categorising, classifying, and thematizing the transcribed texts in relation to the research questions. The analysis in this study was data-driven and the categories were derived on the basis of empirical data rather than by categories defined in advance (as in a grounded theory approach, see e.g. Strauss & Corbin 1998, Glaser & Strauss 1967). The manifest content of the empirical data was focused on, and there was a greater focus on what the respondents said than how they said it. The analysis of data in this thesis have been analysed relatively 'open-mindedly' where the research questions (rather than a theoretical stance) driving the analysis and the results are empirically grounded, but the theoretical framework and central concepts in this thesis were used to reach an understanding of the empirical data. The purpose of the analysis was to raise the level of abstraction of expressions from the informants' concrete

descriptions to more general characterisations of the transitional process. I have strived to reach an understanding of the diversity in perceptions or experiences of the transition from higher education to working life. For the presentation of the results, I have chosen to create a unified story on a group level and have therefore integrated the different fragments presented by different respondents into a whole. The analysis is based on the transcriptions of the interviews in Swedish. Quotations were thereafter selected to illustrate and exemplify the analysis of the results. Thereafter the quotations were translated into English. In the translation, I tried to achieve a balance between a literal translation and a corresponding colloquial (everyday conversational) translation. When selecting quotations to represent the empirical data, a dispersion of the statements among the respondents was aimed for, although the eloquence and readability of the excerpts was also considered.

Another intention was to create detailed and 'thick' descriptions, which would probably make it easier to understand the phenomenon. Qualitatively different experiences and understandings, i.e. variation in experiences and understanding of the transition from university to working life are focused on.

The focus in the initial interviews was on retrospective experiences from the educational programs, although these experiences were somewhat less vivid to the respondents during the follow-up interviews. In the follow-up interviews the conversation shifted to focus more on the respondents' experiences of the demands associated with professional practice and this was also apparent in the analysis of the data.[70]

The respondents' statements are considered to be a representation of their experiences and perceptions of the reality they are part of. The intention is neither to portray a 'true picture' of reality nor to deny the existence of an objective reality, which is experienced or interpreted by the respondents.

5.6 Methodological positioning and considerations

This study explores the respondents' perceptions and experiences of their professional competence and the demands encountered in the workplace interpreted through their statements in the interviews. Thus, the concern is how individuals subjectively understand, apprehend or make sense of events

[70] The follow-up interviews are also referred to in the thesis mainly when there has been a 'longitudinal aspect' considered relevant to emphasise. When a validation or the general conceptions or understanding appear to be constant there is no emphasis in the text on the 'longitudinal aspect'.

and settings. The aspirations of this study are not to reach knowledge about the 'real' competence of the professionals or demands encountered in the workplace.

A central epistemological question in all research relates to how knowledge is constructed or constituted or, in other words, how we derive and construct what we think we know.

> The way we think the world is (ontology) influences: what we think can be known about it (epistemology); how we think it can be investigated (methodology and research techniques); the kind of theories we think can be constructed about it; the political and policy stances we are prepared to take. (p. 197 in Fleetwood 2005)

Thus, central questions in this context concern what kind of knowledge can be derived from this study, as well as what ontological and epistemological stance that I as a researcher represent. Different ways or models of knowledge creation, or going about producing knowledge, contribute to different understandings of the same phenomena (Fleetwood 2005).

From the epistemological stance of this study the researcher is not considered able to attain an unmediated or direct grasp of the empirical world, and the knowledge derived from this study is not considered to simply reflect 'the real world' or strive for claims of objective knowledge (see e.g. Schwant 2000). Social constructs are based on something existing, regardless of how the constructions appear at that moment. Thus, knowledge about reality may be created in an interaction or be socially constructed, but this does not consequentially imply that reality in itself is a social construct and that there does not exist a reality independent of our consciousness (see e.g. Alvesson & Deetz 1999, Weick 1995, Berger & Luckman 1967). Rather, the ontological positioning of this study is associated with that of critical realism. The empirical world and entities can (which does not mean that they necessarily do) exist independently of our knowledge or conceptions of it; things can exist without someone observing, knowing or constructing them.[71]

[71] Fleetwood (2005) makes a distinction between different modes of reality. For example, although an entity may not be materially real (things that would exist even if humans disappeared) the idea of the entity may have 'causal efficacy' or have an effect on how people behave. Ideally, real or discursive entities refer to conceptual entities such as ideas, understandings, discourses, and language, which have a causal efficacy. The world is not discourse (as in the case of a social constructivist approach), but discourse is relevant. Social real entities refer to non-material practices such as social structures (which entail "*configurations of causal mechanisms, rules, resources, relations, positions and practices.*" (p. 201) such as

However, there is an ontological 'gap' between what we can experience and the reality of the mechanisms that generate the events. Danermark et al. argue "*that there exists both an external world independently of human consciousness, and at the same time a dimension which includes our socially determined knowledge about reality*" (p. 5-6 in Danermark et al. 2002). Critical realism is associated with recognising that there are no theory-neutral observations or interpretations. The researcher cannot have unmediated access to the world. A description of the reality in which we live is always subjectively filtered or interpreted. The epistemological consequence of this is that access is mediated by means of pre-existing individual and social (inter-subjective) conceptual and discursive resources (e.g. pre-conceptions, theories, perspectives, norms, but also cognitive and sensory limitations), which we use to make sense of, interpret and understand (see e.g. Fleetwood 2005). The researcher and what is researched do not exist in a dualistic relation or separated from each other; rather, it is a matter of an inter-subjective exchange (see e.g. Lincoln 2005).

Still, the knowledge derived from the study is regarded as a reflection of not only the respondents' experiences of the world, but also of in some ways a corresponding reality as filtered through the interpretations of the respondents and the researcher. By using alternative data collection methods, such as observations, it may be possible to derive other forms of knowledge to complement the results of this study. Implicit tacit knowledge is, for example, taken for granted and people are not aware of its influence on the way they act and understand the world; thus, the respondents in an interview study are inherently unable to verbalise and convey this knowledge to an interviewer. Consequently, uncodified tacit knowledge is difficult to capture in an interview study.[72] Complementary forms of data collection methods, such as observations of the respondents at work and of the workplace would probably increase the chance of gaining a greater insight into these aspects of knowledge.

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education or the market) associated with human activity, and they may exist independently of identification (e.g. institutional racism), but not of actors. Artefactually real entities refer to an integration of the first three kinds of entities (e.g. computers). As entities are conceptually mediated they may be interpreted in different ways and the interpretations are limited by the materiality of the entity, some interpretations are more appropriate or 'better' than others (Fleetwood 2005).

[72] In Eraut's (2004, 2000) terms the focus of the study is on individual explicit knowledge that the respondents are aware of and that they are able to verbalise, in contrast to social and implicit knowledge.

5.7 Quality of the study

Apart from the ontological and epistemological positioning of the study, it is important to consider quality aspects of the study, such as its reliability and validity (Bryman 2004, Merriam 1998, Miles & Huberman 1994).[73]

Reliability often refers to the replicability of the results. However, the knowledge derived from this study is regarded as being related to the specific interaction between researcher and respondent. Social settings and circumstances are not static but ever changing and another researcher would likely reach other understandings than those presented in this text. However, reliability can also be understood as the dependability, consistency or trustworthiness of the analysis and interpretation of the results. The empirical material was collected by two different interviewers in close collaboration and discussion. Thus, a form of inter-observer consistency has been applied. The results have also been presented and discussed with other actors in the project group and as a result of presentations of parts of the analysis of the results in seminars and presentations at conferences, the reasonability of the interpretation of the results have been inter-subjectively 'tested' and modified in different contexts.

Validity, simply put, refers to the method of analysis' appropriateness for measuring what it is intended to measure or how suitable the method is for addressing the research questions. There are different aspects of validity. Conceptual or theoretical validity refers to a method's appropriateness in relation to a theoretical concept. This will concern the design of the study, the data collection procedures, and positioning of the study, where in-depth interviews are often considered a relevant method for reaching understandings of processes such as learning, which this study is concerned with as the researcher has the ability to follow-up the respondents' answers and ensure mutual understandings.

Internal validity concerns the credibility of the results, how likely or reasonable they are (or causality, i.e. the research method's appropriateness for determining the causality for correlations apparent in the analysis) and this is related to the interpretations of the empirical data and the conclusions drawn, rather than data collection procedures and design of the study (which

[73] Reliability and validity are often referred to as the presence or absence of systematic and un-systematic errors, respectively (see e.g. Bryman 2004, Miles & Huberman 1994). Often, alternative concepts such as credibility (relating to internal validity), transferability (relating to external validity), dependability (relating to reliability), confirmability (relating to objectivity), trustworthiness, and authenticity are used to assess the quality of studies conducted according to an idiographic approach (see e.g. Bryman 2004, Larsson 1993).

is related to the external validity). Internal validity is, for instance, also associated with a time aspect built into the design. In this study a longitudinal aspect is present and the understandings of the results are followed over time.

External validity relates to the transferability of the results from the data collection situation to other contexts, or whether the results can be relevant outside the specific context in which the study was conducted. This is related to the possibilities to generalising the results based on the specific context. External validity is also related to ecological validity. A more controlled environment or setting, where the researcher creates unnatural or artificial environments and controls variables relevant to the study (the extreme being an experiment) and thereby intervenes in the natural conditions, creates a lower ecological validity. Thus, the ecological validity of interview studies is in general limited since the interview situation is constructed. In order to achieve a good ecological validity, the researcher should, optimally, conduct observational studies. Through observations, the researcher would be able to complement the results of this study with understandings of the context where learning and working takes place. External validity also relates to the generality of the results when it comes to the participants in the study. Thus, among other things, the selection of respondents becomes relevant to the external validity of a study. Using the selection process (the groups were selected strategically and the respondents in the groups were selected by means of stratified randomisation) we strove to achieve heterogenic groups of respondents in order to reach diversity or variation in the experiences and perceptions among the engineers and physicians, respectively. Variation increases the chance of covering a greater diversity of understandings in the two groups in general (see e.g. Patton 1990). A generality in the sense of statistical inference is not relevant in this study. Instead the generality claims are related to the ability to achieve analytical generalisation in the sense of evaluating the extent to which the results of a study can offer guidance for other contexts by focusing on similarities and differences (see e.g. Kvale 1996).

In this study, due to the methodological positioning, the concepts of correspondence or isomorphism (concerning the truthfulness of the results or their reflection of the real world) are considered less relevant. Instead, the internal coherence, stringency, harmony or logic between research questions, data collection procedures and methods for analysing the data, as well as assumptions concerning the phenomena studied and the methodological positioning are relevant criteria for determining the quality of qualitative research (see e.g. Larsson 1993). This is associated with, for example, clear and thorough descriptions and discussions of the different aspects of the research process.

Finally, it is also important to consider the ethical aspects associated with the research project, e.g. protecting the individuals and their personal integrity (HSFR 1996). The interviews in this study are confidential, and due to the large number of engineering students in information technology and physicians at the universities in question, in combination with the relatively general character of the conversations, it should be difficult to discern any individuals. Furthermore, there are no aspects of what was dealt with in the interviews nor possible implications or consequences of the results of the study that should be considered as sensitive or threatening to personal integrity. The respondents were informed of the aim and context of the research project, as well as how the empirical material was to be used, well before the interviews took place. The respondents were informed that they could withdraw from participating at any time (some respondents also declined to participate in the follow-up interviews).

Chapter 6: Two professions in focus - engineers and physicians

In this study, two professions are focused on: physicians and engineers, specifically engineers with a profile in information technology, which is a relatively new profile or specialisation in engineering. In the following chapter, the intention is to construct a 'case description' of the educational programs in relation to professional practice for the two groups focused on in the study. The chapter includes a presentation of the educational programs, the context in which they work, the specialisation processes, and some previous research illuminating the relationship between higher education and professional practice relevant to the groups focused on. The chapter will begin with an attempt at drawing up a distinction which can illuminate some distinct differences between the two groups.

Graduates with a diploma from higher education are relatively quickly established in the world of work.[74] Graduates from an educational program in engineering and from medical programs are among those graduates who are established in the world of work most rapidly following graduation. Among the technical programs engineers with a computer engineering profile[75] are most rapidly established on the labour market and seem the least susceptible to market fluctuations. Around 95% of the engineers in computer engineering are established in the world of work within a year of graduation and this seems to be relatively stable from year to year. Among the educational programs in medicine and health, the physicians have the least problems in becoming established on the labour market. Physicians and engineers in computer technology were also, subsequently, found to be among the educational programs with the smallest proportion of graduates with a 'weak'

[74] In a report from the Swedish National Agency for Higher Education, establishment in the labour market was defined as having had steady employment for at least one year (not enrolled in any employment measures or having been unemployed) with an income of more than SEK 130,000 (in 1996 and later adjusted for the general increase in wages, i.e. 3% increase per year). Those students who continued in postgraduate education are not included (Högskoleverket 2003:7).

[75] Here, engineers with a profile in information and communication technology are included among the computer engineers.

position in or outside the labour force after one year (Högskoleverket 2003:7).[76]

6.1 Different professional distinctions

The meaningfulness of viewing the professionals as distinct homogenous occupational groups has also been questioned. The educated, intellectual class has been transformed from not being specialised in different academic disciplines and acquiring knowledge could be done in different ways, compared to the clearly specified educational programs today. Formal apprenticeship was the most prevalent way to learn most occupations during the first half of the nineteenth century (see e.g. Torstendahl 1975). In Brint's (1994) words, the professionals were socialised but not trained for a professional practice. During the late 1800s, the professionals were associated with homogenous status groups, which along with the emerging industrial society and the welfare state, were replaced by a variety of specialised occupational professionals. Within these professions there has since been an ongoing professionalisation, whereas much of the research on professionals has treated them as relatively homogenous collectives that are distinct from non-professional occupational groups.

It has not been empirically confirmed whether the distinctive characteristics of the professions actually exist or whether they could also be attributed to other occupations than are traditionally included among the professions. It is difficult to attribute certain characteristics to an occupation and, on this basis, ascertain whether it is a profession or not. Professionalisation and professionally distinctive characteristics are, rather, a strategy or tools by means of which an occupation tries to achieve a

[76] Currently, around 40% in each age group in Sweden attain a degree from higher education (involving more than three years of studies, 120 credits). However, it may take several years more than expected for many and the transition to work may occur before they officially graduate. Some students find employment before they have completed all the courses and never get around to applying for their official diploma, hence they have not graduated according to the official statistics. Most students complete their education and after graduation start looking for work. However, some students have a lot of experience before they enrol in higher education and may have a base for being established in the world of work before they even start studying. Others collect their diploma when encouraged by their employer to do so or when they are changing jobs. About 10% of the graduates continue to study after their first degree, some of these probably do so because of a lack of employment opportunities. Of these, half are enrolled in doctorial studies (Högskoleverket 2003:7).

professional status that has traditionally been reserved for liberal or free occupations, such as law, medicine, or the cloth.

Sarfatti Larson (1977) argues that, historically, the major differences between medicine and engineering can be derived from differences in functional homogeneity and aspects of the market, such as the separation between buyer and consumer in the case of engineering, which leads to a potential conflict of loyalty between the responsibilities to the employer and the consumer. Furthermore, the product in the engineers' case can be seen and examined due to its physical nature.

There have been many attempts to systematise and categorise different types of professions, Abbott (1988), for instance, differentiates between different types of professionals based on how close to the core of the profession they work.

Today there are large differences between professions in the public and private sectors as well as between the established professions and the more recent, such as physicians and social workers in the public sector, with respect to status, authority and material aspects. As a result of this, new distinctions have been called for, which are not solely based on knowledge but also on receiver and sector. These new distinctions are perceived as cutting across the existing professions. A main distinction can be made between welfare and market professionals[77] (see e.g. Hellberg 1997, Castro 1992, Brante 1990).

Hellberg (1999, 1985) proposes a distinction between professions based on the type of knowledge the profession controls and masters divided into two types of professions, L and T type, where L represents knowledge of the living and T represents knowledge of things. L professions are characterised by caring for the basic human rights in a civilised society, such as legal security and health care. T professions are concerned with production, organisation and administration of things and services. In this study, engineering could arguably represent a T profession and medicine an L profession (see also Sarfatti Larson 1977).

[77] Additional professional types that have been suggested are the free professionals derived from the market professionals, the academic profession with the state as the principal receiver in Sweden and as a fifth professional type, Brint (1994) has suggested the political profession.

Table 2: The characteristics of L- and T-professions according to Hellberg (1999, s 32).

	L professions (physicians)	**T professions (engineers)**
Orientation	Altruism	Utility
Closure logic	Legal	Credential
Measure	Legitimation by state authorities	Exams, titles, self-authorisation
Education	One at highest possible level	Several at different levels
Client	Every citizen	Organisations
Labour	Public or highly state-subsidised private sector	Private sector

For the L professions, the physicians, the state and the citizens are the principal actors and for the T professions, the engineers, the main actors are the market and organisations and companies are the primary clients (Hellberg 2002, 1999, 1997). Wingfors (2004) has also introduced an L-flex profession as a mix of L and T professions, which can be exemplified by social workers.

Whereas Hellberg's distinction is based on the professional groups, Brante (1990) has proposed a distinction based on the individual professionals. This distinction is based on the professionals' relation to the receiver and Brante has made a division between welfare professionals and market professionals. Castro (1992) has also constructed a distinction between welfare and market professionals based on the dimensions of hierarchy and structure. The market professionals are characterised by a high level of hierarchy and a low coherence, whereas the welfare professionals are characterised by low hierarchy and high coherence.

What the different distinctions have in common is the relation to the receiving end or client, however, this relation differs due to the nature of the knowledge controlled by the profession and the knowledge demanded or required by the receiving end, i.e. the employer. The state requires that every professional in the group have a certain level of competence and this mainly includes the L or welfare professionals. The T or market professionals primarily interact with clients or receivers who seek knowledge required for a certain task and the receivers do not have the same need to ensure that all the professionals in the group have acquired the same knowledge when it comes to, for instance, technical tasks that might not always require an engineer with 4.5 years of education (Hellberg 2002).

A threat to some professions, primarily L or welfare professions such as physicians because of their historically close relation to the state, due to legitimising and authorisation procedures, is the privatisation and decentralisation of the public sector. The professional ideal, which may have reached its peak during the construction of the welfare state, is weaker today as a result of the welfare state being dismantled and self interest is prioritised at the expense of the collective professional interest (Perkin 1989, 1996).

6.2 Professional organisations

There was a shift in professions in the 19th century when the professionals went from selling services to individuals to selling their labour to organisations, and the problems were defined by the organisations and the problem solving was carried out in the organisational context (Torstendahl 1990). The nature of professional practice is associated with the way work is organised (Freidson 1975). Large organisations are often involved in working across the domains of several professions. There are complex tasks that organisations take on that would be impossible for individual professions to manage as they entail the entire range of expert work, such as building a skyscraper. Hospitals are an example of a complex division of labour, where different occupational groups are completely reliant on others to be able to handle their part of the work and their tasks. Expert organisations are not controlled by the profession but, rather, by outsiders (e.g. hospitals controlled by bureaucrats). Furthermore, large expert organisations are bound by the rules of commercialisation as much as by the rules of the professions. The expert organisations are dependent on tying up capital in real estate, machines and other physical artefacts, as well as support staff (Abbott 1998).

The professionals are members of both a professional group and a more or less bureaucratic work organisation (Svensson 2007). They are commonly employed in professional organisations, which can be characterised in different ways.

In this study, primarily the physicians are generally employed in professional bureaucracies that rely on the competence of the professionals who work relatively independently in relation to the patients and with a high level of collegial control (see e.g. Svensson 2007). The engineers in this study, on the other hand, are not uncommonly found in, what Mintzberg et al. (1995) refer to as innovative organisations.

Hospitals are generally organisations structured occupationally rather than administratively around a hierarchy in which the physicians are

dominant in the control and coordination of the contributions of other occupational groups (see e.g. Freidson 1970a).[78]

Svensson (2007, 2002) argues that the professional organisation is generally characterised by high degrees of freedom in the planning and execution of the work and that the administrative leadership is generally weak (due to demands on discretion). There are often two alternative hierarchies, a professional descending hierarchy and an administrative ascending hierarchy. The recruitment process of new members is often controlled by the professionals and collegial control in the professional organisation means that the professionals work with little supervision from superiors. Furthermore, the professional organisation is often associated with internal competition for resources, which can worsen the conditions for cooperation.

According to Hinings (2005) the distinctive characteristic of a professional organisation is that professionals design and manage the organisation as the principal source of authority. Furthermore, collegiality, peer evaluation, and autonomy are emphasised as a foundation of the authority in the professional organisation. Hinings (2005) refers to an organisation in which the professionals provide the core service, but are subjugated to an external system with limited professional autonomy as a heteronymous professional organisation, such as a hospital, which is related to what Mintzberg refers to as a professional bureaucracy.

Mintzberg (1989, 1983) argues that professional organisations or bureaucracies are characterised by complexity and stability. The complexity means that well-defined competence, which can only be acquired through extensive education and training, is required. Stability refers to the utilisation becoming standardised in order to produce standard products or services. Hence, this requires a standardisation of competence programmed or indoctrinated into the professional students through formal education and training on the job, for example, internships. This, in turn, requires internalisation of values and standardisation of competence. The expertise is then upgraded as new knowledge is generated and developed.

> Thus, in the pure form of Professional Bureaucracy, the technology of the organisation – its knowledge base – is sophisticated, but its technical system – the set of instruments it uses to apply that knowledge base – is not. (p. 203 in Mintzberg 1983)

[78] Hospitals, in contrast to educational institutions, however, exhibit institutionalised aspects and at the same time have a strong technical foundation, subject to both external and technological requirements and constraints (see e.g. Scott 1992b).

A professional organisation or bureaucracy with a close relationship with society in the form of direct relations to the clients can be referred to, more specifically, as a human service organisation in which collegial autonomy and central control are especially accentuated (e.g. a hospital). In these organisations, the patients constitute the raw material (which does not imply that people are "*treated as innate objects without regard to their humanness*", p. 4 in Hasenfeld 1992) in production organisations and it is moral work as the professionals' work cannot be value neutral (Hasenfeld 1992, Hasenfeld 1983).

The professional organisation is performance oriented, aiming at perfecting standardised programs, and not oriented towards problem solving and designing new programs. Mintzberg et al. (1995) argue that in contrast to the professional organisation, the basis for innovation in an innovative organisation (e.g. high-technology research organisations) is the absence of standardisation in order to avoid pre-established patterns. The innovative organisation has a non-bureaucratic structure; it is important to avoid excessive divisions of labour, planning, and control systems, but most importantly the organisation needs to be flexible.

The innovative organisation employs experts, professionals, trying to construct new knowledge through the competence of the experts working in multidisciplinary teams. However, rather than standardisation, the coordination needed for complex innovation requires the integration of different kinds of expertise into 'ad hoc project teams'. Mintzberg also refers to this type of organisation as adhocracies.

> unlike the professional organization, the adhocracy cannot rely on the standardized skills of its experts to achieve coordination, because that would discourage innovation. Rather, it must treat existing knowledge and skills as bases on which to combine and build new ones. Thus the adhocracy must break through the boundaries of conventional specialization and differentiation, which it does by assigning problems not to individual experts in pre-established pigeonholes but to multidisciplinary teams that merge their efforts. Each team forms around one specific project. (p. 295 in Mintzberg et al. 1995)

Project management should be in the hands of the experts and is characterised by coordination rather than giving orders. Since the innovative organisation needs to be able to quickly respond to complex and unpredictable environments, it cannot simply apply predetermined planning or strategies. Its response is instead based on flexibility and solving problems

individually, and thinking and action cannot be separated (Mintzberg et al. 1995).

Organisations are increasingly involved in knowledge-intensive production characterised by rapid changes due to technological innovation, and increased demands on quality, innovation and participation. This has resulted in flat decentralised organisations with formal structures characterised by a reduced number of hierarchical levels, in contrast to the Taylorist rationalisation, based on centralisation of competence and decision-making at the top and routine tasks at the bottom characterising bureaucracies. Lazega (2001) differentiates between 'polycratic' or 'collegial' organisations and the 'monocratic' or 'bureaucratic' organisations. The collegial organisations are characterised by shared power, the professionals in the organisation are equals in their levels of expertise (although it may be in different areas), power or ability to influence others, and status (varying on the contribution to the collective) within the organisation (see also Weber 1964). Of central importance is the role of stable and durable social and informal relationships within the organisation as a basis for cooperation and exchange, but also for monitoring, pressuring, and sanctioning each other. The collegial organisation is characterised by resource interdependencies since all formally equal members have resources (e.g. information and competence, goodwill, and emotional or moral support), which others rely on and therefore everyone has varying degrees of power (Lazega 2001). Engineers, included in this study, are often employed in engineering and technology firms, or parts of larger organisations, which could be characterised as collegial. Thus, the physicians are mainly employed in what can be referred to as professional human service bureaucracies whereas the engineers, as a more heterogeneous group, are employed in collegial innovative organisations, but can also be found in professional bureaucracies. This should, however, be interpreted as rough 'ideal types'.

6.3 Physicians in Sweden

The novice physicians included in this study had graduated from Linköping University, Göteborg University (Sahlgrenska Akademin) or Karolinska Institutet (Stockholm). In 2002, a total of six universities in Sweden offered an educational program for physicians.[79]

[79] In addition to the three educational institutions included in the study, Lund/Malmö, Umeå, and Uppsala universities also offered an educational program for physicians in 2002.

In order to become a licensed physician in Sweden, the students have to graduate from higher education after the successful completion of 220 credits, corresponding to 5.5 years of full-time studies.[80] After graduation from higher education, the physicians also have to complete a general training program (Swedish: 'allmäntjänstgöring' abbreviated as AT) for 1.5 years before they are eligible to receive their formal credentials, or medical licence, to practice medicine. The general training involves training and work in different hospitals in different counties (Landsting) and aims at providing the physicians with a foundation for the development of broad competence in preparation for specialist clinical training or as researchers or teachers. When the physicians have received their licence, they are free to practice medicine within the European Union and in all the Nordic countries. After their general training, the physicians can start their specialist training (Swedish: 'specialisttjänstgöring' abbreviated as ST) in, for example, surgery, general medicine, radiology, geriatrics or paediatrics. Specialist competence takes approximately another 5 years to acquire (see e.g. Högskoleverket 1997:29, Einarsdottir 1997).

The medical education program at the universities in this study can, generally, be divided into two parts. During the first 2-2.5 years, there is pre-clinical part of the educational program where the students' learning is focused on central theoretical medical concepts, diseases, principles of diagnosing and therapy. During the first part of the educational program the curriculum includes courses in, for example, anatomy, cellular biology, biochemistry, physiology and pharmacology. During the second part of the program, clinical training and theoretical studies are integrated to a higher degree and the education is characterised by the interaction with patients. In the second clinically oriented part of the program, the curriculum includes courses in, for example, medicine, surgery, neurology, paediatrics, and social medicine. Practical work or training is carried out in primary health care and at different wards in different hospitals (see e.g. Högskoleverket 1997:29).

At Linköping University, the educational program for physicians was started up in 1986, and the curriculum is structured according to a problem-based pedagogy (modelled after the McMaster University in Canada).[81]

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[80] As a consequence of the Bologna process and the standardisation or adaptation of the higher education curriculum in Europe, the program is being restructured and the new curriculum will consist of 330 higher education credits.

[81] During the second part of the program, clinical training and theoretical studies are integrated after the completion of a research project. A 4-week clinical placement, with a designated senior physician acting as mentor and supervisor, is followed by two weeks of theoretical studies.

Karolinska Institutet was established in 1810 and is one of the largest medical universities in Europe. At Karolinska Institutet, the students can choose to pursue a clinical or a research profile. At Göteborg University, the educational program for physicians was established in 1949 (then as a medical university college), but Sahlgrenska akademin in Göteborg has a history that stretches back to the 1700s. The educational curriculum at Karolinska Institutet and Göteborg University are characterised by a 'conventional' pedagogical structure to a somewhat higher extent that the program in Linköping. However, the curriculum at Karolinska Institutet is designed to encourage the students to actively participate in and take responsibility for their own learning through independent studies, working in groups, and with different kinds of project-based work. The curriculum for the medical students at Göteborg University is based on a student-centred pedagogy where the education is problem-oriented and the students are encouraged to seek out information independently.

Medicine is generally considered to be one of the classic professions and is associated with high status in society. However, medicine as a profession has changed over the last 3-4 decades as the physicians have gone from being relatively free practitioners to salaried workers in bureaucracies, where the fees are set by the state.

In Sweden, physicians received state authorisation in the 17th century (SOU 1983:33). The first modern version of the regulation of the credentials for the physicians came in 1951 ('läkarbehörighetslagen'), which stated that only authorised physicians are allowed to practise the profession. Authorisation could be revoked and practising without a license was subject to legal sanctions (quacksalver legislation). The license has two main functions, firstly it functions as an acknowledgement that the professional has a sufficient and approved education and has thereby, supposedly, acquired the competence needed to perform the work and secondly, it is a means for society to control and possibly revoke the authority given through the licence (SOU 1983:33). In 1998 (SFS 1998:531), a new regulation which distinguishes between four different levels of authority, was introduced (see e.g. Wingfors 2004).

6.4 Engineering in information technology in Sweden

In the 1990s the number of students in engineering programs (4.5 years of studies) increased sharply in Sweden. There was in increase of nearly 60% in the number of beginners in the engineering programs (86% for all the engineering programs) between 1989/90 and 2000/01 despite the fact that the

number of 19-year olds fell by 13% (from 116,000 to 101,000) during the same period. The enrolment of male students in the engineering programs increased from 3,600 in 1990 to 4,800 in 2000 while the number of female students increased by 700 per year to nearly 2000 (the proportion of graduates in engineering programs in Sweden was 3.33% in the age group, in Denmark, 1.52%, in Finland, 3.39%, in Norway, 1.94% and 1.05% in the Netherlands). The number of graduates increased from 2,550 in 1990 to 3,600 in 2000. In an international comparison, Sweden produces as many engineers as Finland in relation to the population, and more than Norway, Denmark and The Netherlands (Högskoleverket 2003:30).

There are several different specialisations in engineering in Sweden. Universities offer engineering programs in industrial engineering and management, electrical engineering, mechanical engineering, chemical engineering, engineering physics, biotechnology, materials engineering, media technology, micro electronics, computer science, information and communication technology, etc. Thus, there are numerous different specialisations in engineering and in 2004 there were 14 higher education institutions in Sweden, which provided engineering programs. A master's degree in engineering[82] is awarded after the successful completion of 180 credits, corresponding to 4.5 years of full-time studies, of which the last semester consists of a final examination project.[83] The educational program for engineers with a specialisation in information technology is a relatively new educational program in Sweden and was introduced in the mid-1990s (see e.g. Högskoleverket 2006:8).

IT engineering belongs to the new specialisations in the field of engineering and according to previous research, is considered to attract more female students than the traditional specialisations such as mechanical and electrical engineering (in which 10% and 5% of the students are women, respectively). Important aspects of IT engineering are those associated with 'female competence', such as customer relations, socio-communicative competence, and having an understanding of other people's administrative and technical problems. The engineering profession has also become more associated with intellectual and administrative work and this may also have

[82] The Swedish title for a master of science in engineering is 'civilingenjör', or civic engineer in a literal English translation, the same title is used in Denmark and Norway. The corresponding title in, for example, Finland, Germany, Switzerland, and Austria is diploma engineer.

[83] As a result of the Bologna process, the programs have been restructured and the 180 credits from the old higher education credit system correspond to 300 university credits in the new system.

lead to the profession becoming somewhat less associated with the traditional male arena (Berner 2003).[84]

The proportion of women in engineering has been steadily increasing, although there is still some way to go until there are as many women as men in the engineering profession. In the 1970s, the proportion of women among the university novices in engineering passed 10%. At the end of the 1990s, almost 30% of the new engineers were women. In 2003, 16% of all professionally practising engineers with a master's degree in Sweden were women, and among those younger than 40 the proportion was 20% (Berner 2003).

The engineering program in information technology focuses on the transfer and presentation of information. The educational program includes learning about how it is possible to handle information through technological artefacts, how information is transformed before it is sent to the receiver and how the receiver recreates the information in the form of text, images and sounds, as well as human-technology interaction and constructing systems adapted to human requirements and prerequisites.

For the engineering students in information technology in both Linköping and Uppsala, there is a compulsory part during primarily the first three years, with courses primarily in computer science, programming, communication technology, computer-human interaction and interfaces, math and natural science. During the last two years, the students are free to choose and construct individual specialisations of breadth; that is, by choosing courses in associated fields, or depth where the students choose to specialise in one area of information, communication, or computer technology. The educational programs also have courses related to the behavioural and social sciences. The pedagogical structure in the program in Linköping is student-centred and based on problem-based learning where the students' learning is initiated by taking a starting point in real-life scenarios collected from the professional practice. The students work in groups of 6 to 8 individuals. The curriculum for the Uppsala students is partly structured as project-based and the curriculum also includes project methodology. The aim is to prepare the students for the way work is structured in the world of work, i.e. to be knowledgeable of the whole chain from construction of a demand or

[84] For further reading on gender aspects of engineering and technology, and being a female engineer in a male dominated profession, see e.g. Berner 2003, Salminen-Karlsson 1999, Berner 1996b.

requirement specifications, financial management, implementation, follow-through, and marketing.[85]

Engineering is not functionally homogenous, the different specialities, including the more abstract contemporary specialities, can be included in a broad general category. Civil engineering may have been in part been derived from the military, overlapping with architectural practice, whereas mechanical engineering is more a product of the industrial revolution and mining engineering was historically somewhat entrepreneurial in character. There is no one earlier type of engineering from which the modern profession stems, but rather different specialisations from which the modern engineering specialities was developed, nor is there a single functional area, as is the case in medicine (i.e. to heal the body) (Sarfatti Larson 1977).

The engineers tended to be salaried workers from the start, working in large enterprises incorporated in the capitalistic society, and not entrepreneurs, independent consultants, or 'free' professionals (Berner 1996a). From early on, finding practical and profitable solutions for new projects in large-scale organisations was central in the engineering practice. Sarfatti Larson points out the most important characteristic of the market for the services of engineers "*…which only becomes more dominant with the standardisation and institutionalization of training: this characteristic is the inherent subordination of the engineers' market.*" (p. 28 in Sarfatti Larson 1977), furthermore Sarfatti Larson argues that "*…the subordination of a professional market minimizes the effects of cognitive exclusiveness.*" (p. 30 in Sarfatti Larson 1977).

Engineers have, historically, primarily been employed by organisations and consisted of a loose aggregation of groups doing relatively different kinds of work but sharing a common orientation. Furthermore, different kinds of credentials have been accepted, not only when it comes to several different levels of credentials but also the credentials of other fields.

6.5 Specialisation in medicine and engineering

Specialisation in medicine and engineering (as in most other disciplines) is continually increasing and it is becoming increasingly difficult for a professional to control the entire field of knowledge within the discipline. Specialisation has also had an impact on the educational programs in higher education. As higher education has expanded so has the diversity in educational profiles offered in most professional fields and the education for

[85] The information above is compiled from official course documents and from information provided by the respondents in the study.

different professions has come to be more and more specialised (see e.g. Hellberg 2002, Einarsdottir 1997).

In medicine, specialisation takes place after graduation from the educational program and all medical students have the same educational core during their undergraduate education and primarily take the same courses. In contrast to medicine, the engineering programs do not focus on a common phenomenon in the education of all engineers, that is, a common core that is included in all the different possible educational profiles in engineering. Although, for example, math courses (e.g. mathematical analysis and linear algebra) are a part of the engineering programs' knowledge base, there is no focus on a common central phenomenon, like the human body, in the educational program that is related to what characterises professional practice for the engineers. Engineering education is specialised from the start as a result of different educational profiles or programs and there is a growing diversity in the different profiles that can be chosen, not only when it comes to discipline. There is also a differentiation at different levels in the educational system, i.e. there are engineering programs at a secondary level as well as shorter and longer educational programs in higher education where master's level engineering, with the title 'civilingenjör', is the longest (taking 4.5 years to complete). This is in contrast to medicine (and other older, 'classic' professions) since other occupational groups have formed in the health sector and taken over the work tasks that may require a different or shorter education, for example, nurses, nurse's aides, and physiotherapists (Hellberg 2002). Parallel with the specialisation in the professions, there is also a differentiation of the professions and nowadays, for example, engineers can be found in a wide variety of positions in society and in the labour market.

6.6 Previous research on what engineers and physicians learn during their education

In an evaluation in the form of a survey sent out to a representative sample of 5,729 recent graduate engineers (who graduated in 1991 and 1994) by the Swedish National Agency for Higher Education (Högskoleverket), a clear majority (87%) of the graduates answered that the content of the education was good and a majority considered the teaching methods and curriculum to be satisfactory, whereas the opinions regarding the pedagogy varied between universities. Furthermore, more than 80% thought that the education provided them with the necessary competence and that it made it possible for them to obtain qualified jobs (Högskoleverket 2003:30).

The qualifications, or abilities and personal characteristics mentioned in the survey, that the engineers considered most important for them to successfully perform their work tasks were: the ability to get a comprehensive view or get an overall picture and analytical ability. Furthermore, flexibility, social competence, and technical competence were also considered important aspects of their work, whereas presentation techniques, leadership abilities, language skills, entrepreneurial spirit, and negotiation skills were ranked as somewhat less important (Högskoleverket 2003:30).

However, although this presents an overall picture, the ranking of these abilities seem to be dependant on the work and work tasks. Notably, a majority of the engineers think that there is enough or even too much emphasis on technical skills in the curriculum. Analytical ability and flexibility are viewed as important abilities in the workplace, but few graduates think there is a need for more emphasis on these elements in the curriculum. Furthermore, the curriculum seems to be considered satisfactory as regards imparting and promoting language skills, social competence, and entrepreneurial spirit in relation to the demands encountered in professional practice. However, the graduates felt that their education was somewhat lacking when it came to the ability to develop a comprehensive overall view (interpreted as a need for a clearer connection between the different parts of the education), leadership abilities, negotiation techniques, and presentation techniques (interpreted as the changes in the world of work where technical advances lead to more information spreading faster and the resulting higher demands on presenting this information).

In two connected quantitative survey studies focusing on the relationship between higher education and work, presented by Hellberg (2002), graduates' attitudes about education and opportunities for further development were explored. One of the studies was conducted in a Swedish setting while the other was a part of a joint EU project involving a comparison between 12 countries. In these surveys, the professionals were among other things asked to what extent they used the knowledge and skills acquired in their education in their professional practise. Overall, the graduates felt that the knowledge acquired in their education was useful in their work, and the professionals overall claimed that they had a job that corresponded to their knowledge. The engineers employed in the public sector answered that they used the knowledge acquired in their education to a somewhat higher extent than the engineers employed in the private sector. The physicians considered their educational background to be the only possible alternative to their present work to a higher extent than the engineers did. A large proportion of the engineers considered other alternative

educational backgrounds as equally appropriate as preparation for their field of work. The answers tended to show a closer link between education and work among the physicians than the looser link that could be detected in the engineers' answers (Hellberg 2002).

Other results show that working-life related knowledge was emphasised by the physicians to a higher extent than by the engineers, and the engineers had more opportunities to choose courses and specialise during their education than had the physicians. The physicians' competence development is more focused on the discipline and the engineers' is more focused on the organisation of work. The physicians regarded continuing competence development primarily as a way to update their knowledge, while the engineers regarded increasing their possibilities for career advancement as an equally important reason. The physicians' need for further professional training was more dependent on the individual professional's own initiative, while the engineers' further education was more formally guided by the employer. An overwhelming majority of the professionals believed that the demands in working life have increased (Hellberg 2002).

The results of these surveys confirm that there are tendencies towards specialisation and differentiation among the professionals in these two groups. Education in medicine is close to the discipline with limited opportunities for the students to specialise during the education. Specialisation takes place after the undergraduate studies (Hellberg 2002).

After five years the physicians are still a relatively homogenous group, few have reached leading positions, and they are concentrated in the hierarchy of the health services. As the physicians become more experienced, they tend to become more widely dispersed in the health care sector, but not as widely as equally experienced engineers. The older and more experienced engineers are scattered over different areas and on different levels in working life. The engineering education is specialised from the start and the engineering students have greater freedom of choice during their education, whereas their continuous further education tends to be more workplace oriented (Hellberg 2002).

For the physicians, the education tends to relate more closely to their professional practice, and their need for professional development is closely connected to the discipline. The engineers do not have the same close connection between education and professional practice, not institutionally or as an expressed need for further training and education (Hellberg 2002).

Statistics Sweden (SCB) also regularly conducts surveys (postal surveys or studies of national registers) with the aim of illuminating the relationship between higher education and the labour market in Sweden, e.g. the labour market barometer ('arbetskraftsbarometern') in which the labour market

outlook for most of the educational programs at Swedish universities (74 in 2004) is investigated. NUTEK[86] also conducts studies, often by illuminating more specific questions about certain groups' positions in the labour market.

However, there are few previous studies using a qualitative approach that have focused on graduates' experiences of what is learned during the professional education, the transitional period, and early learning in the workplace, exploring the complex learning environments and learning processes and the problems graduates face when making the transition from university to work, from education to professional practice. There is, however, some previous research, mainly concerning professional groups other than engineers and physicians.

The transition from higher education to work is a period characterised by substantial changes in the graduate's life. It often entails a geographical move and adapting to new environments and circumstances. A 'smooth' transition and initial period at work are important both for the graduates and the organisation. A good start can result in faster contributions to the organisation and productivity, lower personnel turnover, positive attitudes and so on. On the other hand, a bad start can lead to disillusioned employees and higher personnel turnover. If the employees are satisfied with their situation there is a greater chance that they will stay in the organisation and make larger contributions (see e.g. Perrone & Vickers 2003, Graham & McKenzie 1995a 1995b).

There have also been a number of studies conducted with a focus on recently graduate nurses' experiences of the transition from education to work and their encounter with different workplaces (see e. g. Lindberg-Sand 1996). Nurses' experiences of the transitional process have been described in terms of a 'reality shock' when the demands of working life and the complex conditions became obvious to them. Heggen (1993) has studied workplace learning environments and how nursing students and recently graduated nurses experience and adapt to new learning environments in different contexts. Transitional problems for nurses have also been studied by Kapborg & Fischbein (1996), and Hagström & Kjellberg (2000) have presented a study on work socialisation of nurses and engineers in the light of value changes and work experiences related to the transition. Fransson (2006) has studied the professionalisation of recently graduated second lieutenants and school teachers with a focus on communicative arenas. Svensson & Östnäs (1990) and Svensson (1990) have presented a study where, among other things, the connection between theory and practice and the nature of

[86] NUTEK (Verket för näringslivsutveckling) is the Swedish Agency for Economic and Regional Growth.

knowledge application, in relation to other resources, in the professional practice of psychologists and architects have been addressed. However, this work has less to do with the expected behaviour and what the professionals have learned during their education and more to do with their tasks and the situations in which they act with a focus on the professional practice.

Heath has studied the enduring effects of higher education with a focus on the maturing effects and values by means of interviews. Undergraduate education turned out to have had a lasting effect on their maturing but, when compared to other events in their life, these effects were not very important. In this study, some of the principal effects of "*graduate and professional school were the integration and allocentric maturation of the graduate's intellects and symbolization of their self-concepts*" (p. 173 in Heath 1976).

Dahlgren & Pramling (1985) have shown that recently graduated engineers perceive themselves as being under-utilised and that only a lesser part of their competence is required in their work. Graduate physicians state that there is a lack of priorities in their education and that they have to learn to reprioritise and reorganise their clinical work from a sub-discipline orientation to more common clinical problems.

6.7 Comparative analysis and summation

Collins argues that engineering and medicine are two, of the few, professions in which there is an obvious "*objective technical skill built upon general principles that can be taught*" (p. 138 in Collins 1979). Thus, what the physicians and engineers learn during their professional education can be relevant to their professional practice.

Both physicians and engineers undergo a long professional education. There is a static knowledge base that constitutes the foundation of the educational programs. The physicians' knowledge base is related to the human body, with courses with a relatively static foundation of knowledge, for example, anatomy and physiology. There are also less static elements such as pharmacology where new medicines are developed and also introduced into the education. Still, the physicians have one common functional area to heal the body, which is not the case in engineering. The engineers have various math courses that constitute a form of foundation for the educational program. However, engineering is not functionally homogenous but, rather, constitutes a broad general category. The medical students have a close relation to the professional practice during the course of their education in the shape of clinical training and their education is characterised by interaction with patients. The relation between theory and practice is more loosely linked in the case of engineering education.

The engineers, in a sense, specialise in the selection among the vast amount of educational profiles in engineering. However, there are considerable opportunities for later specialisation during the education when selecting courses. The medical education programs are relatively standardised as the educational programs offered by different universities are very similar. Specialisation takes place after graduation from higher education and general training.

Different distinctions between professional groups and individual professionals, cutting across the professions, have been suggested (see e.g. Hellberg 2002, 1999, 1997, Brante 1990). What is central in these distinctions is often the knowledge base and the relation with the receivers, clients or customers. The physicians could, generally, be described as L professionals and the engineers as T professionals. The physicians are employed by the state and the citizens are the clients. For the engineers, the principal actors are the market, organisations in the private sector, where the customers are often other companies. The engineers primarily interact with receivers who require specific knowledge related to a certain task. In contrast to the physicians, the receiver is not as concerned with all professionals in the group having the same knowledge (Hellberg 2002).

Engineers in Sweden do not have an authorisation procedure, but practising medicine is associated with acquiring authorisation from the state. All citizens are entitled to the same basic quality of services from the public sector, which means that all physicians are expected to have the same professional knowledge, whereas work can be divided and specialised in unique ways in the private sector. This means that the relation between specific higher educational programs and specific positions in the public sector is more distinct and tighter than in the private sector (Hellberg 2002). The physicians almost exclusively work in professional human service bureaucracies where they work relatively independently but close to the 'raw material' consisting of people. Due to the legitimating of physicians, other groups (with other medical knowledge, e.g. complementary or alternative medicine) are excluded from certain positions in the health care sector. Engineers, on the other hand, regardless of their profile work in a large variety of positions in a wider and more open labour market (Hellberg 2002). This is perhaps most evident in the field of information technology, where the specialised engineers are competing with people with a less specialised educational background, e.g. computer engineers, software engineers and systems analysts. When the IT sector expanded rapidly during the 1990s, there were few specialists educated in higher education specifically for the new and expanding field of knowledge and practice. When the first graduates from the educational program for engineers with a specific specialisation in

information technology entered working life, people with other backgrounds had already taken up the competition for the professional field (see e.g. Hinings 2005).

Whereas the physicians generally work in professional human service bureaucracies, the engineers are often employed in collegial, innovative organisations. However, engineers are a more heterogeneous collective than physicians and can also be found in professional bureaucracies. In general, however, the physicians, in this study, work in process-oriented organisations and the engineers, in this study, in result-oriented organisations.

The central aspect of the professional organisation is that the professionals are close to the operating core, providing services directly to clients, with administrative support staff focused on supporting the professionals. The professionals have a high degree of freedom and control over their own work due to decentralised structures and control over administrative procedures and decisions that effect the professionals (e.g. hiring and promoting colleagues and the distribution of resources) (Mintzberg 1989, 1983). Much of the professionals' work is conducted independently of colleagues and without supervision, but close to the clients. The physician meets the patient in a private setting and, not uncommonly, the engineer's work is also conducted with a high degree of freedom and independent decision-making. The professional is trusted to be competent, loyal, ethical, and moral (Svensson & Östnäs 1990). The professional organisation is often characterised by a relatively high degree of specialisation and division of labour (Mintzberg 1989, 1983).

While physicians working in a professional bureaucracy often use standardised applications of already existing knowledge or predetermined strategies, engineers are often employed by innovative organisations characterised by flexibility and demands on constructing new knowledge in complex and unpredictable environments (Mintzberg 1989, 1983). The engineers also work in technology companies, or sections of larger companies, which can be referred to as collegial organisations characterised by shared power and equality as regards expertise and status (Lazega 2001).

Chapter 7: What is learned in higher education

This thesis is concerned with the relationship between the two professional education programs and the respective professional practice. What professionals know and the competence they are assumed to have acquired in their education are closely related to the professions and professional practice. In the following chapter, the novice physicians' and engineers' descriptions of their experiences and perceptions of their education will be presented. Thus, central questions to be addressed in this chapter are what physicians and engineers learn in professional education in relation to the demands or requirements the professionals face in professional practice; or, in other words, how or in what ways education has increased the competence the graduates related to the qualifications needed in the workplace; whether education directly prepares the students for professional practice or, rather, lays the foundation for further development in the profession; and whether education promotes specialist or generalist competence. The focus of the chapter is on different aspects of the concepts of professional knowledge and competence. Competence[87] in the following presentation will be broken down into theoretical knowledge or as 'know-what' (see e.g. Rolf et al. 1993, Ryle 1963), generalist competence, and socio-communicative competence (see e.g. Cheetham & Chivers 1998, Nordhaug 1993). These concepts, as defined previously in the text, should not be conceptually understood as mutually exclusive but, rather, as overlapping. However, for analytical reasons and presentational purposes, they are separated in this chapter. The chapter will start with a background description of the individual reasons, motives and choices which have guided the graduates' choice of specific education and career.

[87] As previously stated competence is understood as a wider concept than knowledge since it includes attitudes, values, motivational factors, personal characteristics, and socio-communicative skills.

7.1 Background - individual reasons and career choices

The professions are not homogenous and there are growing differences within the professional groups as the specialisation and differentiation increases. There are probably also differences within the groups due to individual differences among the professionals. What is learned in higher education as well as the perceptions of and experiences from the education, in terms of personal development and personal aims as regards the education, is likely to be related to individual reasons or motives for choosing a particular educational pathway or career. The transitional process from higher education to work is probably not as rational and linear as is often assumed, but more likely a complex, dynamic and non-linear process where, among other things, students' individual reasons, motives and circumstances have to be considered. Thus, it is likely that the students themselves have more impact on results than is suggested in previous research. The transitional period is also shaped by specific dynamics and it is not just a matter of matching graduates' competences and work requirements, i.e. that a person with the right competence or qualifications ends up in the right place (Teichler 2000, 1999).

The personal objective of the education may vary if it is mainly viewed as vocational training with the goal of a potentially prosperous future career, rather than if the choice is based on a specific interest in studying a particular subject or a discipline and being able to specialise in relation to the professional practice after graduation. I therefore intend to briefly present an overview of the respondents' lines of reasoning regarding their reasons for choosing their professional career as a background of what is actually learned during higher education.

However, it should be noted that while some respondents argue along the lines of rational choices and a clear vision of the expectations of a future professional career, others describe their path as unclear and based on random events and they have difficulty mapping out a straight rational strategy behind their paths or trajectories. This applies to both the engineers and physicians in this study.

7.1.1 The physicians

It is in some ways difficult to find any uniform descriptions of the reasons for the graduates' educational and career choices. Nevertheless, it is not uncommon among the physicians to reason about their educational and occupational career choice in terms of a 'social project', based on altruistic ideals. Often, the physicians refer to an interest in working with and helping

people, with a focus on a professional career, rather than emphasising on an interest in medicine as a scientific or academic discipline.

The physicians often ascribe their educational and occupational choices to the expectations of the specific tasks or the content of the work in a future professional practice (such helping others). The education is both a means of reaching their goal, becoming a physician, and is expected to provide use value as a direct preparation for professional practice.

The choices that have led some of the respondents into a career in medicine are also based on an 'inherited' interest from parents and other family members. Others emphasise the lack of physicians among family and friends when describing their path, but many physicians still choose to relate to a perceived public understanding that the medical profession is something that is hereditary within families.

> I belong to those who have it in the family so to speak. My father is a physician, my mother is a pharmacist, that is, she works in a pharmacy and then I have a lot of other relatives who are physicians as well /…/ in a way it is, so to speak, from the family it is … that is it is a very accepted choice, so to speak, to become a doctor, and then, by the way, I think it is exciting as well. (Female physician, 31, Linköping, interview person 39, interview 1)

The medical education is structured as a highly vocational preparation for the world of work since clinical training is deeply incorporated into the education and, thus, for many physicians a clear picture emerges during their education of what awaits them after graduation from higher education. The opportunities for the physicians are more limited than they are for the engineers when it comes to choices of working for different employers and in different sectors. The physicians generally tend to work in similar organisational structures in the public sector.

7.1.2 The engineers

The engineers, on the other hand, tend to end up in more diverse settings and as students have a less clear conception of what awaits them after graduation. Thus, the reasons for engineers choosing to study IT engineering are not as often based on the expectations of the specific tasks that await them in professional practice, as they are on the educational profile. The engineers seem to emphasise to a somewhat greater extent the importance of the educational profile and attach less importance to the specific content of the work in a possible future professional career. The engineers' choices are not seldom based on a general interest in the scientific discipline. They connect

their reasons to a general interest in technology and science, and sometimes specifically to an orientation towards computers, computer science or information and communication technology. While the physicians more often relate to the profession, the engineers tend to relate to different branches in general and specific organisations or workplaces more specifically (once they enter professional practice).

Several engineers have had little or no experience of computers before the educational program, and argue that their interest in the discipline has grown during their education. For some engineers, the choice was based primarily on the pedagogical forms of the programs rather than an initial interest in the discipline and they chose the educational program rather than the occupation or the profession. Furthermore, the education is also partly viewed by some engineers as a way of getting a receipt, which certifies that they have appropriated certain knowledge, an exchange value, which is also related to a 'professional pride'. One engineer argues that the education certifies that the graduates have acquired a certain formal competence, which is assumed to be equal to a certain actual competence, and the graduates are capable of working hard, which leads to increased employability.

> A ring /…/ I feel that what you get from the education is an occupational pride anyway. That you know that you have a foundation to fall back on, I hope anyway. That you get some kind of security there, and especially that you won't always have to prove to others that you are somebody or that you have certain knowledge. When you say that you are this or that, or when you say that you are an engineer [civilingenjör] then people know you have certain knowledge. That is probably what is most important. (Male engineer, 23, Uppsala, interview person 13, interview 1)

> In a way you have the education as a foundation, so that you know what you can do. It is in a way a small proof of what you know and that you know that you can learn. So I think I have greater use for that than I have of having taken specific courses. (Female engineer, 25, Linköping, interview person 40, interview 1)

When the engineers in this study enrolled in higher education, the information-technology sector was expanding heavily. An education with a computer engineering and information technology profile seemed to be a good way of increasing the individual's chances of getting a job and having good career opportunities. However, by the time the respondents interviewed in this study had graduated, the labour market in general and the IT sector in particular had deteriorated. Although the IT sector has deteriorated, a degree

in engineering is still perceived to be a good investment as it is felt that it increases the employability of the individual.

For some of the engineers the educational choice was based more on expected employment opportunities, being able to get interesting and varying jobs, in a relatively new and expanding sector. In some cases, the education is viewed as being necessary to get a desirable job and the education is primarily a merit or credential, which signals to potential employers, and themselves, that they have acquired some specific formal competence.[88] For some engineers as well as for some physicians future security in terms of financial resources and job security are important aspects of the reasons for their career choice.

7.2 Specialist knowledge

In the following section, the respondents' perceptions of what theoretical specialist knowledge is learned in the professional education is focused on, as well as the perceived bearing this knowledge has on professional practice. Theoretical knowledge refers to explicit discipline-related, specific declarative or propositional knowledge (i.e. academic specialist 'book knowledge) that can be verbalised and communicated as knowing what (see e.g. Svensson 2006, Eraut 2000). The main focus of the section is on presenting the graduates' descriptions of the educational knowledge base, the academic theoretical foundation of the profession, in relation to the professional knowledge base.

7.2.1 The physicians

The ability to collate and integrate information gathered in different medical examinations (inference) in the form of a diagnosis and to determine appropriate treatments requires a solid foundation of medical knowledge that constitutes the foundation of the professional practice or the professional knowledge base. A foundation of general theoretical knowledge and a general overview of medicine are generally emphasised by the physicians when they describe what is learned in higher education. The educational knowledge base is considered to consist of medical facts or details, basic medical knowledge, theoretical and technical knowledge in medicine, or simply knowledge specifically related to what a physician knows. Statements such as 'solid medical knowledge', 'to be knowledgeable in general medicine', 'to know about a lot of different diseases and treatments' and accounts with similar connotations are prevalent among the physicians'

[88] Further developed in section 8.2.4.

perceptions of what is learned in higher education that is relevant to the requirements faced in professional practice.

The physicians argue that the theoretical foundation essentially consists of knowledge about the human body (biology, anatomy and physiology), knowledge related to the preparation for the ordinary panorama of diseases and conditions and how to recognise them (could e.g. be lists of symptoms of different diseases), knowledge about different medicines (pharmacology), and theoretical knowledge about patient-related work (e.g. ethics). The physicians claim to have learned how to take care of the patients in an appropriate way, how to diagnose, treat and medicate patients in the an appropriate way, what tests and treatments are justified under different circumstances, what drugs to use and their active components (having an understanding of cause and effect as well as potential side-effects) and how to follow up the patients' progress. This is also expressed as the need to 'know what you are doing'. Expectations of being knowledgeable are perceived to come from patients, as well as colleagues and other professional groups. The theoretical knowledge is considered to be a foundation in order to know how to proceed and how to behave in practice; essentially, a foundation for the ability to examine, diagnose, and treat patients, which is analogous to Abbott's (1992) three acts of professional practice, that is, the classification of a problem, reasoning about the problem and, finally, taking action.

The physicians generally regard the acquisition of discipline-specific theoretical knowledge as a necessary criterion without which a physician would not be able to practise medicine at all. This is often considered so self-evident and obvious that the physicians only mention it in passing if at all.

> Then you have to have proficient medical knowledge as well, of course. But in a way it's self evident, I think, for otherwise you don't know what you are doing. (Female engineer, 25, Linköping, interview person 40, interview 1)

Through medical science, new knowledge is generated, more knowledge is accumulated and some knowledge also becomes outdated. Thus, non-static theoretical knowledge is also considered to represent less important aspects of what is learned in the educational program. Although theoretical knowledge is generally emphasised by the physicians it is also argued that some parts of the education focus on unnecessary details. An excessive level of detail is generally considered to concern mainly aspects of the 'pre-clinical' part of the education. A course that is singled out by several respondents is cellular biology (a course at the beginning of the program).

What is considered most important is, instead, to at least have a grasp of the general theories, to acquire an overview of the field, and 'to know the basics'.

> It is almost easier to say what felt least important and that I think the first semester was, that is this cell chemistry part, because it is, so to speak, non-static knowledge. I mean, I can't work without my knowledge of anatomy, physiology, pharmacology so those are things I kind of have to bring with me. (Female physician, 30, Stockholm, interview person 35, interview 1)

Generally, the physicians consider the bulk of the pre-clinical part of the educational program as necessary (as a foundation for the clinical training), but it is often argued that the clinical part of the program is most relevant to their professional practice.

> The pre-clinical part, it is most likely a foundation that you should ground … that you probably need to understand the clinical part. But it is still the knowledge from the clinical part that you use. (Female physician, 28, Göteborg, interview person 36, interview 2)

Another physician, on the other hand, argues that there should be a greater focus on the theoretical part, and argues that the educational program should include more theory. He links this to the legitimacy of the profession. Discipline-specific theoretical knowledge is what distinguishes the physicians from other professional groups in the workplace. Highly specialised theoretical knowledge is what defines physicians as a professional group. An understanding of cellular biology is necessary in order to understand pharmacology. The theoretical knowledge is a foundation of the physicians' legitimacy, which distinguishes them from other occupational categories (cf. e.g. Macdonald 1995, Abbott 1991, 1988).

> I think /…/ that there should be more theory, that the theory should be more difficult. There is so much you have to assimilate that you only have the time to assimilate there … to arrange all the diseases, that is what makes us … that is what makes you a physician, that you have a deeper knowledge. You know a lot about pharmaceuticals, you know a lot about diseases, you know a lot about the constitution of the body, other than that the heart is on the left. Thus, you should have detailed knowledge and I think that is good. /…/ without the theoretical background there is not much that distinguishes you from other occupational categories /…/ in order to understand pharmacology you really need cellular biology as well. (Male physician, 25, Göteborg, interview person 9, interview 2)

In is not uncommon for the physicians to have a holistic view of the education in which all the individual parts are needed to create a meaningful whole. Knowledge is considered progressive and accumulative with one part resting directly on the previous part. Thus, an understanding of the theoretical knowledge is necessary in order to be able to manage the practical training, and the courses in the pre-clinical part of the education rest on each other.

The physicians argue that they apply much of what they learn in the educational program in professional practice. A common understanding among the physicians is that the professional practice requires them to know much of what they learned in their education. However, several physicians consider it to be an impossibility to remember all the theoretical knowledge included in the education. It may not be necessary to memorise every bit of information, all the facts and details, and there is a notion that the theoretical knowledge can often (but not always) be 'looked up' when it is needed. The theoretical knowledge acquired in their education is considered a foundation the novice physicians can refer to when they encounter new situations. Thus, it is also important to know how to quickly find appropriate information and relevant knowledge.[89] Still, it is considered essential for the novice physicians to have an overview of or overall orientation in the discipline or field in order to know what to look for and where. The physicians argue that they have to know the basics, or enough theoretical specialist knowledge 'by heart', to know where and how to retrieve additional knowledge. It is important to at least know if the problem concerns the leg or the head, as one respondent puts it.

7.2.2 The engineers

The engineers argue that they have learned theoretical knowledge or discipline-specific knowledge, i.e. book knowledge, facts, and information, in their higher education. The theoretical specialist knowledge, or the educational knowledge base, includes, for example math, physics, general and specific computer knowledge, human-computer interaction, user-friendliness, interface design, object orientation, systems analysis, systems administration and knowledge related to computer programming as well as knowledge about computer networks and databases. Commonly, the engineers argue that they have acquired a solid foundation of knowledge through their education. This is perceived as constituting a general overview of knowledge of hardware and software or a general overview of the discipline. This can be exemplified by knowing what a server and a database

[89] See section 7.3.1.

is at a general level. However, the engineers also mention specific applications, such as MS Word, Java programming, and SAP. The courses singled out as most important in relation to the engineers' professional practice, during the initial interviews, are as a rule the concrete programming courses.

However, the acquisition of theoretical knowledge or the discipline-specific knowledge content of the educational program is not emphasised by the engineers to any great extent. Instead, they argue that theoretical knowledge becomes relatively quickly outdated. It is considered more important to have a general understanding or an overview of the field, or the theoretical discipline knowledge, and to be able to update the knowledge than to have internalised facts or details from the specific courses. One engineer makes an explicit comparison with the static knowledge base relevant to practising medicine and argues that the rapid technological changes in the field of information and communication technology make it even more necessary to constantly update theoretical knowledge.

> I really don't value the theoretical knowledge very much /…/. I can imagine that /…/ medical students – for them a lot of things are static. There's a lot that is more constant, for example, the name of body-parts and so on that have a name. But in this discipline, I feel that everything changes quite rapidly /…/ it is a constant learning process. You have to find out new facts and so on. For example, we studied a lot of math that I have never applied and I don't really know if I ever will use it either, these advanced mathematical equations. (Male engineer, 26, Linköping, interview person 7, interview 1)

The engineers have to be prepared to learn to appropriate new knowledge to learn how to not only use but also develop new technologies. The engineers argue that their discipline and professional practice is subject to constant rapid development and change, a lot of knowledge is outdated so quickly that much of the theoretical knowledge taught in the educational program is not relevant when they graduate. This concerns concrete discipline-specific knowledge. The longer they have been working, the more evident this becomes and thus this is more frequently stressed in the follow-up interviews. The detailed theoretical 'book knowledge' is rarely considered indispensable in professional practice (whereas the importance of qualified practical knowledge as well as generalist and socio-communicative competence is often emphasised as essential in relation to the professional practice).

> You have to renew and above all in such a flexible sector as IT and technology, you have to constantly renew anyway, but the foundation you

> feel that you retain, and the ability to read I think, and you have a lot of use for that /…/ maybe not just the discipline-specific experiences, but everything you have around. (Male physician, 29, Linköping, interview person 2, interview 2)

The engineers argue that the specific course content or the theoretical knowledge acquired during the education has limited relevance to their professional practice (i.e. the professional knowledge base). This applies to, for example, specific math and physics courses and certain programming courses as well as signal processing, antenna, compiler and radio technology. Furthermore, it is argued that the theoretical knowledge acquired in their education that is not used in professional practice is forgotten and has to be renewed. In a follow-up interview, one respondent, when asked to summarise what he had learned, had a difficult time recollecting what he had learned at all.

> I learned mathematics but that I have forgotten /…/ the math, but what I remember we learned … that was difficult … I remember more like courses and specialisations. You know that you have read something like it before or something. Now I seldom have to use it in my daily work, but … no, I can't … not like that - no! It's difficult. (Male physician 34, Linköping, interview person 12, interview 2)

However, the engineers also argue that while they themselves have had little or no use for much of the specific knowledge learned in many courses in their education they understand the benefit of incorporating it in the educational program. If they had chosen to work in another field or with another profile in engineering the knowledge might have come in handy. Quotes such as "*I haven't had any use for it, but others may have*"[90] illustrate this.

Nevertheless, during their education the engineers have acquired theoretical references to which they can relate new information they come across, or knowledge they need to acquire, and which allow them to sort and categorise information and facilitate finding new relevant information. A common line of reasoning among the engineers is that once one has at least glanced through something once, it is easier to find it again, it narrows the search grid, and there are not many concepts or areas they will encounter in the future that are completely new to them. The engineers argue that although they, for instance, lack experience in the programming language used at work, they have learned other languages during their education and

[90] Male engineer, 26, Linköping, interview person 7, interview 1.

understand the basic principles and have references, which allow them to learn other programming languages more quickly.

The engineers emphasise the importance of having a broader foundation of theoretical knowledge than the specific knowledge applied in their daily practice. The broad foundation allows the engineers to quickly orient themselves in new circumstances with little introduction, and tackle problems and new unexpected situations. In addition, a broad foundation of theoretical knowledge is considered essential for holistic understanding and attaining an overview of operations in professional practice.

> It requires me to be very broad, I think. Because I have worked with very different assignments the whole time really and many things that I have not read anything about or knew anything about, really, that you have to learn now. And they also told me explicitly when they employed me that it was my assignment, so to speak. But what they required from me was that I should be very broad and be able to sit down in projects that are about all sorts of things really and that I wouldn't need as much introduction as other may need maybe. (Male engineer, 26, Linköping, interview person 7, interview 1)

Furthermore, the acquisition of an overall view is related to the engineers' self-efficacy, they feel that they can handle, that they have the tools to tackle, all possible problems and situations that may arise or that they might come across in their professional practice. A broad theoretical foundation appropriated in higher education is also related to being able to quickly learn and appropriate new knowledge. The specific theoretical knowledge learned in the educational program or the substance of the education is, however, not considered all that relevant to their professional practice.

7.3 Generalist competence

In the following section, generalist competence as well as the respondents' perceptions of the relation between generalist competence developed in higher education and professional practice is focused on. Generalist competence is also closely associated with theoretical and practical knowledge discussed in the previous section. Generalist competence refers to universal knowledge, necessary knowledge or as a kind of lowest common denominator in different kinds of competence that can be a part of some specific competence or a general competence. Generalist competence can be understood as meta-competence that transcends other aspects of competence, portrayed as, for example, adaptability, flexibility, problem-solving, analytical thinking, reflection and self-examination, enabling introspection,

enhancing or facilitating the acquisition of knowledge (or learning how to learn) or other aspects of competence (see e.g. Cheetham & Chivers 1998, Nordhaug 1993).

7.3.1 The physicians

As illustrated previously, a solid foundation of theoretical specialist knowledge is considered to be an essential prerequisite for the physicians that constitutes the foundation for the medical profession. In professional practice, the physicians experience demands on being knowledgeable. However, there is an understanding among the physicians that it is generally accepted that novice physicians do not need to master everything that is included in their long education. It is considered central for the physicians to have the ability to renew and update their knowledge in order to cope with the demands placed on them in the professional practice. Thus, the newly graduated physicians also mention generalist or meta-competence such as the ability to quickly learn, to find, sort and prioritise information, to acquire new knowledge, and to be able to evaluate when it is appropriate to consult others. Hence, the physicians also emphasise that they have acquired generalist competence in their education.

> I have learned how to appropriate knowledge to solve the problems I encounter. I am … I think my education has made … actually there are no difficult situations for me, even if it isn't … even if I don't have the knowledge in my pocket or in my brain, so to say; but I know exactly how I should handle the situation, who I should consult, what medium I should search for the knowledge, so that's what I mean. That is what being a physician is all about really, in a Swedish health care system anyway; or preferably it should be that way. (Male physician, 31, Linköping, interview person 20, interview 1)

Generalist competence is also associated with self-efficacy and confidence, that they need not know everything by heart and if they lack knowledge they know how to retrieve it. Being confident in the ability to find the knowledge needed also leads to the ability to handle a wide variety of situations and this reduces the hesitation or fear of getting involved in situations and tackling tasks where the graduate does not have total control. This is also considered by some physicians to be necessary in professional practice.

It is also argued that an ability imparted by the education is to constantly renew, retry, and reflect on the knowledge as it is not constant. New advances in medicine are continuously being made and it is important to keep updated.

Here, the ability to critically reflect and not taking things for granted is also relevant.

> I think I have learned to critically reflect (Male physician, 28, Stockholm, interview person 11, interview 1)

> I think we have been trained here in Linköping to question a lot, to not take things for granted. (Female physician, 31, Linköping, interview person 18, interview 1)

In the follow-up interviews, the physicians tend to stress generalist competence as an even more important aspect of their education and place somewhat less emphasis on the detailed discipline-specific theoretical knowledge. It is argued that knowledge learned in higher education is less relevant to their later specialisations. The advancement of research and technological development contributes to knowledge becoming archaic or outdated, and parts of knowledge acquired in their education becoming obsolete after only a few years. It is also felt that this creates problems with transference of competence between different contexts or utilising the knowledge acquired in their education in professional practice. Several physicians claim that a lot of detailed knowledge taught in the 'pre-clinical' courses is not that useful in their professional practice, the exception being primarily the anatomy, physiology, and pharmacology courses. Several respondents also argue that parts of the theoretical foundation in the pre-clinical part of the education program are primarily a preparation for the physicians who choose research positions later on.

Furthermore, several engineers argue that they have forgotten a lot of facts and theoretical knowledge learned in their education after having practised medicine for a few years. In general, the discipline-specific theoretical knowledge seems to be considered less important as time passes, and the respondents tend to instead emphasise the importance of generalist competence. Studying and learning 'book knowledge' has lead to the development of generalist competence such as the ability to learn and to find, sort and prioritise large volumes of information, as well as to critical reflection, for the physicians. The theoretical knowledge is thus not uncommonly viewed as a foundation for continuous development and learning in the profession. Although, generally, the physicians tend to argue that the most important knowledge is practically applicable and theory is often associated with the possibilities of standardised practical application.

7.3.2 The engineers

The engineers tend to emphasise the importance of generalist competence, such as the ability to learn, to handle abstractions and methods, problem-solving abilities, flexibility, reflection, and analytical thinking. The theoretical substance of the educational program is, on the other hand, viewed as more or less irrelevant to professional practice. The ability to readily learn and appropriate new knowledge and not being afraid of tackling new areas and problems is related to the need to learn all practical knowledge relevant to the workplace and the tasks in professional practice. In virtually all the interviews with the engineers, the respondents mentioned the ability to know how and where to find information as a central part of their education in relation to professional practice or to learn the professional knowledge base.

More specifically, the ability to learn and renew knowledge is considered to involve how to assimilate new information, to collect, sort, process and structure information. It is important to be able to pick out the most important information such as not reading everything in the course literature. In relation to professional practice, the engineers stress the importance of being able to quickly orient themselves in new areas, tasks, contexts or practices, to quickly get a grasp of things and learn what is needed.

> I have learned really to learn, you could say. Now I don't have all knowledge but I have learned to take in knowledge fairly easily. So if there is something I don't know I can learn it rather easily. So that is the biggest thing that you have primarily learned, to like gather knowledge and appropriate it. (Male engineer, 26, Uppsala, interview person 15, interview 1)

Furthermore, the engineers argue that the educational program provides the students with a certain frame of reference and attitudes characterised by general problem-solving abilities (individually as well as the ability to cooperate in order to solve problems), logic and abstract reasoning skills, analytical thinking skills and being structured. This generalist competence is also found to be useful in diverse settings in their work and is considered to be a prerequisite of successful professional practice. Generally, the engineers consider it essential to be able to solve problems, to see different possible ways of solving the problem and to be capable of implementing the solution; or in Abbott's (1992) terminology diagnosis, inference, and treatment. Problem-solving is perceived to involve being able to identify and formulate the problem, to break down the problem into different parts and then approach the problem by setting up partial goals in order to more easily

identify how to tackle and solve them (which some engineers argue is derived from math where this is a central methodology). Problem-solving is also about prioritising and realising when to seek out assistance and who should be consulted.

Problem-solving is also related to the ability to see a phenomenon from different and new perspectives, finding new ways of doing things, and being reflexive and critical. It is argued that there is seldom a right and a wrong way of doing things or solving a particular problem, just many different ways, and it is therefore important to be able to analyse the problem from different perspectives. Even if the exact solution is unclear, the tools and references to be able to tackle and solve the problem have been acquired through education.

> Problem-solving and … new ways of doing things I think, to abstract things. Try … methodology development and such I think, or that you feel secure in that you know that even though I do not have the exact solution written down here, I will be able to solve this because I have all the tools, I have learned how to find the information, I have learned how, this is what I did in a different case. /…/ You have learned many different ways of dealing with problems, and that I think is what you learn the most at the university. (Female engineer, 29, Linköping, interview person 38, interview 1)

An abstract reasoning ability is important in order to be able to establish an overview, overall picture, to see all separate parts and aspects from specifications through design, constructing models and finding solutions to implementation. The specific knowledge required for different assignments and tasks are then considered relatively easy to learn when needed.

The generalist knowledge the engineers develop in their education is often connected to the organisation of the curriculum rather than the content, that is, to aspects such as cooperation in problem solving. Furthermore, the educational program is a patchwork of many courses (as many as 60 different courses) taken parallel with each other. This also necessitates the ability to structure, prioritise and manage several courses at the same time. Several engineers also claim that the program is segmented or compartmentalised and it is not easy for the students to see the connections between the different courses. The organisation of the program forces the engineering students to prioritise and 'multi-task', they have to be able to complete different assignments parallel with each other and plan for different examinations at the same time. Thus, prioritising and structuring work are important aspects of being able to successfully complete the educational program. Another

dimension is the ability to decode implicit understandings and how to decode the academic context, which can also be transferred into other contexts.

However, the engineers argue that the acquisition of a generalist competence during their education is a by-product of the learning process focused on in the course content, or the discipline-specific theoretical knowledge. The engineers often state that the substance or specific knowledge content of the education is irrelevant to their professional practice. However, the specific courses have provided added value and, for example, the processes and problem-solving strategies used in the math courses are sometimes considered to be transferable to other contexts.

> It's just like everybody tried to tell you also when you thought that all these math courses we had to take, it's really true – that something good will come out of it, and it has /…/ it is not the factual knowledge in it self, some of which I have to look up already /…/ no, the math courses that you took during the first and second year – the details of which I have forgotten, this and that logarithm, but something else came out of it that you have brought with you, and people told you that already back then – that it will, but you didn't realise that back then /…/ you understand that afterwards and especially when you work with people who don't have it. (Female engineer, 25, Linköping, interview person 43, interview 1)

Thus, the specific content of the educational program and the individual courses is mainly a means to develop and train generalist competence, the main outcome is not the internalisation of theoretical knowledge but, rather, the acquisition and development of generalist competence. Several engineers mention that they do not remember specific details from the courses such as specific algorithms and theorems, the facts can always be 'looked up', but the courses have contributed to an overview or overall picture, and the development of transferable generalist knowledge. Thus, during their education the engineers may have learned things, which they had not expected to be the main focus of their education. The development of generalist competence is considered a side effect that, in the end, turns out to be more important than the perceived main objective of the courses. The learning processes, which focus on the discipline-specific theoretical knowledge provide training in generalist competence.

> I have also learned some things about problem-solving, but in an indirect way. Now I can see that I have done that, and that you have probably learned things you didn't realise that you have learned; and that you have a use for things other than those you thought would be useful; and that you have learned how to learn things. That is probably better than learning the

> things you thought you would learn. (Female engineer, 25, Linköping, interview person 43, interview 1)

During the initial interviews, having a broad general overview and having acquired generalist competence are generally considered to be the most important things learned in the program. The importance of the generalist competence in professional practice becomes even more evident in the follow-up interviews.

7.4 Socio-communicative competence and interaction with others

Modern professional work is characterised by interaction with others, for example, colleagues, clients, and customers. The graduates will need to be able to communicate and cooperate with colleagues in their field of work as well as with people with other backgrounds and from other disciplines. Technical competence, theoretical and practical knowledge, alone is not enough today, it is important that the professionals have an understanding of other people's administrative and technical problems, that they can communicate and make themselves understood to different people in different contexts. Socio-communicative competence, leadership abilities, and the ability to cooperate are becoming increasingly important (see e.g. Blackstone 2001, Hassall et al. 2001, Rajai & Johnson 2001). Socio-communicative competence could be regarded as generalist competence but is also related to personal characteristics. In the following section, the central concern is the novice graduates' experiences of their interaction with others and the development of socio-communicative competence in professional education.

7.4.1 The physicians

A central element of practising medicine is the interaction with others. The physicians argue that as result of their education, they have developed and trained their ability to communicate with the patients, colleagues and other occupational categories in the workplace. To be able to handle the everyday contacts with others, the physicians have developed their socio-communicative abilities and conversation techniques as a result of their studies.

> It is of course … that is the most important, my most important instrument in my work as a general practitioner is still the conversation, and the

> educational program has been very useful from the beginning. (Male physician, 29, Linköping, interview person 2, interview 2)

In the everyday work of a physician, the interaction with the staff, other professional colleagues, and other occupational groups, e.g. nurses, nurse's aides, and physiotherapists is important. The physicians can at times cooperate with 7-8 different occupational categories simultaneously. During clinical training, the physicians were out in practice and experienced and participated in the interaction with patients and other occupational groups. They trained their ability to establish working relationships with superiors, senior physicians, and other occupational groups.

> Have to be good at communication, how you speak to and treat different people the right way, to be comprehensible and understand what they want. This goes for both patients and colleagues as well as other occupational groups. We work a lot in teams, so you work with nurses, physiotherapists and occupational therapists and counsellors, it is very important to get it to flow. So it is about finding the right path in all these … and also to find your own role in it. (Female physician, 34, Linköping, interview person 39, interview 2)

The newly graduated assistant physicians in general training end up in a 'middle position' between the senior physician and the nurses. This is a position that is perceived to require mediating, flexibility, and adaptability in order to avoid unnecessary confrontations. The intern is especially dependent on the senior physician, but as illustrated in the quote below, there is also a notion of a need to keep a distance.

> You are in some kind of middle position all the time when you are an assistant physician, that you are sort of in between the chief physician and the nurses; and then you have the patient and you have to integrate all this so that it works. And this requires that you listen perceptively so that you can make it work. And that you don't just go your own way. On the contrary, you have to be very sensitive and smooth, simply have to. It requires enormous adaptability to /…/ handle different situations. Primarily /…/ you are extremely dependent on your chief physician, and it is /…/ not good to not be friends with your chief physician … to quarrel with your senior physician. Then you end up in the wrong – camp. (Female physician, 31, Linköping, interview person 39, interview 1)

Still, the most important interaction is commonly perceived to occur with the patients. The socio-communicative aspects and the ability to communicate

with the patients are often stressed more than the medical specialist knowledge as being relevant to professional practice. The theoretical knowledge learned during the educational program is considered by some physicians to be secondary to learning to interact with the patients and the experiences of patient contacts during their education.

> The work is a lot about the meeting with the patient. What is basic is to establish a good contact – that the person feels secure in the situation, has confidence in me as a fellow human being – is necessary if the physician is to convey all necessary information. 90% of diagnosing patients lies in the meeting with the patient and the conversation and 10% in different examinations, lab-tests, x-rays and so on. (Female physician, 34, Linköping, interview person 18, interview 2)

The physicians argue that in the health care system, the patients are often in an exposed and subordinate position as they are ill and vulnerable. Consequently, the physician is in a superior position and it is therefore important to learn how to act empathically and respectfully and this is based on knowledge about people. The physicians describe this as learning how to interact in a respectful way, to respect the personal integrity of the patients, to be benevolent, sensitive, empathic, humane and 'nice' to the patients without getting too personal. This requires the ability to listen and be sensitive to the patients and their different needs (e.g. different pain thresholds), as well as adaptability, that is, for example, to be able to talk to different people in different ways.

The physicians emphasise the necessity of being able to inform the patients, both orally and in writing, to be didactic when explaining to the patients. A part of this is also being able to handle difficult conversations with the patients and their relatives. This also entails delivering unpleasant and negative messages to the patients. It is important to be alert, sharp, vigilant, concentrated, present ('not drifting away and thinking of other things') in the interaction with the patients, colleagues and staff, for example, when recording the patient's history and documenting their symptoms or when the senior physician talks to the nurses.

Establishing good communications with the patients involves listening and sensing what the patients need. The physicians consider it important to have the ability to communicate with or mediate information to the patients effectively and to ensure that the patients understand the information the physician is trying to convey. This entails, for example, speaking plainly and at the right level to the patients, avoiding extensive use of technical and medical terms (such as Latin terms).

> to speak as plainly as possible. Often your are occupied by your own thoughts … you know, medical … the technical medical terminology and perhaps easily say the Latin name of some bone and say that there is a fracture there and so on … and the patient doesn't understand anything. That you speak as plainly as if there is nothing strange so to speak. Those I think are good characteristics … well, the way I think a doctor should be. (Female physician, 26, Linköping, interview person 29, interview 1)

Elaborating and thoroughly explaining to ensure that the patients understand what the physician is trying to convey is important for several reasons. One reason mentioned is that it is important to explain and get through to the patients in order for them to comply with prescriptions and recommendations. A perceived problem related to communication with the patients is that the patients are generally more informed or at least perceived to be better informed about their own medical condition today than in the past.

> There are many patients today who are very knowledgeable; that read on the Internet and come and say: well, they've done this … they've tested some new treatment somewhere in Germany now. And then you have no idea about what it is. So sure … so it's a lot like that. It's a little embarrassing sometimes! /…/ You can think that, okay I have no idea about what that is. (Female physician, 28, Linköping, interview person 40, interview 2)

As the patients are often knowledgeable about their illness, several physicians point out the need to have respect for the patients' knowledge and opinions. Furthermore, the respondents argue that the fact that the patients are more knowledgeable could be perceived as a problem and that this in some ways undermines the physician's authority as an unquestionable expert. The patients may be second-guessing the professional expertise of the physician, today, may not be perceived to be as unquestionable as in the past (cf. Hellberg 2002). This may also lead to the physicians overestimating the patients' abilities to understand more complex medical reasoning and thus lead to communication problems.

> they should explain to the patient. I think that is very important. And I think that is where the physicians are often very deficient. They do not explain things to the patients, but assume that the patients know. And it has become a trend even more now, when the Internet has become so popular. Because many patients know so much, but there are still those who do not know; and then they just sit and say yes, yes, yes … and then I

> meet the patient another day and he has no idea of what disease he has or anything. So a little more of this like, explaining, asking the patient if he understands; do you understand what I mean and so on. (Female physician, 26, Göteborg, interview person 8, interview 1)

The physicians often argue that how to interact and cooperate with others is something that has to be learned through practical experience. The way to learn and develop socio-communicative competence is to meet many different kinds of people. Generally, the physicians stress the importance of getting as much experience as possible of interacting with patients, as well as acquiring knowledge of patient-related work as early as possible in the program. The physicians argue that practical experience, having a lot of contact with both patients and colleagues, helps them learn how people react in different situations.

7.4.2 The engineers

The ability to cooperate and communicate with others, such as co-workers and clients, is an essential requirement of professional practice for the modern engineer. In contrast to their education, which is commonly perceived to be an individual project, the engineers emphasise that few problems are solved individually in the world of work. In general, the engineers work in projects requiring constant close interaction with others in the workplace, and are dependent on the work of others proceeding as planned. Working in a project requires the ability to cooperate and means being dependent on co-workers since they, for example, share, complete and hand over tasks to co-workers, and all the participants share a common responsibility for the projects.

> You work in … it has to a great extent changed to working in projects and teams and so on. And then it's important to have the ability to cooperate and be able to talk to each other and come to an understanding with others. You don't solve problems on your own anymore. So I think that those are rather important characteristics – more that than having specific specialist knowledge, at least if you see it in general. (Female engineer, 24, Linköping, interview person 10, interview 1)

When it comes to the development of socio-communicative competence, the pedagogical organisation of the education is often emphasised by the engineers. The engineers interviewed in this study have been enrolled in an educational program organised around a problem or project-based curriculum, respectively, which is accentuated in this context. Working in

groups, teams, and projects during their education is perceived to partly have prepared them for the way work is organised in working life, as it has approximated the working conditions encountered after graduation. It is argued that at least elements of the programs are oriented towards developing this competence. The engineers have studied communication, developed and trained cooperative and socio-communicative competence.

> Consequently, what I feel most, that may be underestimating the computer part somewhat, but it is … what I have felt most is, damn, that's good; that is the project work, where I worked so much in projects. The last two years were principally only project work, I almost said, but almost anyway. And that leads to you not feeling so lost when it comes to working in projects; that you have someone who demands things; that you should document everything; that these routines feel rather natural /…/ Working in projects, that is what I primarily feel that I have brought with me from the program. (Male engineer 24, Uppsala, interview person 32, interview 1)

The ability to cooperate, to work in groups or teams, solving problems and assignments together, learning to be flexible, adaptable and to compromise is considered to be one of the most important aspects of the educational program with high relevance to the world of work. The opportunities to choose who to work with may be limited in the world of work. Therefore, it seems especially valuable to work with different kinds of people in the educational program. Several engineers refer to the benefit of learning to set aside personal differences when working together with people who they initially do not get along with for different reasons (or even dislike) in order to complete a project as it is 'a realistic' training for the world of work.

> We have often worked in groups, done lab-work together and worked in groups, both in groups you could put together yourself and in groups they put together. Despite the fact that I was sceptical of the fact that you couldn't chose groups on your own, it is pretty good now afterwards, that you were forced to work together. That is the way it works in working life. There, you can't always choose who you work with. So it has been, it has been useful; to compromise; if you wanted to do it in different ways you realised that it can't be solved, you simply have to compromise. (Male engineer, 31, Linköping, interview person 12, interview 1)

Another aspect of working together with others is training the ability to give others constructive criticism, to evaluate oneself and others regarding the work as well as sensitive aspects concerning personal attributes. The

development of the ability to be able to give and take criticism is also ascribed to group-based work in the educational program. This is also related to working processes in the world of work, for example, project meetings.

Furthermore, the importance of being eloquent, having good verbal skills, both orally and in writing, and being comfortable with public presentations are aspects that are thought to be important in the world of work. Having skills in the English language is also considered important. As English is the official language in many organisations and branches of business, it is important to be able to both read and understand, as well as to write and speak, adequately in English. Some engineers also mention the ability to document the work satisfactorily by, for example, constructing texts that are understandable and well structured as being important. This kind of competence is perceived to have partly been developed during the educational program, although these aspects are also seen as under-prioritised and are perceived as a general deficiency in the educational curriculum in relation to professional practice.

The extent to which the engineers interact with clients in their professional practice varies. However, the engineers with client-related work consider the ability to establish a solid relationship with the clients as central in their work. The engineers generally consider it important to be service-minded, adaptable, and flexible in order to be able to communicate with different people in a way they comprehend. It is considered important to be able to communicate with different kinds of people, co-workers and customers, being able to convey information in an understandable way and understanding the needs of others. Several engineers mention the importance of being able to communicate in different ways with different people, to convey information or an understanding about different products and aspects of the work to people with different levels of knowledge For several engineers, it is also important to be able to listen and collect relevant information, primarily from clients and the end-users of the products, in order to understand what the user wants or needs.

> I am often out visiting costumers so I can understand what needs our customers have. Thus, I can see the technical solutions, but I explain them to the customer from a user perspective. I communicate with their words and think technical implementation, and then I can translate the customer's needs, the technical insight so to speak, I convey that to my colleagues. That's probably the way I primarily use my education. (Male engineer, 34, Uppsala, interview person 33, interview 2)

Additionally, something mentioned as an important outcome of their education by the engineers is the social network. During their education, they have made contacts, which they think could be very useful in their future professional careers.

> A vast social network for the future, like many of those I have studied together with, I will run into them sooner or later. Sweden isn't that big and the world isn't that big. We will be useful to each other in the future. (Male engineer, 31, Uppsala, interview person 33, interview 1)

The benefits of a broad social network and contacts are seemingly considered even more important in the follow-up interviews. As the engineers have gained more experience and greater responsibility, advanced and become more integrated in the organisation, they may have seen the greater benefits of 'knowing people' outside the organisation. Some engineers have seen that the contacts they acquired during their education are beneficial for their own careers and the business. Some engineers even regard an extensive social network as the most valuable aspect of their education.

> That is to say, it is to a great extent the social network, it really is /…/ I think that you have really created, like, a circle of acquaintances you get on well with. And then also business-wise as well, that you know you have people spread out in different places and that feels good /…/ spontaneously, I think that is what is most valuable. (Female physician, 28, Göteborg, interview person 4, interview 2)

Thus, many engineers emphasise the importance of socio communicative competence in professional practice, but there are different opinions as to what extent the education has contributed to the development of this competence. The engineers also emphasise the importance of being able to handle tasks independently without having to spend a lot of time on introduction and of quickly becoming productive contributors in the organisation.

7.5 Comparative analysis and summation

The way the students approach their studies and what they perceive the aim of higher education to be is related to the individual reasons on which the choice an educational and professional career are based. In the empirical material, several different lines of reasoning emerge. Some respondents' explanations, as to why they ended up where they are, seem to be characterised by random events or non-rational choices. This applies to both

engineers and physicians. However, when a rational approach or trajectory emerges, the physicians usually refer to their future professional career while the engineers' reasoning is divided into two different rationalities. The engineers not uncommonly refer to a general interest in the discipline or, alternatively, a view the educational program from an employability perspective. From the first perspective, the engineers' interest in the scientific discipline, that is, a general interest in technology and science, or specifically computers and information technology, is emphasised rather than the possible future professional career and the specific content of the work in their possible future career pathways. The second line of reasoning regarding the reasons for becoming engineers relates to the education being a valuable credential, which increases individual employability. It is argued that engineering in general and, specifically, an education with a computer-engineering and information-technology profile would improve their chances of getting a job, or even a high-salary job, and ensure good prospects of a prosperous career.

The physicians, on the other hand, generally ascribe their educational and occupational choices to the expectations of the specific tasks or the content of the work in a future professional practice and their education is a means for professional development and becoming a doctor. They are also interested in working with and helping people, as an altruistic or social project, rather than in medicine as an academic discipline. For the physicians, a central aspect of the educational program for the physicians is the shaping of the future professional, the creation of a (medical) identity. The engineers, on the other hand, do not relate to expectations of the specific tasks that await them in professional practice, Instead, the engineers emphasise the educational profile and they seldom have constructed any clear representations of what constitutes the specifics of the profession. In general, the physicians relate to their profession to a greater extent than the engineers and the physicians, in a sense, have a stronger professional cohesion than the engineers from the start. For a rough overview of the main results of the chapter, see table 3.

Table 3: The table includes a schematic overview and summation of the most important results from chapter 7. As there is a considerable within-group variance, the presentation should not be interpreted as dichotomous categorisations, but rather as an orientation towards one of the endpoints of a continuous scale.

	Physicians	**Engineers**
Motives	Altruism or a social project	Career or employability perspective
What is learned during the education	Theoretical and practical knowledge, socio-communicative competence	Transferable generalist competence such as problem-solving, analytical abilities and flexibility
Educational knowledge base	Static	Static

When asked what the graduates have learned in higher education and what they had 'brought with them' from higher education into working life, both physicians and engineers talk about the importance of having a theoretical foundation of specialist knowledge and of generalist competence as a base for continuous development in professional practice. In the case of the physicians, this foundation or knowledge base is generally considered to consist of some form of basic or general medical knowledge and facts related to knowledge about how to diagnose and treat illness, the human anatomy and physiology, pharmaceutical knowledge, and knowledge about patient-related work. Socio-communicative competence is also emphasised by the physicians. Central to the professional practice is the ability to cooperate and work in teams with other professional groups, but most importantly, the physicians argue that the ability to establish a good relationship and the ability to communicate with the patients are the most central aspects of working as a physician. Socio-communicative competence is mainly developed through practical experience and the clinical training. In the follow-up interviews, the importance of the parts of the education where the physicians trained in patient-related work and had contact with patients is emphasised even more, mainly by the general practitioners and the physicians with frequent patient contacts.

The engineers argue that their educational knowledge base consists of general and specific computer knowledge acquired in higher education. However, the engineers generally tend to instead emphasise the importance of generalist competence and place less emphasis on the concrete discipline-specific theoretical knowledge since the educational knowledge base is considered to be loosely coupled to the professional knowledge base. The engineers often claim that the discipline-specific theoretical knowledge has

limited relevance to the demands faced in professional practice, or is at least subordinate to the generalist competence. What is important to most of the engineers seems to be the ability to easily adjust and become initiated into new tasks, to be adaptable and flexible. Through their education, the engineers have learned where and how to find the relevant facts and information in an effective way, how to sort and organise information, to learn how to learn, analytical thinking, to be structured, general problem-solving abilities, the ability to identify and deconstruct a problem, critical thinking, reflexivity, not taking things for granted, being able to give and take criticism, and to be self reliant. The engineers also point to the ability to cooperate as an important aspect they have trained during their education. Overall, generalist competence is emphasised much more than specific discipline-related knowledge or explicit factual knowledge. Studying theoretical knowledge is mainly a way of acquiring generalist competence, methods and tools that are useful in their continuous development in professional practice and for the acquisition of practical knowledge. Another aspect mentioned by the engineers as an important outcome of their education is the social network and the contacts they have built up during their education, which they believe will be very useful in their future professional practice and in their future professional career. This is an aspect that is not mentioned by the physicians to any notable extent.

Both the engineers and the physicians also mention the importance of their education in the context of their development as an individual, their self-confidence and self-efficacy. However, many of the graduates feel that is very difficult to determine what aspects of this can be attributed to their education and what aspects are unrelated.

Chapter 8: Demands encountered in professional practice

In the following chapter, the novice graduates' perceptions of their encounter with the demands that characterise professional practice are described. Whereas the focus of the previous chapter was on the graduates' competence, this chapter focuses on qualifications.

The transition from higher education to professional practice brings with it not only new and varying demands on competence, but also new responsibilities. There are descriptions of a professional practice that is characterised by a complexity and uncertainty that the graduates generally feel somewhat unprepared for (cf. e.g. Barnett 2004, Schön 1983).

For the physicians, the relation between theory and practice is intimately connected through most of their education while the engineers generally perceive theory and practice as separated. Thus, there are different views on the transferability of or the opportunities for utilising what is learned in the educational program in professional practice. The structure of the professional education, the characteristics of the work and professional practice are described in widely different ways in the two groups and cannot easily be categorised in the same way. Accordingly, the structure previously applied in the text is broken up somewhat in this chapter.

8.1 The physicians

In the following section, the physicians' perceptions of their encounter with the demands or requirements that characterise professional practice are described. During the educational program, the physicians experience a close integration of theory and practice and they consider their education to be a direct vocational preparation for the world of work. Thus, in general, the physicians experienced the transition as a relatively smooth one. However, the encounter with professional practice has often not been altogether completely unproblematic. For the physicians, the main characterisations of the transition are associated with the increased responsibilities of leadership, demands on acquiring references and experience, the need to reprioritise the knowledge learned in higher education, and developing an insight into the limitations of their own knowledge.

8.1.1 The encounter with the workplace

The formal introduction to the workplace is organised very differently in different hospitals and in departments or wards in the same hospital. Thus, the physicians' experiences of the transition vary widely. Some of the physicians have had a longer period of introduction and, for example, have had the opportunity to work alongside a more senior physician and are gradually given greater responsibility and a larger workload.

It can be concluded from the respondents' stories that the introduction and first orientation in the workplace and to the profession appears to occur in several different ways. How the physicians perceive the transition and first period at work depends on several factors, including earlier work experience, as well as conceptions and expectations of the encounter. Previous experience from working in the health care system has, to some extent, prepared some physicians for what lies ahead after graduation. At the time of the physicians' graduation, there was a shortage of physicians in Sweden which was especially apparent in primary care centres where several of the physicians were working. In this context, the causes of the shortage are not mentioned or speculated on, the respondents instead elaborate on the consequences this has had for their experiences of the transition to and encounter with the workplace. Several respondents point out that the general shortage of physicians is partly geographically oriented and concerns some specialities more than others. A consequence of this is, for example, that the physicians are given an opportunity to substitute as physicians before graduation. Several of the physicians have previous experience of working as substitutes or deputy physicians during short periods before they graduated (e.g. during the summer breaks) and before they have finished their general training. Some physicians also have work experience from other medical or care domains, for example, working as nurse's aides.

The first position is most often a general training position (which the physicians have to go through as part of their training before being eligible for a medical licence) and is in some ways perceived as an extension of their education. However, getting a general training position or an internship is not always easy. As the internship is a part of their medical training it can be viewed as a structured transitional phase since it functions as a stepping-stone into the working life. The interns often have their introduction together with other interns and they have each other's support. The experiences of the transition are therefore also dependent on whether they go from higher education directly to an internship or if they start working as substitute physicians directly after their education.

Several of the physicians interviewed were very worried, nervous and stressed just before they started working and during the first few days or

weeks. Many of the respondents felt uncertain of how well prepared they were for their future professional practice and questioned their own knowledge and capabilities. Some of the physicians described a feeling of being a fraud or just playing doctor and a feeling of insecurity in the role of being a physician. This uncertainty, however, subsided relatively quickly and many say that in retrospect the transition was smoother and easier than they had anticipated as their self-confidence and self-efficacy gradually increased.

> Nervous. I was really stressed and thought that it wouldn't work, I won't know anything. I don't remember anything of what I had gone through these 5 ½ years, it was totally blank. But then they go on the principle that you start from the beginning, with infections in the upper respiratory system and infections in the urinary tract and so on, you learn to write prescriptions and stuff like that. Start dictating faster and constructing good journal notes. And there is also the stress, at that time I took the work home with me. I was lying and thinking about what I had done with the patients during the day. /…/ it's not the same thing as entering working life as a physician, it was an enormous adjustment, I think. But there was positive stress as well, so getting into it was relatively smooth. Self-confidence built up gradually. And you have to accept that it's not possible to answer all the questions a person might have with them in one day. (Female physician, 30, Stockholm, interview person 35, interview 1)

Although, there is often an element of being 'thrown out' into the practice, the transition from higher education to working life and the first encounter with the workplace has in many ways been perceived as a gradual and relatively unproblematic process by many of the physicians who were interviewed. It is described in positive terms and as 'smooth' or 'diffuse'. Through the clinical training the physicians have developed an understanding of their future working conditions. In many ways, the physicians feel well prepared for the work after graduation, knowing what the future holds in store. Many of the physicians argue that in many ways practising medicine does not differ that much from studying to be a physician. The main difference is a heavier workload, greater responsibility and being accountable for the decisions that are made. Furthermore, after graduation the senior physicians pay more attention to the novice physicians' opinions and trust their judgement to a greater extent.

> That was the reason that I worked myself up, because I thought there was going to be a big discrepancy, but there wasn't. That is, it was so like the work I had done before during all my clinical placements. There was no

> big difference. (Female physician, 31, Linköping, interview person 18, interview 1)

Several respondents also stress that physicians have an advantage compared with other educational programs as it is a professional education with integrated continuous clinical training and vocational preparation for the world of work.

> Well, I think it has been pretty smooth. I think that you as a medical student have an advantage over other educational programs, for example, engineering students, I have a friend who works with that. And also law school, in those educational programs you read a lot of theory and learn a lot of things, but you are not out in work placements to the same extent as you are as a medical student at all. During the second half, you are out in the clinics and you get a good picture of what you do and so on. You tag along as a shadow person almost all the time, so the picture gets clearer and clearer. (Male physician, 28, Linköping, interview person 6, interview 1)

Still, being new in a workplace also means encountering many new situations, meeting new people, learning to find your way around, learning how to write prescriptions the right way, handling new computer systems and other administrative procedures. The first days or weeks at work are described as a period of practical orientation when they are preoccupied with what one male physician calls 'little things', the specifics of the workplace such as the practical and administrative routines. Learning the specifics of the workplace, how to navigate, and especially the administrative procedures, take up a lot of the graduates' time during the first weeks and even months and time to adjust is often needed. An important part of this is to be inquisitive in order to learn and develop in new situations.

> Everything is obviously very new, during the first days you are very preoccupied with the small things… Who do I consult regarding this and how do I go about writing prescriptions, how does the computer system work, how do I see … what's specific for this place of work. (Male physician, 26, Linköping, interview person 2, interview 1)

The transition from higher education to being new in the workplace not only involves a period of practical orientation but also learning how to understand, interpret and decode the implicit assumptions that in different ways are displayed in the new workplace, such as assumptions about how they are expected to be and how they are expected to act in different situations. The

experience of the transition as well as the experience of the first period at work appears to vary between different people, workplaces and also over time in the same workplace. Surrounding circumstances are expected to affect both the workplace and the people working there, resulting in constantly changing experiences. The experiences are not the same, but change from day to day and from one week to the next.

> it's not just that you are supposed to learn how the computer system works and learn where everything is, you have to learn how to find your way around … you have to watch and see how the others act, not just when they interact with patients but also simply how the others act. (Female physician, 29, Stockholm, interview person 3, interview 1)

During their education, the physicians have been out on many rotations in different workplaces at different hospitals. Through the clinical training, the physicians feel that they have also developed a kind of tolerance to being new in different contexts, constantly meeting new people and circumstances. The physicians develop their adaptability and a sense of security, not being afraid of 'feeling lost'.

8.1.2 Becoming a leader

In professional practice, the physicians argue that they will find themselves in a position where they will be managing and leading the work. Thus, leadership abilities are considered to be a crucial aspect of the professional practice. The physicians argue that it is expected of them to take charge, make decisions, answer questions, coordinate work, and be an authoritative leader. As the only physician on the team, the physicians are often solely, responsible for prioritising, delegating work and distributing tasks to others, e.g. nurses and aides, and clearly stating what is expected; and they are generally responsible for coordinating and ensuring that work proceeds smoothly in a team consisting of people from other occupational groups.

In professional practice, the physicians have to work independently, without supervision. When the physicians enter working life, they are forced to take on significantly more responsibility when examining, diagnosing and treating patients. During their education, the students were always supervised and were only required to come with suggestions, but in the end they did not have to make decisions and take responsibility for the consequences of those decisions. From being used to having a more senior physician tell them what to do or take the responsibility for the decisions, they have to get used to others coming to them for guidance. They are expected to take command at the same time as they feel insecure and uncertain of their own competence.

The increased responsibility is experienced as a burden at the same time as it makes the work more stimulating. As a graduated physician, they have to inform the patients themselves and make decisions even if it is not an easy call or obvious diagnosis.

> And then you have the responsibility part, that is really a big difference, you suddenly feel that you are the only one who can solve this or actually have to take responsibility and inform the patient of the bad news, for example. /…/ you have to manage that part… and … it's the kind of thing that you, in some way, realise when you are in the situation. You kind of have to solve the problem somehow and you didn't feel that way during your education. Because then … you didn't feel those kinds of demands and you shouldn't either, it was like this … it can probably be like this and then you consulted your teacher. Now you have to make a decision even if the diagnosis is not self-evident. (Male physician, 28, Linköping, interview person 6, interview 1)

The physicians will often find themselves in complex and uncertain situations without clear directives or a clear idea of what they should do and they are forced to improvise. There is seldom just one obvious option or standardised application, or one answer to the problems encountered in professional practice. Managing the daily work is a matter of being able to make up one's mind, to prioritise, to make a decision, to stand up and be accountable for that choice. Learning how to quickly evaluate situations and prioritise is also associated with decision making and taking responsibility and being able to answer for any potential consequences of the decisions that are made.

> To be able to stand up for what I do, to never do anything that I don't feel I can stand up for – one hundred percent and defend in front of others. Because you are a … when you start working you are in a subordinate position, you are an assistant physician in many ways. In the beginning, you do as you are told because you are concerned about, like, making a good impression and you are grateful for all the help you can get. But then you can end up in very strange positions, when you are left defending someone else's decision that you don't understand yourself. That's very weird. So I have learned that you should never do anything that you can't stand by. (Female physician, 27, Linköping, interview person 5, interview 2)

Being a physician entails decision-making under varying circumstances. The work is often characterised by making many and frequent decisions, for example, in the emergency room, decisions have to continuously be made

about whether a patient should be admitted or not, if surgery is needed or not, what medication should be used, etc. Decision-making can also include whether or not an older patient will be able to manage living at home, or if the patient should be referred to a retirement or nursing home, and managing the contacts with different institutions regarding caring and rehabilitation plans for the patients.

The physicians feel pressured not only to make the correct decisions but also to make them quickly. The leadership role entails making sure that decisions are carried out quickly and information has to be conveyed and communicated in a credible way. This is often considered more important than choosing the optimal route. Being determined, assertive, resolute, and decisive and clearly stating how things are to be done is related to the professional role, and becoming self-assured in the role of being a physician. The physicians argue that it is important for them to portray themselves as self-assure and authoritative. This may be even more important for the female physicians. A female physician argues that men have greater authority than women as it is more of a problem for women to delegate responsibility, and it is thus better being a man in order to fit into the role of a 'good' physician. Insecurity and indecisiveness are considered to be characteristics of a poor physician. Although the practice is characterised by uncertainty and the physicians will often find themselves in positions where there is no clear-cut and obvious answer to a problem, they argue that they have to convey a sense of security and authority, the patients and nurses have to trust the decisions they make.

> I realise now that I have been working for a while that this work is about being able to make different decisions in different situations. It is simply about being able to make up your mind. When you are in the emergency room you have to decide, should we admit or should we not admit this patient. Is it something that requires surgery or not. What medication should this patient have; is there any medication that should be removed. /…/. It is also a question of conveying this in a credible way, even if I feel that I have no idea what this is, I have to convey a sense of being on top of things, both to patients and nurses so that they trust what I tell them /…/ often we have no idea what diseases people have, it is one of those things you realise after a while, you realise more and more that you actually have no idea what people are suffering from /…/ then it's a matter of making reasonability evaluations all the time /…/ obviously you shouldn't pretend to be on top of things when you aren't, but you still have to convey a sense of calmness. (Female physician, 31, Linköping, interview person 39, interview 1)

Professional practice also involves the ability to be autonomous, self-reliant, work independently and be able to take initiatives. Several physicians argue that medicine is lonely work, although they work in teams together with other professional groups. For several physicians, the loneliness stems from the distinction between different occupational categories and professions and that they are the only physician on the team, solely responsible for the decisions that are made.

Generally, the physicians' feel that they can cope with the demands of professional practice and that they have opportunities to get support from co-workers. Some physicians argue that is important to have the possibility of consulting others before they make decisions. According to the physicians, a central part of making decisions is determining when other people are to be consulted and when they can make the decisions based on their own knowledge and experience, which is closely related to having an insight into the limitations of their own knowledge.[91]

The physicians generally seem to consider themselves less prepared by their education for the increased responsibilities and the leadership role they encounter in professional practice. During clinical training, the physicians did not have the full responsibility for their decisions and actions and thus the respondents do not feel that they have faced the real pressure of being a practicing professional. However, these aspects may not be possible to incorporate fully into formal education. As is illustrated in the following quote, it has to do with experiences, growing and maturing in practice.

> I have become aware of making decisions. That was what I really feared during my education /…/ that is one of the more difficult things, to know when you have enough knowledge to dare make a decision. And when you lack the knowledge you have to find it somewhere and say that this is a decision that I can't make, this is up to someone else, someone with more knowledge. And it is really difficult and there is nothing that can prepare you for this, it is something that has to be inside you and mature. And that is one of the most important things I have learned since I started working. (Male physician, 28, Göteborg, interview person 9, interview 2)

Although some of the respondents mention that these aspects are to some extent discussed during their education, the physicians do not generally realise the full implications of being in a position where they will be leading work until they enter professional practice. During clinical training, they argue, they did not experience the pressure and stress involved in their future

[91] See section 8.1.4.

professional practice when other actors turn to the physician and expect answers.

> I sometimes feel that everybody is watching the doctor and wondering; well what should we do now? Then in a way … and it is not their fault either, it somehow concerns expectations that … that the physician is suddenly expected to come up with some incredible solutions. (Female physician, 31, Linköping, interview person 18, interview 1)

There is also a notion among the physicians that they are tested and provoked at first, in order to be forced to become more resolute and determined. The physicians argue that they have to 'prove themselves' to their co-workers in order to become fully accepted in their professional role as a physician. The professional role also entails being able to cope with pressure from others. They have to show that they are knowledgeable but humble, able to take initiatives and be firm and decisive while still listening to others.

8.1.3 Reprioritising and re-evaluating knowledge

There is a prevailing perception among the respondents that work as a physician requires reprioritising the knowledge acquired in their education. One of the physicians illustrates this by characterising the entrance into working life as a transition from 'a confused theory to a practice that emphasises completely other things'. According to this view, a lot of what the physicians thought was essential as students turned out not to be that important or relevant when they started working and a lot of the things that are prioritised in working life did not have a prominent position in the educational program. The physicians feel that the importance attached to and focus on different diseases during their education do not correspond to the prevalence of the same afflictions encountered in professional practice. As the priorities in working life are not the same as in the educational system the graduates are forced to reprioritise and re-evaluate their knowledge once they start working. Furthermore, the world of work is less elucidated and predictable than the education. And the reality of the workplace is less static than the books and is characterised by a greater variation, diversity of new problems and contexts (cf. Bowden & Marton 1998).

> You are pretty happy when you find something that fits in with the textbooks, so to speak, among the patients you meet. Often a very obscure picture emerges when you are out in practice, it is seldom as apparent as you previously experienced. Instead, it is often a bit of everything and more difficult. /…/ You don't really understand how ordinary things are.

> When you read about it, then you can … you can easily get the impression that you are going to encounter very strange diseases, but when it comes down to it, it is pretty much the same thing so to speak. (Male physician, 31, Linköping, interview person 21, interview 2)

As a novice physician, it is not unusual to have expectations of seeing a wide variety of different afflictions, but in reality there are some afflictions that are more prevalent among the patients. Expectations change with the new reality and in time, more unusual symptoms and diseases are encountered.

> You are actually broader that way, when you come directly from the program you have a more open mind to different things, that you may encounter different things. And then after a while you become more like … they are more common things. And then you might say that it shifts back again a little, you realise that you encounter rare things as well. (Male physician, 31, Linköping, interview person 21, interview 2)

The disparity or gap between the knowledge conveyed in the educational program, or rather the expectations appropriated by the physicians during their education, and professional practice is also exemplified by the recognition of different disease symptoms. The symptoms of a disease may vary and the disease may manifest itself in different ways. During the educational program, emphasis is not seldom placed on the most common panoramas and symptoms. Thus, there may be some lack of preparation for the less common ways a disease may manifest itself.

> Everything depends a little bit on which clinic you have been in during your education; that is, where you have been placed and so on. Because if you only go by the books, it is very seldom real life is as it is portrayed in the books. That someone with, for example, gallstone-related problems should have a yellow skin, or have some specific 'triad' – that is pain, fever or something more like that. If you have never encountered a similar case in real life so that you have seen what it actually looks like, then it may sometimes be difficult to relate theory to practice; that is, what it really looks like. (Female physician, 29, Göteborg, interview person 8, interview 2)

Thus, the perceived gap between the knowledge acquired in the educational program and professional practice may lead to problems with transfer or in 'applying' the knowledge appropriated in the program in the workplace. The extent to which knowledge acquired in the educational program can be applied in practice is related to practical experience, having encountered and

experienced a variation of cases.[92] Gaining experience by working, on different wards, is necessary in order to be able to adapt the theoretical and practical knowledge acquired in the educational program to the reality of the world of work.

> In your undergraduate studies, when you were reading about, for example … well, cardiac infarctions then they say that the patients should come in with chest pains; and then there are those who come in without chest pains but are still suffering from a cardiac infarction. /…/ I have the knowledge but it … something else is needed in order to make the connection in some sense, that it may really be that. It's a matter of experience and the more practical … that I have seen variation. (Female physician, 28, Linköping, interview person 40, interview 2)

8.1.4 Insight into their own knowledge and limitations

Several physicians observe that a novice physician lacks a lot of the knowledge needed in professional practice, and the first period at work is about getting to know their own limitations and learning to ask for help and how and when to consult others. It is emphasised that it is important not to be afraid to ask questions and consult others, if they are not certain about what to do, it is important to not take any unnecessary risks. The decisions that the physicians make can have very serious consequences. The physicians argue that in order to make well-balanced decisions, it is necessary to be able to determine if and when others should be consulted. The physicians emphasise the need for solid self-knowledge, or having an insight into their own knowledge and knowing their own limitations. The physicians have to be able to value situations and determine whether they have or lack the competence needed to perform the tasks and not make premature decisions on their own.

> The most important requirement you actually experience is, I think, that you have good self-knowledge, that you realise when there is something you don't know. And primarily that you realise that when there is something you don't know, you need to get help. Because no one ever checks up on you if you don't ask. So I can make – if I don't realise that that I don't have the knowledge – I can make any kind of strange mistakes during a period, and then of course something bad happens. However, in the workplace there is no one who … almost no one came. So there are

[92] See section 8.1.5.

> requirements concerning having good self-knowledge. (Male physician, 29, Linköping, interview person 2, interview 2)

Colleagues expect you not to make mistakes by making decisions you are not competent to make. It is emphasised by several physicians that, although it is considered acceptable to consult others to a certain extent, it is also important to also be self-reliant and to not burden colleagues and take up too much of the co-workers' time with too many or frequent questions. Once the physician has encountered a case enough times, she or he has to have the courage to make the decisions on her/his own. There seems to be a delicate balance that the physicians have to learn. There is almost always someone to consult, but it is not always evident when it is necessary. In the following quote, a physician argues that it may be difficult to decide when it is appropriate to call on backup, and describes a kind of reluctance to wake up a senior physician at night if it is not really necessary.

> Since you are an assistant physician now, you ask a lot. It depends a little on when and in what situation as well, but if it is daytime in ordinary department work and so on you simply ask the senior physician. If it is during emergency (on-call) hours you try to search in the literature first. /…/ and if it concerns something vital you have to talk to your supervisor, your on-call backup. So it depends on /…/ how serious the condition is and how big the consequences are if you choose not to ask, also if it is a decision that can wait, the time of day and so on. So there are actually a lot of factors to be considered. However, principally, you always have someone to ask, no matter what time of day it is, only sometimes you choose to wait. (Male physician, 27, Linköping, interview person 31, interview 2)

Furthermore, other physicians argue that it happens that physicians do things they do not really have the competence for in order not to lose 'face' in front of their co-workers, e.g. nurses. Being more careful than necessary is perceived as more positive by the co-workers. Thus, the physicians generally consider it essential to determine whether they have the necessary knowledge or whether they need to consult others.

8.1.5 Practical 'know-how'

It is not only important to know what but also how. In order to handle the demands of the professional practice the physicians point to a need for practical knowledge and procedures, or 'know-how' (cf. Ryle 1963). What the practical know-how consists of, whether it is elementary or qualified (see

Rolf et al. 1993), and how it is relevant to professional practice vary depending on the specific workplace and different specialisations. In some specialities, there is greater emphasis on practical know-how. In, for example, anaesthesia the practical know-how is considered to be very important, whereas for the general practitioner, other aspects (such as socio-communicative competence) are considered more important.

An important aspect of the educational program, emphasised greatly by the physicians, is the practical experience of doing, and practical know-how is generally considered to be more important than explicit theoretical knowledge when the physicians enter the workplace and encounter the demands made in everyday work. The novice physicians gather experiences by walking alongside and watching senior physicians perform the tasks associated with professional practice and learning what the professional role entails. A valuable aspect of the educational program is the opportunities the students have to participate in the examination and diagnosis of patients, to learn under supervision how to talk to the patients and to observe operations.

> Sure you can learn a lot of things by reading and listening to others, but in the end it still comes down to, it is when you perform a task on you own that you learn something. That's what it was like during the clinical semesters, when you could go out to the wards and meet patients and really … well, work as a so-called – in quotation marks – "real doctor" then, when you … I experienced that I learned something useful. Most of what I have with me now. (Female physician, 34, Linköping, interview person 18, interview 2)

Generally, professional know-how is considered to consist of, for example, knowledge related to how to process the patients, the examination of patients, diagnosing illness, what patients to register and remit, which ward to refer the patients to (e.g. when the patients should be x-rayed) as well as when the patients are to be recalled for a check-up. Other aspects of practical medical knowledge or know-how concern medical procedures, such as how to go about administering anaesthesia or place intravenous drip or other concrete practical operations. Some physicians talk about the benefits of knowing how to write prescriptions and of having dictated journals so they know what 'should' be included. The physicians argue that much practical knowledge or 'know-how', especially the more qualified practical knowledge, is not something that is (or can be) learned in the theoretical courses in the educational program, but is acquired through experience in the workplace and in clinical training.

> Partly, it's theoretical background knowledge that you have and which you ,of course, also have to replenish. Then there's probably a great deal of general knowledge about how you behave and how things are done, like practical knowledge, who should I ask now and how should I do this? … and a lot of practical knowledge about how to process patients, for example, which ward the patients should be sent to and if they should be given an x-ray first or later, that is many such small things really, things that you might not learn during your education but learn now. (Male physician, 27, Linköping, interview person 21, interview 1)

The physicians argue that in order to become a successful practitioner, it is important to develop a practical dexterity or manner, or 'clinical eyes', which could, for example, involve examination techniques and treatment procedures. This practical dexterity is something that is learned and developed through experience in professional practice and the 'know-how' is appropriated and developed through experience.

> Then the medical profession is to a large extent about clinical eyes, and at first you have no experience and you basically have to get help in the form of x-ray examinations and other examinations, blood-tests and so on, but ultimately it is more the clinical eyes and diagnosis methods and so on. (Female physician, 29, Stockholm, interview person 3, interview 1)

The physicians also emphasise the importance of learning about the organisation of the health care system, how different hospitals are organised and how different parts of the health care system work, e.g. the social security system. This is also associated with knowing who and what authority to contact under different circumstances. One of the physicians refer to this as 'hidden knowledge' and that it is not possible to acquire a satisfactory understanding of this very complex system, and how a patient is to be guided through it, by reading books or from lectures.

> It is also knowing who to call and talk to, who to contact /…/ and specifically in a primary health care centre, is it a matter for the social insurance office? Who should be referred? There is a lot of hidden knowledge really that you cannot learn by reading. And in some situations, you can become informed and learn, but it is the kind of knowledge that cannot be found in any books really that … and there is a very complex system /…/ surrounding a sick person who has a specific affliction, because he should be guided correctly through the system and get the backing from the social insurance office maybe or from an insurance company and such. (Male physician, 28, Linköping, interview person 6, interview 1)

Some physicians regard their education as an important foundation for further learning and development or for the understanding of practical know-how and how to act as a physician. However, in general, the physicians tend to view theory as something that should be applied in practice and emphasise that the educational program has a highly vocational character and that the physicians are, although not fully learned, still ready to work as physicians directly after graduation. The physicians expect their education to supply them with a 'tool kit' ready to apply in practice, and the educational curriculum is generally also considered to be structured in such a way. There are clinical placements and practical training built in to the educational program where the students can practice their future profession and acquire practical know-how. Generally the physicians feel that they were well prepared to begin working relatively soon after graduating from higher education and to start working independently as a practising professional without much introduction and supervision. Others argue that it took a little time before they felt fully productive and able to contribute fully in the organisation. Thus, there are variations in how well prepared the physicians perceive themselves to be, and this is often related to how practically oriented their education has been. A common perception is that more and earlier contact with practice, meeting patients, is better preparation for professional practice.

8.1.6 Experience, variation and routine

It is considered necessary to have experience of practising the profession in order to get references to relate new experiences to. A physician exemplifies this by arguing that it is necessary to have seen a patient who cannot breathe during a cardiac infarction in order to be able to identify it the next time and it does not matter how many books you have read.

> You know a lot theoretically, you are really good at that. What you don't know is practical … how does a patient look who's not getting any air … well, in a cardiac infarction, but if you have never seen one it doesn't matter how many books you have read. It is a question of seeing, that is what it looked like. What you should learn now in the profession is to acquire references. So theoretically I think that you are well prepared, but practically and … well, experientially … but that's difficult to acquire. (Male physician, 28, Stockholm, interview person 11, interview 1)

During their education, the physicians have acquired references in practical clinical experience. They argue that through practical experience a physician learns by seeing enough patients and enough variation, to recognise certain

cases. Since the physicians encounter a variety of cases, they can more readily diagnose patients in a quicker investigation. Because the physicians have encountered a larger number of patients, their diagnoses are facilitated by the experience they have gained through previous cases. Schön (1983) refers to this as knowing-in-practice. It is not uncommon for the physicians to argue for the importance of this kind of repetition-with-variation which facilitates the application of standardised procedures or treatments (cf. Abbott 1992, Mintzberg 1983). As a novice, the physician needs to perform a more extensive and thorough examination by doing more tests such as x-rays or blood samples. Another example is the emergency room, where some patients make a lot of noise without being in need of quick processing, while others are quiet although they are in great need of help.

> Personal development is related to constantly encountering things you have never seen before, and sometimes it happens that you come across these things that are very rare so to speak, so when you come across it – a year later, then … and then you have probably seen 2,000 patients in between, then you recognise it; and then you feel that, well, I learned that … I learned something the last time and I learned something this time. You learn something, you see the effects of different treatments. (Male physician, 28, Göteborg, interview person 9, interview 2)

> The more patients you have met the more you know if this is appendicitis or if it is constipation or … But if you haven't seen so many, then… then you are most afraid that it is appendicitis and you simply send them to be x-rayed, but the next time then … well, it is probably constipation. (Female physician, 29, Stockholm, interview person 3, interview 1)

The physicians also mention the importance of being able to have an overview, a holistic approach to the patient, in order to determine what is wrong with the patient (where she or he is in pain and how the pain is manifested) and how this can be remedied. Commonsense is as important as concrete discipline-specific knowledge, according to one physician.

Thus, the practical know-how necessary to perform the work and successfully navigate day-to-day practice is acquired through practical, hands-on experience. This experience accumulates with time, from the first clinical placements during the educational program and the general training period after graduation through to the specialist training. Several physicians mention that it is not possible to be fully learned as a professional on graduation from higher education. Professional practice is still characterised by constant continuous learning.

The novice physicians argue that there are few tasks they encounter in professional practice that they can do routinely. The work is characterised by complexity and uncertainty. Still, there are instances where the physicians can quickly identify the problem and use a standard procedure. It is thus considered important to acquire knowledge of the most common cases in the workplace. In surgery, this can be exemplified by a kidney stone, gallstone and acute pain in the abdomen. However, the physicians argue that there are few typical cases and there are always small variations, such as the patient being allergic to the most common medicine.

> There are fairly few occasions when you feel … and supposedly it is supposed to be that way, that you can do things routinely. There can be times when you feel that there is a person who has a typical history with pain in an ear and it seems very obvious and then you look into his ear and then … "yes, that's right", and then you know that you apply the standard treatment if the patient isn't allergic or something. But that … I think that it is quite rare that it actually is a typical case, because almost always somebody is allergic to the most common medicines, somebody … there is something that is different all the time and then it isn't really just operating according to a template. (Male physician, 28, Linköping, interview person 6, interview 1)

Although the physicians often describe a work situation characterised by variation and varied tasks, part of the work still entails routine tasks where the physicians argue that little of their competence comes into use. With experience, more tasks are considered to be routine and involve standardised applications; consequently, the physicians argue that more of their work is characterised by routine in the follow-up interviews. There are descriptions of having to go through many cases:

> Children who have a lot of inflammations of the ear or children with fluid behind the eardrum who get plastic tubes in order to either be able to hear well or to prevent infection. That is the smallest intervention we do here and the one that is fastest at the clinics, but it has to be done. Sometimes you feel that this is so simple and why do I only get these kinds of patients. Then you may feel that you are not really able to use your knowledge. (Female physician, 28, Göteborg, interview person 36, interview 2)

Some practical procedures are more quickly learned and mastered than others. One physician mentions intubations as an example of a task that he felt comfortable with after only a few months.

8.2 The engineers

The engineers have no close integration between theory and practice during their education as there is no practical training incorporated in the educational program or an apprenticeship system organised in relation to the professional education where they are socialised into their professional role. Thus, the engineers do not have the same opportunities as the physicians to prepare for professional practice in their education and to learn about how work in the world of work is organised. The engineers are also a more heteronymous group than the physicians when it comes to potential workplaces. Consequently, the engineers also experience the transition in varying ways. The engineers also describe a gap between the specific discipline-related theoretical knowledge acquired during their education and the demands of professional practice; that is, a gap between the educational and professional knowledge base, and between competence and qualifications.

8.2.1 The encounter with the workplace

Unfavourable labour market conditions constituted a serious limitation on the engineers' opportunities to choose among different workplaces and to even gain employment at all on graduation. This has in many ways influenced the engineers' choices and experience of the transition from higher education to the workplace. The economic situation and high unemployment rates during the engineers' transition contributed to anxiety and uncertainty, as many companies were dismissing employees, especially in the field of information and communication technology.

It is not uncommon for the engineers to write their final thesis or examination project during the last phase of the educational program as a project or commissioned by a company or an organisation. It is often not a matter of full employment (rather project-based employment) as the work is not fully incorporated in the organisation although they often get some kind of reimbursement. Still, they work on a project in which the company has a specific interest and it is not all uncommon for them to have had access to an office and a supervisor or tutor in the organisation. Often, the students also start working for the company after they have completed their final examination project. This gives the students a good opportunity to gain valuable work experience and develop an understanding of the organisation. This is also a way for the organisation to evaluate the students, to get to know

them and assess their competence. It also facilitates the transition to the world of work.[93]

Those graduates who carried out their final project for an organisation emphasised that, before their (formal) employment, they had an opportunity to get an idea of how many things in the organisation function, the organisational structures, the organisational culture, the facilities (how to find their way around the premises), getting to know people, i.e. potential future colleagues, socialising routines (such as at what times it is appropriate to take a coffee break, etc.). Even if they did not eventually end up working for the same company, the graduates felt that they had gained valuable experiences relevant to their future careers and complementing their formal education.

Thus, the transition from higher education to working life is often not all clearly discernable for the engineers since they often get a small head start at the end of their studies. Exactly what constitutes the transitional period is therefore difficult to clearly define or distinguish. For many of the engineers, it is often difficult to determine when the actual transition from being a student to being an employee occurs, and how long it lasts. The transition is therefore also often described as being 'smooth' or 'easy', and a not uncommon perception is that there was no major difference between studying and working. Many engineers felt that the transitional process had been stretched out over a relatively long period of time and it is seen as a step-by-step process, from their studies to the final research project, and from the project to the labour market. The research project is viewed as a halt or a stepping-stone midway between studying and working where theory and practice is integrated. There is a notion of having both during the last semester (as if they had been studying and working at the same time).

> There actually was a bigger difference between studying and the examination project than there was between the examination project and starting to work, I think, really. Because I wasn't doing the same things then, and the examination project was a little more independent, you weren't as dependent on others within the organisation. (Female engineer, 25, Linköping, interview person 40, interview 1)

Consequently, a considerable proportion of the engineers found the transition from higher education to work to be relatively unproblematic. However, whereas some engineers felt that the transition was a gradual process, others felt that they were more directly thrown into the 'deep end of the pool'. This

[93] This may in some ways be comparable to the physicians' period of internship or general training.

was sometimes also associated with the context of the final projects. Graduates who carried out their final projects at the university or were not closely associated to any specific organisation have often had a somewhat different premise for their experience of the transitional process. Some of the engineers experienced their first encounter with working life as a 'reality shock', which was associated with uncertainty, confusion and a feeling of being lost. This was often attributed to an insufficient introduction into the organisation. The encounter with professional practice was characterised by uncertainty about what exactly their work assignments were, what they were supposed to do, the organisational structure, and who they were supposed to address their inquiries of different kinds to.

> It was very shocking … well, a little like that, a shock and some confusion. I was employed rather quickly and then I was given assignments immediately; that was the reason why they wanted to employ me, there was a hole to fill. So I had time to sit in my office for one afternoon I think – a consultant office, and catch up with the personnel and make some bookings. And then the next day I was out invoicing a customer. It was tumultuous you could say. It wasn't panic-tumultuous, but still it was kind of … difficult getting familiarised. (Male engineer, 28, Linköping, interview person 19, interview 1)

The first weeks, or even months, are naturally also associated with many new impressions and experiences, and it takes time to learn how to manoeuvre in the new context (and the graduates' experienced that it took a long time to perform the tasks associated with their work assignment). Reducing the transitional period requires (people within) the organisation to assist and guide the newcomers so that they get used to a totally different way of doing things and essentially learn how to do the work or adjust from a school rationale to a production rationale (cf. Helms Jørgensen 2004). There are also many practical details, and a lot of new things have to be learned during the first weeks and months, such as how to manage new computer systems.

> The first period. Well, a little tentative as it often is before you feel at home in an organisation or whatever situation it may be. Everything took a little longer because you didn't really know how to tackle the problems, and because you didn't know the business operations. You didn't know who to approach, you didn't know … well, such things, beginner's … well, beginner's frustration. (Female engineer, 28, Uppsala, interview person 26, interview 1)

There were also concerns among the graduates that they did not have the competence needed to manage their work assignments. Their insecurity was also increased by the vagueness and ambiguity of the work assignments. In some cases, the graduates formulated their own job description and work assignments, in consultation with their superior, as there was no previously defined work for them. Several respondents felt uncertain and insecure at first but this eventually subsided when they discovered that they in fact did have the basic knowledge they needed and could quickly learn the specifics of their work.

The uncertainty about how prepared they were, their knowledge and abilities, could also be viewed as an exiting challenge and as a good way of getting started, to be motivated to contribute, when there is a lot of work to do and little time for hesitation, to finally find out what they were capable of.

8.2.2 Initiatives and innovation

Commonly the engineers experience that their work situation requires the ability to structure and perform the work relatively independently. Their work is generally characterised by a high degree of freedom, and they are most often in control of their own work. The engineers usually emphasise the importance of introducing their own ideas, being able and not afraid to take initiatives and tackle new and unexpected situations. This is also associated with having the courage to take risks. The engineers argue that they can seldom expect anyone else to come and tell them specifically what to do or how to do things. Rather, they have to take initiatives, schedule meetings, and approach co-workers if they need something from them. Their descriptions are generally characteristic of innovative organisations (see e.g. Mintzberg 1995).

> Well, you should be rather … I don't know how to put it … enterprising. You should be able to … it doesn't work sitting down and waiting for people to tell you what to do. There is no list of what I should do, on the contrary, it is more up to me to figure it out and that is the way it is meant …. Of course you can experience: do this, do that, but then it is also up to you to do it. It varies a little, other people have different ways of working, but that's the way I work. It is also associated with … improving for myself as well. So I do a lot of work to facilitate, I can design a program that does certain things to facilitate my work, and maybe one's superiors expect you to do that; that if you want a thing done well, do it yourself. (Male engineer, 24, Uppsala, interview person 32, interview 1)

There are seldom any specific demands or concrete instructions explicitly formulated and engineers must independently identify and tackle problems in ways they find appropriate. The engineers experience that they need to have the ability to realise or see what 'needs to be done' without being instructed, which may be considered even more important in a smaller organisation. Thus, the engineers experience demands on being self-reliant and responsible for structuring and planning their own work. This may, for example, involve structuring and planning their work and daily activities by drawing up sub-goals and partitioning their time in order to get things 'out of their hands'. Being structured is also related to establishing routines, doing things in the same way.

For some engineers, being innovative and a driving force is essential in order to be able to perform their work successfully. They are often dependent on the work of others and have to motivate others to complete different parts of the work. Consequently, the engineers consider it important to have the ability take responsibility and initiatives, to be creative and imaginative, introducing new ideas, finding new solutions, and contributing to innovation (cf. Mintzberg 1995). Although, many engineers regard their work as being independent they are at the same time dependent on the work of others as well as limited by organisational restrictions.

> That I am a little structured and actually decide that: this is what I am going to do today and try to set up some individual goals: this is what I should have done before … and so on, so that you actually get it out of your hands. Then I feel that my perception of what I consider I get out of my hands and what others think I get out of my hands isn't quite the same thing. Well, you are accustomed from school to … 'this and that should be finished by then', to doing my part and then it is done. You are kind of up to speed and then it is not certain that others have the same speed … and I kind of: 'well, now I have done this and … well, now we need to fix this and that and can you … can you do it? And this may be your part to handle and then nothing more happens. It relates to this business of the real world, that you are no longer in complete control of your own efforts any more. (Female engineer, 25, Linköping, interview person 43, interview 1)

There are variations depending on the place of work and organisation, different knowledge and personal characteristics are sought for. To what extent the work is independent is also to some extent related to the structure of the organisation in which they work. If the organisation is highly hierarchical, the degree of freedom may be more limited. On the other hand, in a small collegial organisation with a shared distribution of power and

equality of expertise, the co-workers' interdependency may be greater, and the need to be creative and take initiatives and solve the problems together with the others may be even more essential (cf. Lazega 2001).

> It depends on where you work, but here there are demands on being a creative person, that you can come up with your own ideas and solutions that are, well, realistic so to speak /…/ As we are small, no one can boss about, and say: this is the way we should do it. Instead, you have to solve the problems cooperatively and then it is very important that you are creative. (Male engineer, 23, Uppsala, interview person 13, interview 1)

Some engineers also argue that their work makes demands on certain leadership abilities. For instance, several engineers emphasise the importance of being able to convince others to do certain things or that they understand the need to do certain things. This requires the ability to negotiate, to convince, or even to manipulate others. The engineers, for example, speak of the ability to convince others to do what they want or need them to do. One engineer mentions that the people in the organisation may be reluctant do anything that is not explicitly included in their responsibilities.

> As team leader I must be able to hold my team together, must keep track of what the whole team is doing and direct, make sure we are doing the right things, prioritise our work assignments – be able to communicate and keep in contact with important people. (Female engineer, 28, Linköping, interview person 1, interview 2)

The engineers associate leadership abilities with socio-communicative competence and personal characteristics. Not uncommonly the engineers emphasise personal characteristics, such as having social or people skills and being extrovert, enthusiastic, open-minded, being a motivator or driving force and taking initiatives, rather than specific or generalist competence as important requirements for functioning in professional practice. Generally, the engineers point to personal characteristics and attitudes as their primary contribution in the workplace, rather than aspects ascribed to their education, as important when handling the new demands and responsibilities associated with professional practice.

8.2.3 Transferability of knowledge and competence use

There are engineers who argue that generalist competence such as methods and attitudes acquired in higher education are used in professional practice, while theoretical specialist knowledge acquired in their education is

considered less relevant to their present work. In practice, the engineers perceive that they can utilise transferable generalist competence, such as the analytical skills, problem-solving abilities and strategies acquired in their educational program. It is considered important to know how to approach and tackle problems. The engineers seldom mention the specific content of the courses in the educational program. Rather, a common perception among the engineers is that for instance the knowledge in math acquired in their education is less relevant and useful in professional practice. One engineer states that "*it's not really that kind of knowledge [such as math] that you use out on the job, instead it is more overall knowledge*".[94]

> What you learned during the educational program, I have a difficult time seeing that I have any use for, no. So referring to math courses and such – not completely – completely practical I have no use for. Maybe I have trained my logical thinking, if you go deeper into it, because that is logical too, but … programming courses to some extent perhaps, but I don't program in any language we learned there. However, you already knew when you started how programming works, even in other languages. (Male engineer, 34, Linköping, interview person 12, interview 2)

> Unfortunately, how should I put it, I don't use, for example, all this math I learned at university, actually not especially much at all. Then you could say that … math is good, it is math that gives you a perspective and you can get problem-solving strategies, and I mean you probably use a lot of what you have brought with you, from learning a lot of math. That … well, just the fact that you can manage to read so much. That is to say, that you always have with you. But unfortunately it's something that I don't …. that, for example, I don't use my actual math knowledge. (Female engineer, 28, Linköping, interview person 1, interview 2)

Although the engineers generally tend to emphasise the importance of generalist competence, some of the theoretical specialist knowledge acquired in higher education (or parts of the education knowledge base) may be transferable and applicable in professional practice, as competence-in-use. Some of the engineers work as programmers and the programming knowledge acquired in their education is obviously considered most relevant by these engineers. Thus, some of the respondents argue that some specific theoretical knowledge acquired through the education is relevant in their professional practice. Even though the programming languages applied in the

[94] Female engineer, 30, Uppsala, interview person 26, interview 2.

daily work may differ from the content of the programming courses in higher education there are some aspects, such as rules and design, which are common and easily transferable. There are some fundamentals that have been learned in higher education that are useful when the engineers learn new programming languages and they can relate the different languages to each other.

The educational program is considered to be broad to prepare the engineers for a wide variety of possible future tasks in the workplace. It is thus inevitable that much of the content of the education becomes irrelevant when the engineers specialise in the workplace. Several engineers argue that the educational program is so broad and that they have learned so much that they obviously have a lot of knowledge that is not used in professional practice. Predominantly, the qualifications required in professional practice are contextual, related to the workplace and the specific projects in which they work. Still, there is some generalist competence (including values, attitudes and motivations) which is relevant and considered transferable between projects and different contexts.

> But on the other hand it is exactly the same thing – if I have now worked in my 4-5 different projects here, much of what I – that is, the actual factual knowledge related to the assignment that you have, and I don't use that when I go on to the next on, instead I use what I call 'overall' or what you bring with you that is useful from time to time; that is, processes and tools and perspectives and such like /…/ and that is also what you bring with you from university. (Female engineer, 28, Linköping, interview person 1, interview 2)

Furthermore, several engineers argue that the educational profile is oriented towards a certain type of work, such as systems development, and a certain line of business, for example, the telecommunications industry. Thus, if the engineers work outside theses areas, which most of the respondents in this study do, much of the theoretical knowledge and the specific content of the education is less relevant to their professional practice.

> Since I don't work as a systems developer I don't use much of the knowledge I acquired at university (Female engineer, 32, Linköping, interview person 38, interview 2)

> In order to have any use for the knowledge acquired in the educational program you would have to work for either Ericsson creating mobile telephone systems, or for SAAB creating missiles /…/ this particular

> educational program was commissioned by Ericsson. (Male engineer, 27, Uppsala, interview person 13, interview 2)

Generally, the engineers argue that much of the specialist knowledge and qualifications required in professional practice is specific to the workplace and the work assignments. The engineers argue that they will end up in various different occupations with different kinds of tasks and assignments, which share no common foundation of explicit knowledge; that is there is no distinguishable professional knowledge base. They thus feel that it is impossible for the educational program to prepare them for the specific tasks that they will encounter in the world of work. The novice engineers do not feel that they are expected to know these specifics either. The novice engineers generally feel somewhat unprepared, but this is also what they had expected or anticipated while they were studying. The encounter with professional practice is associated with a period of learning when the novice engineers acquire knowledge and learn to understand applications, methods and tools that are specific to the workplace, and learn about the organisation and the products.

> It is the sort of things I have learned at work, that is – the actual foundations, to more easily be able learn the role, which you have learned during your education – but in order to be able to do the actual work, you have to learn in the workplace. (Female engineer, 32, Linköping, interview person 41, interview 1)

The engineers also emphasise the importance of practical experience in their professional practice. Many novice engineers lack practical experience and this is perceived as troublesome. In, for example, the interaction with co-workers and clients it is necessary to know the specific technical terms and concepts, used in the workplace and in the industry. Furthermore, the engineers mention an insight into where the industry is headed and the ability to anticipate future demands and needs are. Without this competence, the interaction with others does not run smoothly and the work is hampered. A foundation that facilitates further development and learning in the profession may be established during the years at university, but many of the procedures and how to construct 'real' products are learned in practice.

> You are pretty badly prepared at university, really, when it concerns coming out and doing this kind of work. Instead, most … you have learned a foundation, but when we are going to create real products it is a completely different way of working. This isn't something you learn before you have graduated. I have had internships and summer jobs, which

> have been the same so to speak. Now, I have had the opportunity to learn there. I have learned a lot more in my summer jobs than at university when it comes to this … exactly this programming to develop products and such like. Then basic knowledge – fundamental knowledge; which you have learned at the university. (Male engineer, 26, Uppsala, interview person 15, interview 1)

8.2.4 Education as a formal credential

Many engineers consider the specific content or profile of the educational program to be less relevant to their professional practice than generalist knowledge. An important reason why the engineers consider it more important to be a generalist and have a broad foundation is the perception that everything important that they need to know in order to cope with the demands in professional practice is learned in the workplace from experience in professional practice. Furthermore, the engineers mention the importance of not being narrow-minded and too focused on specific technical aspects; instead, general knowledge and an all-round education are considered to be valuable.

The specific educational program is in this sense not considered to be a necessity for the professional practice by all of the engineers. The knowledge required in professional practice may be acquired by means of alternate educational programs or in other ways. Still, their education is considered to be a useful foundation for the continuous development in the profession or, rather, development in the workplace, as the engineers argue that the generalist competence acquired during their studies has made it possible to more quickly become effective workers and reach full participation in the community of practice. In other words, without their education they would not have been able to adapt to the world of work as quickly, their education acts as a catalyst for further learning. Another aspect is the increased employability their formal education provides. There are engineers who argue that their education is not a necessity for doing the work, but without it they would probably not have been employed in the first place. The formal credentials are also related to the prospects of future career advancement.

> That academic title is valuable, that is, it's valuable in your CV, it's valuable when you are … in order to reach higher positions in organisations. So you have to have a degree somewhere in the background. You don't have to, but it helps, it facilitates. It puts a label on you as a person, if you work with IT because you have graduated from a master's program in IT or if you work with marketing-concepts or

> something similar, it doesn't matter at all. But you have learned abstract thinking, you have things in common to discuss and so on. (Male engineer, 31, Uppsala, interview person 33, interview 1)

One line of reasoning among the engineers is that their education is primarily a broad foundation and a meriting experience rather than a vocational preparation providing competence directly applicable in professional practice. Formal competence is emphasised and formal credentials are also relevant from this perspective. Having graduated from a program in engineering implies that the individual is capable of hard work and has the ability to learn. The exchange value of the educational program is emphasised and the education itself acts as a meriting system and a sorting mechanism (cf. Collins 1979, Meyer 1977).

> I see [the title] 'civilingenjör' more just as a receipt that, well … here is someone who can learn a lot of things in a short period of time, it is not the knowledge acquired in the educational program per se /…/ I don't use the knowledge in my daily work /…/ so I don't think you have to be an engineer with a master's degree – I don't think so. It is more, it is easier for the employers when there is some kind of label on you, it makes it easier to arrange people in different compartments. (Male engineer, 31, Linköping, interview person 12, interview 1)

It is not seldom implied by the engineers, especially in the follow-up interviews, that their educational profile is interchangeable with other professional educations or educational profiles and programs. The specialisation in information technology and not even an engineering background are viewed as necessary prerequisites of performing the work associated with their professional practice. There are other, alternative, ways of acquiring the generalist competence needed in professional practice (such as the ability to sort and structure information, the ability to learn).

> You don't have to have an education for the jobs we do – you don't have to. Not everybody has, especially if you look at those who are older. (Female engineer, 30, Uppsala, interview person 26, interview 2)

Although the engineers might have been able to do the work in professional practice without the experiences attained in the educational program, the

knowledge acquired through education is considered to have made the transition to productive professional practitioners easier.[95]

8.2.5 The gap between theory and practice

In the engineers accounts, there are descriptions of a 'gap' between higher education and the world of work, i.e. between theory and practice. There is a discrepancy between the educational and professional knowledge base and what is needed to perform the work is acquired in the workplace. Academia and working life are two separate communities of practice dominated by two different rationales (see Helms Jørgensen 2004). The engineers argue that the ways things are done, e.g. the methods and tools used, are significantly different in the world of work compared with the educational institutions.

A common understanding among the engineers is that the world of work is more complex than the work conditions during their education. In the world of work, the engineers face situations in which the problems are not clearly defined beforehand, but instead the professionals themselves have to identify the problem and the relevant knowledge to address the problem. In professional practice, the conditions and parameters constantly change and this means that the work requires flexibility and adaptability, whereas their education is perceived to have been arranged and static with delimited tasks to work with (cf. Bowden & Marton 1998).

> It is more complex out in practice. It is not like this or that as it was in the books, you took one course at a time and it was like this or like that. Instead, now it's everything at once. So it's sort of about ascending one level – knowledge-wise, that you … everything you have learned has to be adapted to all the complexity, and it is not just like this or that. (Female engineer, 30, Uppsala, interview person 26, interview 2)

Thus, the educational program is not perceived as constituting a realistic representation of what is expected in the world of work, according to the engineers. The engineers generally do not experience that their education gives them an adequate understanding of the conditions that characterise the professional practice, such as changed deadlines, budgetary restrictions, specifications from customers and other conditions that change during the course of their work. Nevertheless, the project and problem-based structure of the educational program is sometimes considered to be important in this

[95] For the physicians on the other hand, the education is a necessary requirement for being able to practise the profession at all.

context as it in some ways gives a more realistic presentation of some of the aspects of how work is structured in the world of work.

> During the educational program when you study certain things, you don't have any other parameters that have an influence. Even when you are doing small projects, you have no customer who comes in halfway and tells you that, by the way, you have to consider these requirements … we have already developed our requirement specifications. It doesn't work that way, you have to update and fix and try to incorporate and so on – well it doesn't work with the navigational structure we have built and then you have to adapt. Then when you have come that far, they come in and say: well, no, now we have to shorten the project by two months, now we'll take away this functionality. Then … well, you have to dig in again. So there are many such things that control, that you don't have to consider at university /…/ it could be anything, like the requirement perspective changing and deadlines being pushed up, or that two project members are suddenly transferred to another team or - oops, now we got a new architect here, that we have to bring up to speed. (Female engineer, 28, Linköping, interview person 40, interview 2)

During the program the engineers could concentrate on the specific content of the courses separately and they had an understanding of the predefined and constant criteria around which the assignments were structured. In practice, however, there are no distinctions and no predefined parameters, the conditions and criteria according to which the work has to be carried out constantly change. This means that there are demands on the engineers to have the ability to establish an overview and to manage different tasks at the same time.

> At university, a lot was very arranged. You were provided with relatively good conditions or … now we are going to take this course or this aspect and it will take 5 weeks and we have this … you have this requirement specification from the start or these are your goals, this is what you are going to achieve, and then there is an examination at the end of it. In working life, you may think that there is this fine framework, but then when you start digging and we are going to start working both this and that is missing and – oops, suddenly the date was moved, to when it all should be done, maybe even closer and so on, and when you are almost done it is moved the other way, and you can't control things and … well, I say that this will take two weeks and then somebody else says that you can only work on it for one week – okay … it is tougher out here I think. (Female engineer, 28, Linköping, interview person 1, interview 2)

At the university, the assignments are relatively clearly structured and arranged, well-organised and predictable, accommodating a 'school rationale' (see Helms Jørgensen 2004). The student 'knows' that there is a solution to the problems and the parameters are static. Furthermore, there is always someone more knowledgeable to consult. This is not necessarily the case in professional practice. Professional practice is characterised by unpredictability and uncertainty that differs from what the engineers experienced during their education. The engineer must formulate and solve the problem independently at the same time as being uncertain of what the possible outcomes may be. There is a framework of time and economy to consider and the results are also more important as others are dependent on their work. Furthermore, the parameters are not constant, deadlines are moved, the budget is altered during the course of a project, etc.

> The theory is very square in some ways. It works very well in an example, but then when you are going to implement it, then you have … In practice, you usually have many other parameters to consider that can be very easy to sift out in a theoretical problem, and primarily in technology, you have a lot of surrounding noise that always interferes and that makes implementation difficult, you have a lot of additional things to consider. (Female engineer, 26, Linköping, interview person 10, interview 2)

One of the major differences between studying and working pointed out by several engineers is that the quality of their work is required to be higher (compared to when they were students) partly because there is someone who pays them to do the work. Adjusting to the production rationale entails considering financial issues of the projects they are working on as well as the politics, and becoming result oriented rather than process oriented (cf. e.g. Helms Jørgensen 2004). Primarily, the higher demands are associated with adjusting to new criteria for evaluating quality. There are suddenly different (and higher) standards when it comes to quality and showing measurable results is central in professional practice. The projects the engineers have started working on are also bigger, more complex and extensive, and also stretch over longer periods of time. Thus, it is more difficult to attain an overview of the work and organisation. It is considered more difficult to determine how much time things will take. In professional practice, there is also more pressure and stress.

Several engineers emphasise the importance of realising that the work is ultimately about generating profits for the organisation (having a financial awareness) and showing results. This means that they have to balance the time and energy invested in specific tasks. Thus, the engineers also mention

the need to limit and adjust their efforts to the budget and time restrictions, for example, what is requested by the customer or "*to not do any extra work that no one asks for*".[96] Furthermore, one aspect of the computer-related work, mentioned by the engineers, is that it can be difficult to give an account of how much work and time has been invested in specific tasks. For example, upgrading a system may take a lot longer and use up more resources than the customer or user may realise. The engineers have to learn to evaluate how much can be achieved in relation to the financial limitations and the time restrictions. Thus, the products and services must work, be delivered on time and this must be carried out within a certain economical framework.

8.3 Comparative analysis and summation

The encounter with the workplace is associated with different initial conditions for the two groups. During their education, the physicians have a close relationship between theory and practice by virtue of the clinical training. Furthermore, the physicians believe their education provides them with competence that is directly applicable in professional practice and they see themselves as being prepared for the tasks and the way work is organised in professional practice. The physicians' educational and professional knowledge bases overlap. They tend to talk about the importance of being able to constantly associate their theoretical knowledge with practical implementation. Their education has a use value. The engineers, on the other hand, experience that there is a looser relationship between theory and practice. What is learned in higher education is not directly used in professional practice and there is a gap between the educational and the professional knowledge base. Their education has an exchange value and the engineers also argue that it constitutes a credential, important for their future career. This has in some ways also affected the descriptions of the transitional period. The physicians generally perceived their encounter with professional practice as a smooth transition into a world of work, which was well known. The engineers, on the other hand, more commonly describe the transition as bumpier or even as shocking. For a rough overview of the main results of the chapter, see table 4.

[96] Male engineer, 29, Linköping, interview person 19, interview 1.

Table 4: The table includes a schematic overview and summation of the most important results from chapter 8. As there is a considerable within-group variance the presentation should not be interpreted as dichotomous categorisations but rather as an orientation towards one of the endpoints of a continuous scale.

	Physicians	**Engineers**
Theory and practice	Closely interconnected during their education	Separated during their education
The nature of professional practice	Routine and standardised application. Process orientation	Complexity, uncertainty, unpredictability, diversity and variation. Result orientation
Professional knowledge base	Static	Changing
Relation between the educational and professional knowledge base	The educational and the professional knowledge base are strongly coupled	The educational and the professional knowledge base are loosely coupled
The impact and use of education	Direct vocational preparation, use value	Indirect general foundation, exchange value
The gap	Knowledge needs to be re-evaluated and reprioritised, increased responsibilities associated with leadership	Disparity between theory and practice, increased responsibilities associated with structural restrictions

Both engineers and physicians describe a disparity or gap between the knowledge conveyed in the educational program and professional practice, or rather between the expectations appropriated during their education and the reality of the workplace, which are manifested in different ways (cf. Helms Jørgensen 2004, Harvey et al. 1997, Lesgold et al. 1997). This disparity is connected to the fact that the world of work is too complex and uncertain to be fully prepared for in higher education. The engineers describe an incoherence or disparity between the way their education and their work is organised as well as between what is learned during their education and the demands that characterise professional practice. They argue that the knowledge about how to perform the tasks associated with the work is learned in the workplace. The educational program is not expected or perceived to be vocational and the knowledge provided is a foundation for learning the specifics in the workplace. The engineers argue that problems must be formulated and solved independently with an element of uncertainty as to what the possible outcomes might be at the same time as deadlines are moved and budgets revised during projects. There is a great variation in the

nature of the novice engineers' work and organisational contexts where the engineers are employed. It is understood that the educational program must prepare for a wide variety of potential tasks and that it can thus not be directly vocational, which means that there is an inherent gap between theory and practice as the specifics need to be acquired in the workplace.

Practical knowledge refers to procedural knowledge learned experientially and expressed in practice as know-how. Practical knowledge can be elementary, involving simple routine tasks associated with definitive rules and associated with stable and predictable contexts (Rolf et al. 1993).[97] Qualified practical knowledge is, on the other hand, associated with work contexts characterised by uncertainty, unpredictability, vagueness, and ambiguousness and requires flexibility and independent thinking (Rolf et al. 1993).[98] Thus, for the physicians, theoretical knowledge and elementary practical knowledge should generally be expected to be more important than for the engineers for whom the qualified practical knowledge should be more important in relation to their professional practice. For the physicians, few tasks are initially considered to be routine. However, through practice, as the physicians attain practical know-how, references, and accumulate experiences of a variety of cases, more aspects of the work seem to become routine. Experience can turn complexity into standardised applications in the relatively stable institutionalised context in which the physicians work (see Mintzberg 1983) requiring little reflection (see Schön 1983) or inference (see Abbott 1992).

However, the novice physicians describe a gap between theory and practice as a need to re-evaluate and reprioritise knowledge appropriated during their education. There is a line of reasoning among the physicians according to which emphasis placed on certain knowledge during their education is disproportionate to the importance placed on the same knowledge in the world of work. This can mean that the focus of different diseases during their education is not perceived to correspond to the prevalence of these diseases in professional practice. Knowledge, which the novice physicians had the impression was essential during their education turned out to be less important in professional practice and conversely knowledge that is prioritised in working life does not have a prominent position in the educational program.

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[97] By Mintzberg (1983) associated with standardised applications in professional bureaucracies where physicians are primarily employed.

[98] Related to what Mintzberg (1995) refers to as innovative organisations in which many engineers are employed.

The encounter with the workplace was also considered to bring about an understanding of what responsibility in professional practice entails. Professional practice is characterised by leading, delegating and managing work. The novice physicians have to learn how to manage being an assertive and decisive leader once they enter the workplace after graduation. Furthermore, the physicians have to take responsibility for making decisions that affect others and take responsibility for the consequences of these decisions. Associated with this is also having an insight into their own knowledge and knowing their own limitations. In order to make well-balanced decisions, the physicians argue they have to be able to determine if and when others need to be consulted. Colleagues expect them to not to make mistakes by making decisions they are not qualified to make at the same time as they are reluctant to burden colleagues if it is not necessary.

The engineers often argue that professional practice is associated with interdependency or being dependent on the work of others and greater responsibility to complete tasks in time as other are depending on it. They argue that the encounter with professional practice is also associated with adjusting to new demands and different criteria for assessing the quality of work. Their work is guided by generating profits for the organisation and showing results which means that the engineers always have to be financially aware. The products and services must be qualitative and be delivered on time subject to a specific economical framework and organisational restrictions. Several novice engineers are also in positions where leadership abilities and managing work are important, which they felt their education had not prepared them for.

The engineers consider themselves to be generalists with a broad foundation, which allows them to experientially learn the specifics of the work in professional practice in order to cope with the demands and requirements in the workplace. The theoretical specialist knowledge required in professional practice is considered to be specific to the organisation, the tasks, and projects in which they work, and related to specific applications or tools. In this sense, it is not possible for their education to prepare them for the specific tasks they will encounter in the workplace and the novice engineers do not generally perceive that they are not expected to know the specifics. Some engineers feel prepared for an intensive period of learning, whereas others describe a ‘reality shock’, where expectations of a smooth transition are in conflict with the realisation that they need to learn all over again.

Chapter 9: Learning and professional development

As the Greek philosopher Heraclites from Ephesus observed more than 2,500 years ago, the universe is in constant change ('panta rhei'). Thus, this is not a new thought but it seems to be more relevant than ever and appears to hold true for a world of work constantly changing at an ever more rapid pace; a change driven by technological innovation, increased internationalisation, competition, and division of labour. The view of education as preparatory is being challenged by the need for lifelong learning and demands for continuous learning and development throughout the professional career (see e.g. Barnett 2000a). In this chapter, the respondents' experiences of the need and opportunities for further development and learning in the workplace and in their profession will be explored, that is, what is learned and how. The generation of new knowledge has also led to an increased mass of knowledge related to the practice of most professions, which is associated with the specialisation process within the professions and the question of generalist versus specialist knowledge (see e.g. Abrahamsson 2002b), which has also led to difficulties in maintaining a professional identity (see e.g. Hellberg 2002). Consequently, the respondents' descriptions of the specialisation process and the construction of a professional identity and socialisation processes are also discussed in this chapter.

9.1 Learning at work

We live in a world undergoing constant change where nothing can be taken for granted, no understanding can be held and no action can be taken with any confidence, we are constantly and continually conceptually challenged. Both in society in general and in the world of work, as a result of uncertainty regarding future tasks, the demands for lifelong and life-wide learning have increased (Barnett 2000a). As described previously, it is not uncommon that the graduates portray their practice as characterised by encountering new and unknown problems and situations. Hence, continuous learning and professional development are essential for a successful professional practice. In the following section, the respondents' perceptions of the demands and opportunities for learning in the workplace and in the profession are focused on. Furthermore, an account of the respondents' descriptions of their experiences of obstacles or hindrances to learning in the workplace is presented.

9.1.1 The physicians

The physicians generally consider the demands for continuous learning and development in the profession to be significant. Their work requires constant acquisition of new knowledge, keeping updated and constantly renewing their knowledge about, for example, the most recent treatment methods and medicines.

> It is a continuous struggle so to speak, that I feel that I constantly have to further my education, continuous learning. To keep up with developments and … Only in this business of medicines, that is, pharmacology – there are new medicines almost every week that I have to know about and know indications and I have to know about the side-effects. Sure, you can read in FASS and so on, but it is ... you should preferably have your own experience of these medicines. And then there are different … well, treatment areas and new investigatory procedures and … that is, there are new developments all the time, so it is very difficult to keep up. (Female physician, 34, Linköping, interview person 18, interview 2)

Some aspects of the professional knowledge base are considered to be relatively static whereas in other areas, research and development rapidly renders knowledge obsolete and increases the demands on the physicians as regards continuous learning. The extent to which the knowledge is considered static varies with different specialisations. One physician argues that the foundation of knowledge, or the knowledge base, seldom changes in for instance lung or kidney medicine whereas general medicine is a specialisation where the knowledge base is constantly being updated and the conditions are changing all the time. Furthermore, medical knowledge is also considered to be relative and related to contextual factors as there are different interpretations and 'cultural' differences between different places of work.

> In some areas, there has been a status quo since the 1800s and in others very much will happen extremely fast /…/ The conditions have changed and it is important to keep up with developments. Firstly, it is difficult to use the knowledge, it is simply outdated, you constantly have to find new knowledge. Secondly, nothing in medicine is static and constant, it is always about interpretations and everywhere there are different ways of perceiving things. You use different treatment methods depending on the tradition and material assets or financial or … well, whatever it may be that is the basis of the decision, but everyone does it a little bit differently. Everybody has individual ways of seeing things which also makes it very

> difficult and frustrating when you are new. (Female physician 27, interview person 5, interview 2)

The general training position, required for the medical license, after graduation from higher education is considered to be an educational or training position and a continuation of the higher education program, which includes formal aspects, such as lectures and seminars. Experience of professional practice is considered to contribute to the novice physicians' learning and personal development. A common way of reasoning among the physicians is that they learn daily through constantly encountering novel situations and problems, they meet patients with different problems, see new things, and are forced to re-evaluate and renew their knowledge. The physicians often feel that they learn by carrying out the activities associated with the daily practice such as writing reports and interpreting x-rays. The primary context in which the learning is perceived to take place is the interaction with others, mainly in the form of contacts with patients. Important sources of new knowledge are feedback from patients, seeing what works and what does not, a kind of 'trial and error and hope no one dies' as formulated by one physician, is considered an important part of the learning process. Making mistakes is emphasised as an important aspect of the learning process, as long as the patients are not affected negatively. Among other things, the physicians learn about themselves and how they react in different situations. The physicians generally feel that the opportunities for learning and development at work are good. However, several physicians describe their development as being characterised by, alternately, periods of stagnation (associated with routine and low demands) and periods with high demands on learning. This is associated with, for example, new work assignments or having a good supervisor.

The physicians also generally stress the importance of co-workers for continuous daily learning. In situations where the physicians are uncertain about the next step, feel that they lack knowledge or question the limits of their own knowledge, the primary course of action is to seek out and consult a senior physician. The novice physicians generally state that they always have someone to consult. Senior physicians, supervisors, and other colleagues and occupational groups are often considered by the novice physicians to be important sources of learning and development in the profession.

> I have learned incredibly much by working … well, with different senior physicians and … well, colleagues as well of course, other physicians in specialist training and … I have learned, I have learned a lot from other

> occupational categories as well, that is, everyone from nurses to occupational therapists, physiotherapists, psychologists, counsellors. (Female physician, 34, interview person 18, interview 2)

The interaction with other people is considered to be an important part of the process of building confidence, self-efficacy, and a sense of security, which promotes personal development. New knowledge is associated with role models where both positive and negative examples are considered important.

Primarily, the physicians associate learning with informal contexts and consider learning to be imbedded in their work, where their work and learning cannot be separated. However, the formal demands of, and often also the opportunities for, formal education and learning are not always considered to be high. Learning and development are often considered to be the physicians' own responsibility, and are related to taking initiatives and it is important to establish solid contacts with colleagues. Some of the physicians mention that they experience limited support from management as regards the continuous learning and development in the profession. It is felt that the demands on being knowledgeable come primarily from the patients. The physicians also make high demands on themselves when it comes to being knowledgeable and having answers for patients and co-workers.

Other sources of information are books and the Internet. One physician points out that the medical literature, in many areas, is predominantly American and that the research is not always applicable to the Swedish context. Thus, consulting others is still the single most important source for continuously updating and renewing the physicians' professional knowledge base.

> If I think I can look it up easily in a book, if it concerns very concrete things, such as dosage for medicines and so on, I will do that; or an alternative is the Internet. However, if it concerns assessment of … so to speak, well, a patient, you go to a supervisor or senior physician and have a discussion; sometimes even other physicians undergoing specialist training. (Male physician 29, Linköping, interview person 2, interview 2)

Obstacles to learning

The physicians also describe hindrances or obstacles to their professional development. The primary hindrances to learning and development in the profession, mentioned by nearly all the physicians in this study, are a heavy workload, stress, insufficient resources and time (compare with the nurses' experiences in a study by Eraut et al. 2003). The lack of resources is a strain

on the system and in some places there is a lack of available or accessible specialists for the novice physicians to consult and learn from. There is little time during the working day to read and acquire new knowledge. Several physicians also argue that there are limited opportunities for reflecting on their own decisions and the actions of others as reflection-about-action (cf. Schön 1983).

> I think that a lot concerns time aspects. That is to say, there is often a very tight schedule and you wish that you had more time sometimes so you had time to explore interesting things; but often you have to move on immediately so you never really have the time to pause and maybe read up or like … as you would like. And you don't always have time to reflect about what happened and so on either, instead you often have to just move on. So to a large extent it concerns time – lack of time I think is often a major obstacle. (Male physician, 31, Linköping, interview person 21, interview 2)

One physician argues that all the time in the workplace goes directly into the 'production' and there is little or no time for learning and development. According to this physician, 'production' refers to how many examinations a physician can complete within a specific period of time, and the primary goal of the practice is to reduce the queues in the health care system. Thus, it is felt that the health care system is becoming increasingly result oriented.

9.1.2 The engineers

Generally, the engineers consider the profession is learned in the workplace and the engineers' initial encounter with the workplace is often associated with an intensive period of learning. The opportunities for learning and development in the profession are commonly considered to be good and the engineers' professional practice is often characterised by constant knowledge acquisition and continuous learning. It is not uncommon for the engineers to relatively frequently change work assignments and roles in the organisation. A new situation, such as the start-up of a new project, creates demands for new learning (and the ability to quickly orient themselves in new areas and to be flexible and adaptable), but can also generate insecurity as regards their knowledge and affect their self-efficacy. There are descriptions among the engineers of recurring periods of feeling under-qualified.

> A little harshly, you could say that it is completely new knowledge when you change to a new assignment. Now this is … my fourth assignment anyway, where you change customers. You change direction somewhat,

> and that requires massive knowledge acquisition. And then you continually develop it and that is, well, you have to. You have to learn new things all the time. And then when I have been on this assignment for almost a year, you are still learning things and you have to learn things /…/ when you are involved in starting up a project or designing something or exploring things then it can feel like you are developing immensely. (Female physician, 28 Linköping, interview person 1, interview 2)

The engineers often work in project-based environments. Both the requirements and demands on learning during the projects can be experienced as uneven over time, as 'jerky' or 'periodic'. During the start-up of a new project, there are requirements related to acquiring a large amount of new knowledge associated with the specifics of the particular project and thus an intensive period of learning follows. There are engineers who argue that, in primarily large or comprehensive projects that run over a long period of time, a phase of retaining status quo characterised by maintenance and administration then takes over. During this period, the focus is on supporting and administering the ongoing project and the demands on and opportunities for development and learning are considered to be limited. The management of the project is instead characterised by routine tasks.

> Now it has become more maintenance and such boring things /…/ by maintenance I mean sustaining existing solutions for customers, that is, more like managing operations. It has to work over time, but it is a rather boring enterprise. (Male engineer, 27, Uppsala, interview person 13, interview 2)

Getting stuck in an administrative position with routine and repetitive tasks is perceived as leading to stagnation in one's professional development. Lack of variation and challenges in the tasks and assignments as well as an inability to utilise competence is perceived by the engineers as a potential threat to their opportunities for learning in the workplace. Several engineers argue that work characterised by routine, or that lacks sufficient challenges, is a primary reason for changing jobs or place of work. Instead, constantly learning is considered to be a central part of the profession for the novice engineers. The engineers commonly emphasise the importance of varying and diversified tasks, of constantly being challenged and stimulated and encountering new problems related to knowing-in-practice (cf. Schön 1983). An engineer argues that "*the significant development occurs when you encounter something unknown and have to figure out how it works*"[99]. A prerequisite of

[99] Female engineer, 35, Linköping, interview person 41, interview 2.

learning is considered to be when the content of the work is challenging; "*you learn by working with things you don't know how to do*";[100] "*the most effective way to learn is to find the courage to do things you are afraid of*".[101] Thus, the learning process for the engineers is often perceived as taking place when they solve problems, encounter new problems, face difficult situations, and make difficult decisions.

The engineers in general feel that the relation between their competence and the demands in the workplace are well balanced, although this may vary depending on assignments and projects. Having a match between the actual competence and the requirements of professional practice is considered essential. The work should be challenging with little routine work and a high degree of freedom.

The engineers argue that the primary source of information and new knowledge is the Internet. Knowledge is seldom acquired from books as it is felt that they become outdated too quickly. In addition to the Internet and, in some cases, articles, the engineers also claim to learn through interaction with other people in the workplace, such as colleagues but also consultants and customers (cf. Eraut et al. 2003). The extent to which the engineers feel that they are given support and are able to consult co-workers varies greatly. Several engineers also find it difficult to determine what is expected of them, what they should be able to manage and cope with on their own, and to what extent they can demand assistance from other people. Furthermore, it is not always easy to determine who they should turn to for support and assistance.

Through experience in the workplace, the engineers acquire an overview of the competence of their colleagues and learn who to consult on different issues. There are also more or less structured informal systems for conveying information in the organisations in which the engineers work.

> In this company there is a competence network, so you just send out a question and what category it concerns and then those who think that they can answer the questions within the category answer. So it's a rather fast way to get your questions out and have them answered. So there are no problems, it is used rather diligently. (Male engineer, 29, Uppsala, interview person 15, interview 2)

The perceived control or degree of freedom in the learning process varies. Some engineers feel that their work limits their opportunities for general learning and development in the profession and broadening their professional

[100] Male engineer, 29, Uppsala, interview person 15, interview 2.
[101] Male engineer, 28, Uppsala, interview person 32, interview 2.

competence, for instance, when they have to focus on very project-specific knowledge. The engineers feel that they do not always have time for general reflection or seeking a deeper understanding through reflection-about-action (cf. Schön 1983). Other engineers, on the other hand, feel that they have more freedom to control their own learning process.

The organisations for which the engineers work are more or less diligent in arranging and providing formal education for their employees. Often, formal education initiatives need to be initiated by the employees. External courses and conferences are mostly considered to be most beneficial for the engineers, mainly because they are a way of establishing new contacts and expanding their social networks outside the organisation.

> I am taking a course in a few weeks, only a two-day course, in user-friendliness. /…/ it is both for the knowledge you acquire, I think, and then for the network you acquire, probably a little more for the network - you pay a lot of money for the network. But for meeting others in the same situation, that you are able to keep in contact with them, seeing how they solve problems and what methods they work with and so on. (Female engineer, 28, Linköping, interview person 40, interview 2)

The engineers argue that some forms of learning are considered more beneficial for their future career than others. General individual professional competence is often perceived to be subordinate to increasing competence relevant to their specific tasks. Formal education providing credentials in specific contexts is more of a merit than seeking a general understanding of different processes and acquiring an overview of the activities and organisation. Several engineers work as consultants in competitive conditions. Formal credentials are a way of enhancing personal merits and it is considered beneficial to have 'diplomas' to show the employer when negotiating.

> To a certain extent it is, it is not easy because consultant-based workplaces are about selling yourself or your competence. So it is a lot about rattling off abbreviations about this and that, things that can be put down on paper. However, there are a lot of things that cannot be put down on paper as well, for example, that I think strengthens that … the comprehensive overall view, really understanding the whole chain. Such things are considerably more difficult to put down on paper than that I know this and that programming language. (Male engineer, 29, Uppsala, interview person 16, interview 2)

Obstacles to learning

However, general knowledge acquired in day-to-day activities is not always acknowledged as a merit from a career perspective. Informal learning and professional development are seldom 'measurable' for the organisation and possible to relate directly to increased efficiency. Consequently, aspects of individual professional development and learning are less prioritised in the organisation. Professional development is therefore often dependent on individual initiatives and occurs outside the framework of the work context. One engineer refers to informal learning that is not directly related to specific work assignments as 'guerrilla activities'. Another engineer argues that in order to get time in the workplace for formal education and development, the benefits of individual learning and personal development have to be converted directly into potential economic gains for the company.

> If it was a little calmer at work, that is, you could take the time, you could take an extra course, you could turn off the phone on Monday and read up on something, you wouldn't have to be on edge all the time, so you could play around a little more. That might make me a better leader perhaps. It is constantly about pre-emptive work and discharges, so to speak. Perhaps in the long run you would profit if everybody did it. However, it is not measurable and as long as it can't be condensed into a pile of money that can be compared to another pile of money you can't get through. Money is … because if I could calculate this – well, if we dedicate 4 hours on Monday mornings every week to do whatever we like or read interesting books that would give us a half per cent in increased effectiveness. If there was only a measurable number then I could sell it to any project leader in the world and that would be a step in the right direction. Still, as long as you can't measure it, the only thing you hear is – well demands, demands. (Male engineer, 31, Linköping, interview person 19, interview 2)

Some engineers argue that there is a lack of consideration for the long-term benefits of the general professional development and broadened competence of the employees.

> It is very difficult to give a reason for perhaps, to your boss or to a board or whatever it may be, that we need a long-term plan or we need to invest money long-term. Because you can't justify it and this short-term perspective always wins and – no, you can't go on a one week course, then our short-term plan of being able to deliver before summer is shattered. While in the long run, you may generate a person who is motivated and has learned something new. That he has new motivation and also perhaps

> newer knowledge, which will make it possible to do things more efficiently. (Male engineer, 28, Uppsala, interview person 32, interview 2)

It is not uncommon that the engineers argue that their work and thus their learning opportunities are controlled by time, money and customer needs. Heavy workloads and lack of time are other restrictions on the engineers' perceived opportunities for professional development. Also, for several engineers, customer relation are central in professional practice and learning how to interact with, handle customer needs and sell ideas is emphasised. One engineer argues that the projects are controlled by customer needs and all solutions should always be initiated by the customers in order to avoid spending time on solutions without knowing if the customer is interested. This also implies close cooperation with the customers.

> Solutions should always be initiated by the customer, for example, so you can't sit down and come up with something and think that this is really good, we will sell a lot of this and people will want it, and you put a lot of time into it and then when you go to the customer and say this is what we have, the customer says - but we have no interest whatsoever in that. Thus you must always collaborate closely with the customers. (Male engineer, 27, Uppsala, interview person 13, interview 2)

Another obstacle or hindrance to the learning environment mentioned by an engineer relates to collegiality and the potential internal competition among consultants. There may be reluctance to provide colleagues with information or help them acquire knowledge in order to attain a 'monopoly' of the expertise in an area within the organisation in order to become indispensable.

> Then there are these people who are not willing to give, who have knowledge but perhaps do not want to share it. /…/ they are a little protective, they see it as their niche perhaps … this is what I know and it may be what keeps me in the company … it may not be that serious, but still more or less, some people are a little stingy when it comes to sharing /…/ they may feel threatened by new people, who have, or will come up with, new ideas that they may not understand or it may be a little threatening overall. It may be that somebody feels, to be able to stay on or to still be an important person, they want to keep the knowledge to themselves. (Male engineer, 28, Uppsala, interview person 32, interview 2)

9.2 What is learned in the workplace

The learning processes, as described by the respondents, were presented in the previous section. Whereas the preceding section focused on the how aspect of the physicians' and engineers' learning processes, the focus of the following section is on what is learned in the workplace, or the substance of learning, relevant to professional practice and development within the profession.

9.2.1 The physicians

When talking about what is learned in the daily practice related to the professional knowledge base, the physicians emphasise the development of their communicative competence in patient contacts, theoretical specialist knowledge, related to different methods and medicines, practical knowledge or know-how related to, for example, clinical examinations, operating procedures, treatment of fractures, interpreting x-rays, treating burn victims, and the ability to make decisions.

In their professional practice, the physicians claim to have learned how to become more effective, which entails having to spend less time with each patient before being able to determine what course of action is appropriate, spending less time ordering unnecessary tests, carrying out the investigations and examinations in a shorter period of time, spending relatively less time on administration and other routine-oriented work and more time with the patients. This is associated with gaining confidence in their professional role, their knowledge, and acknowledging their limitations.

> Important learning is, what I already have touched upon is, that you don't have to take so many measures with everyone. You can come a long way, especially when it comes to vague pains that do not fit into any diagnosis or any pigeonhole, you can come a long way by just listening and being honest and saying that – I don't really know what this is, there is not much I can do about it, it doesn't seem like anything serious. (Male physician, 29, Linköping, interview person 2, interview 2)

The educational program may have provided a foundation of theoretical and practical knowledge, but still, as one respondent argues, the novice physician have a "*general idea of everything, but really don't know that much*".[102] In professional practice, the physicians learn to implement theoretical knowledge in practice, to turn know-what into know-how. In many

[102] Female physician, 28, Göteborg, interview person 36, interview 2.

specialisations in medicine, professional practice is characterised by know-how that is appropriated through experience, that is, knowledge that has to be learned in the workplace and cannot be provided by the formal education. How much of the theoretical and practical knowledge learned in higher education, which is used in professional practice, and thus also how much they have to learn after graduation in order to become an efficient practitioner seems to be related to where the physician is working. Some of the physicians claim to have learned a lot about how to actually perform the work and how to act as a physician in the workplace during their general and specialist training. The knowledge appropriated in their education is also often considered to be primarily a base to build on in practice where the practical knowledge characterising professional practice is learned by working. Much practical knowledge needed in professional practice is appropriated through experience and by having the courage to perform the practical procedures as well as reflection (cf. Schön 1983).

> You have a lot of basic knowledge – I already had that before, because it is a prerequisite that you know a lot about different diseases and anatomy and physiology and understanding pictures and so on, of course. However, the purely diagnostic side - looking at pictures and interpreting. I mean just a computer tomography – I had no idea of what I was looking at when I was a novice, it was only a conglomeration of grey nuances, but now suddenly I am able to discern what is healthy or sick and what it is, hopefully. So it is, in radiology it is pretty much starting from scratch when you come here. (Female physician, 36, Linköping, interview person 25, interview 2)

In the interaction with the patients, the physicians learn, among other things, to be assertive and self-confident. During their education, the physicians are basically instructed how to act and what to do and how to become a decision-maker and a leader is a transition in learning.

The physicians also claim to have become better at handling the contact with patients, from experience the physicians become more focused and concentrated when meeting patients and are thus also more effective in their work and establish a more confident relation with the patients. As novices in the profession, the physicians have to spend a lot of time conversing with the patients, determining the essence of the problem for which the patients are seeking help. With experience of patient communication, the physicians learn to become more effective, to arrive at a diagnosis in a shorter period of time.

Several physicians also state that they have come to realise that the meeting and communication with the patient were even more important and central to professional practice than they realised during their education. In

professional practice, they have learned the importance of being emphatic, of being humane, compassionate, and listening. One physician claims that it is often more important to explain things thoroughly, to emit confidence and to be reassuring. Listening to the patients and taking them seriously results in more satisfied patients as well as a lighter workload in the end.

9.2.2 The engineers

The engineers' learning and professional development is generally closely tied to the organisation in which they work and the position they hold in the organisation. Generally, the engineers argue that the learning in professional practice is characterised by specific knowledge about the products and the organisation. The content of learning or the professional knowledge base is often connected specifically to the organisation and the products the engineers work with, but can also be of a more general nature, e.g. problems related to programming.

> It is often very applied knowledge, that is, it concerns how our product works and such things. It is seldom the kind of things you can read up on at university. (Male engineer, 34, Linköping, interview person 12, interview 2)

The engineers claim to have learned different specialist competences in professional practice, including competence associated with specific methodology, attitudes, and technical skills, e.g. related to programming; "*I passed through the entire educational program without knowing a single Unix command, but my first job was as a systems administrator of Unix systems, I needed to learn everything from the ground up there – it is also useful for understanding Windows*".[103]

Through experience, the engineers argue, they have learned how to apply theoretical knowledge about methods and 'tools' that they previously only had a general understanding of but never had the opportunity to utilise, turning know-what into know-how (cf. Schön 1983). Through practical application and consequences, the engineers have learned about the advantages and disadvantages of different methods and solutions. Their theoretical knowledge is related to practical applications and 'the real world'. In general, the engineers emphasise the importance of practical experience as a means of acquiring a more profound understanding. Practical experience also creates references for their theoretical knowledge as well as authority.

[103] Female engineer, 32, Linköping, interview person 41, interview 1.

> Today, I feel that I have a bigger … I have bigger luggage, I have more things to compare with. I can … I can justify based on experience in one way or another, what I want to do or why and what objective I think we should have, or objectives – what strategy we should have and so on. It wasn't this way when you were a novice when you could justify with knowledge … or, well, knowledge based on a theoretical foundation. Now I can justify by referring to real cases. (Female engineer, 28, Linköping, interview person 40, interview 2)

In professional practice, the engineers are part of an organisation or structure (e.g. a project) and several engineers argue that they acquired a wider perspective related to having learned how different parts are connected and how different solutions affect each other. Several engineers also argue that they have learned that they are dependent on the work of others, that other people rely on their work and how co-workers 'function', to finish things on time and to give clear instructions about what needs to be done.[104]

In professional practice, the engineers also claim to learn to become more effective and how to balance time constraints with quality, that is, finding a balance between what they want to do and what the customer wants. The engineers have also learned how to organise their own work and the work of others, how to delegate work and take responsibility. The engineers also claim to have learned to become more assertive and confident in their own knowledge, and this also leads to the confidence to say no.

Several engineers argue that they have learned to not spend as much time on different tasks/assignments, statements such as 'time is money', 'you can't do what you want to do, but what you have to do', 'you have to leave things and move on before you understand them', 'every hour costs money so you can't do things just for fun' underline this.

One engineer argues that what is learned in professional practice lies outside the core of the educational program; in other words, the educational and professional knowledge bases are separated and do not overlap. However, the educational program is considered to have a bearing on professional practice and constitutes a relevant foundation for the acquisition of this new knowledge, which gives the engineers a basis for contributing to the organisation.

[104] See section 7.4.1 for further elaboration.

9.3 The specialisation

New knowledge and new demands associated the professional practice, and an increased differentiation within the professions, have lead to the need for many professionals to specialise within their professional field (see e.g. Hellberg 2002). The specialisation process is also related to whether the educational program is seen as a direct vocational preparation or more of a broad general orientation for further development or learning in the profession (specialists vs. generalists). The engineers in a sense specialise even before entering higher education when they choose an information technology profile for their studies. The physicians' specialisation, on the other hand, takes place after they have graduated from higher education and their general training (and have received a licence to practice medicine). However, this is somewhat simplified and in the following section, the respondents' specialisation processes are focused on and further elaborated.

9.3.1 The physicians

The physicians share a common background in their education. After graduation, they have to go through a general training program after which they start their specialisation. The educational program gives them a broad vocational foundation after which they are ready to start working as general practitioners; but during their specialisation, the physicians focus on and deepen their knowledge in relation to one specific discipline in medicine.[105] When choosing a specialisation, several physicians argue that the choice is also between breadth and depth, to be a specialist within a narrower field or to be a general practitioner.

> The educational program is broad and then when you chose a specialisation you also chose what not to work with, because you can't work with everything you have studied, that's the way it is. (Female physician, 36, Linköping, interview person 25, interview 2)

Some physicians associated becoming more specialised with losing the broad foundation or general overview of medicine (as knowledge not used, utilised or applied in professional practice is considered to be forgotten). Other specialities are considered 'narrower' and the physicians feel that parts of their education become less relevant as they search for in-depth knowledge and a deeper understanding of their specialisation.

[105] As elaborated in chapter 8.

> You have gone through your general training which does not include children, so there you were working for two years with things that you don't have any use for here; and of course you will eventually lose the knowledge that you don't use here /…/ you always make a choice, except for general medicine, then, and family physicians and such like, in those cases you become broad /…/ It is mostly adults and the elderly and cardiovascular disease and so on and that has no significance for children. (Female physician, 31, Stockholm, interview person 3, interview 2)

Thus, the extent to which the physicians perceive their education as relevant to their professional practice, or the extent to which they utilise the knowledge acquired in their education, depends on which specialisation they have chosen. One physician argues that "*general medicine is a very broad, but shallow specialisation*".[106] Working in the emergency room also gives the physicians more opportunities to draw on much of the knowledge acquired in their education. This is also a situation for which, some physicians argue, the educational program has provided solid prerequisites, enabling the physicians to utilise much of the knowledge acquired in their education.

> That is what is so rewarding when you are working in the emergency room, that is, here you can really use all the knowledge you have /…/ you have the opportunities to do precisely everything and then you use everything you have learned in different lectures around – almost everything, even pathology /…/ there, you have every opportunity to transform it into practical knowledge. (Male physician, 28, Göteborg, interview person 9, interview 2)

As a general practitioner, it may not be necessary to have in-depth knowledge, but the important thing is to have broad knowledge and have a general sense of a wide variety of possible diagnoses. One physicians describes the work as a general practitioner as not helping the patients to any major extent, but rather to be able to generally identify the problem and guide the patients to a place where they can get help.

> I think that I am rather good at my main assignment, that is, meeting the patients, identifying the problem and ensuring that they feel heard and satisfied with coming here and trust that I will make a reasonably accurate assessment, even if it doesn't mean that they will get that much help from me, so to speak. (Male physician, 29, Linköping, interview person 2, interview 2)

[106] Male physician, Linköping, interview person 37, interview 2.

Generally the more highly specialised the physicians become, the more they tend to argue for the importance of their education as a foundation for further development rather than for the directly vocational aspect. The educational program is not a direct preparation for the specialisations in medicine. However, the physicians, who have chosen to specialise in general medicine, tend to emphasise the directly preparatory or vocational nature of the education al program to a greater degree than those specialising in e.g. radiology or surgery.

Different specialisations make different demands on the physician, with more specialisation comes more specialised demands. An example given in the interviews is that in geriatrics, it is important to be able to discern what is normal aging and what is associated with illness. One respondent argues that a general practitioner meets many patients and most of them are not considered ill enough to be referred or even to be in need of any further medical assistance. However, the more specialised a physician becomes, the more sick patients he/she encounters. Also physicians with specialisations other than general medicine consider it important to have a solid foundation of general medical knowledge, although they also emphasise the need for deeper knowledge within their specialisation.

Generally, the physicians see their education as a direct vocational preparation (in contrast to perceiving it as a general foundation for further learning and development in the profession), and feel that they have acquired the appropriate theoretical and practical knowledge required in professional practice. They consequently tend to emphasise the directly practical preparatory elements in the educational program. The educational program is thus expected to contribute knowledge directly applicable in practice or, as one physician puts it: "*The most valuable thing was that you got a vocational education.*"[107] One physician makes a comparison with engineering education, which is not considered to be vocational. Instead, engineering education is perceived to be a credential or proof of the graduates' ability to work hard (cf. Kaufman & Feldman 2004).

> That the advantage of this job or the education I have is that it is a vocational education; that you are educated for exactly what you are going to work with. So I can imagine that there are … it can be like for the Chalmerists [engineering education] who get a more diffuse education in a field without knowing exactly what their work will be, but may start when they have graduated by handling finance, for example. They only have their degree as proof that they can work hard. No, I don't feel either over-

[107] Female physician, 25, Göteborg, interview person 4, interview 1.

> or under-qualified for what I do, but sometimes I feel that I could do more if my work was organised in a different way. (Male physician, 28, Göteborg, interview person 9, interview 2)

The physicians' specialisation takes place in the workplace where they are still undergoing formal education and general training, which is followed by specialist training. Their education is considered to be a broad preparation and provides a foundation of theoretical and practical knowledge in general medicine that is relevant to their professional practice. However, the physicians become specialists in a specific discipline in medicine in a formalised system building on their formal professional education where all physicians follow a similar path although they may have chosen different specific specialisations.

9.3.2 The engineers

Many engineers generally emphasise that their work requires broad and general knowledge, rather than in-depth, specialised knowledge, or knowledge about a specific field or area. It is generally considered more important to know a little about a lot of things than a lot about a few things and above all transferable generalist knowledge is emphasised. Thus, generally, the engineers tend to emphasise the importance of broad generalist competence rather than specialist competence. It is considered valuable to have skimmed the surface in many areas and subjects during their studies, such as having gained experience of working with computers and having seen different computer programs. The tasks and the nature of everyday practice constantly vary. The engineers encounter new and unexpected situations, new problems and demands for new knowledge. The demands for specific knowledge required in professional practice also vary with the specific tasks, projects and place of work. The engineers specialise in relation to the organisation and the products they work with. Client-related work entails less theoretical knowledge and makes greater demands on personal characteristics while systems development makes greater demands on technical knowledge.

The most important aspects of their education is often considered to be its breadth which allows the engineers to acquire an overview, having heard the terms and concepts before is more important than knowing all the specifics. It is more desirable to have a holistic understanding than to be an expert in a more limited field.

> Actually, you don't have to know every little detailed thing, instead I think that what has been very useful from my education is that you – that you in

> some way have developed a general conceptual understanding, you have heard the concepts before and so, what people say isn't just mumbo jumbo, instead you have a general understanding of what they are talking about, and if they explain even further you understand even more. (Female engineer, 25, Linköping, interview person 40, interview 1)

Hence, a common perception among the engineers is that they are generalists; they claim to 'know a little about everything' but are not experts on anything. The engineers consider themselves to have a holistic overview of operations or activities and seek out roles that entail organising, managing and leading work.

A general overview entails being able to survey different situations, collate large quantities of information, being structured, having general analytical skills and being able to foresee potential possibilities and risks in order to know what is realistic, and being able to draw up estimates. This is also referred to as conceptual knowledge, which relates to knowing how things work (not in detail, but generally). These are considered essential characteristics of being able to bring different activities together and encourage people to cooperate effectively. The ability to 'see the bigger picture' is also considered to facilitate problem solving.

> Solving problems in a creative way, trying to identify the problems, analysing them and not staring blindly at just one thing, but instead trying to see the context, to see the broad outlines and ten be able to break it down and address it. (Male engineer, 29, Uppsala, interview person 16, interview 2)

A broad foundation is also considered essential in order to be informed and understand different contexts in the organisation. Detailed knowledge is considered less important and as they have acquired generalist competence, the engineers are confident that they can quickly acquire the specific knowledge required when needed.

> I have broad knowledge, I think, in many areas. /…/ you know that there are different types of solutions and know how they generally work, but the detailed knowledge you have to dig up when it is needed, so to speak. (Male engineer, 27, Uppsala, interview person 13, interview 2)

Being a generalist rather than to being highly specialised is also related to the desire not to be restricted in the future professional career, expressed by a respondent as "*I don't have to do the same thing all my life*" and by another engineer who argues that:

> I think that with my education I will be able to work in many different organisations only because I know how to learn new things, not that I know that specific organisation. That is what I think. (Female engineer, 28, Uppsala, interview person 26, interview 1)

However, having a broad foundation, knowing a little about a lot, can also have negative aspects and can be perceived as frustrating. One engineer is dissatisfied because she has not mastered anything specific well enough.

> We have become rather broad. I don't really feel that I come out and I know this, instead I know a little about a lot and that feels a little … in a way unsatisfactory, that you don't feel that you master anything really well. So that is what I am pursuing now, when I have started working, to find your domain, because I still don't think you have done that or I hadn't found my domain during my studies that I feel that I … am enthusiastic about. Instead, you have learned how to study, you have learned, well, learned a lot but maybe not that, I can't really apply it because I haven't worked more with it. (Female engineer, 25, Uppsala, interview person 23, interview 1)

There are also engineers who chose to specialise and become experts in a specific field or discipline. The engineers who chose to specialise, in e.g. computer programming, may not feel they are expected to participate in activities related to organisational development or feel the need to acquire an overview of the organisation. The demands they experience are related to the specifics of their work. However, the majority of the engineers in this study chose to become generalists rather than specialists. Generally, the engineers consider their education to be a broad foundation for further development and learning in relation to their work and the organisation.

9.4 The professional identity

In the following section, the focus is on the respondents' descriptions of the construction of their professional identity or role. Whereas the first two sections in this chapter illuminated the training and qualifying aspects of professional practice, socialisation will be central in the following presentation. Furthermore, the respondents' orientation in the development of their professional identity will be focused on. Education is commonly considered to be important when it comes to socialising processes or fostering individuals as members of a group, but the work community is also significant when it comes to the professional socialisation of non-cognitive attributes, personal characteristics such as values, vocabulary, manners or

appropriate behaviour, discipline and work ethics relevant to functioning in a professional role and adjusting to a work culture and professional context (cf. e.g. Hall 1994, Giddens 1993, Parsons 1991). For many physicians, the development of a professional role is considered a central part of their professional development, while the engineers do not relate to their profession and have difficulties describing the professional identity of an engineer.

9.4.1 The physicians

Many physicians describe the formation and development of a professional identity, or the shaping of a professional role, as an important aspect of what is learned during their education and in professional practice (cf. also e.g. Parsons 1991). Many physicians associate being a professional in many ways with personal characteristics and socio-communicative competence, rather than with being knowledgeable. However, there is no clear consensus on what constitutes a professional identity and there are variations on what is acceptable when it comes to how a physician should be and behave. In professional practice, the professional identity is also regarded as being developed and changing over time. It is, for instance, argued that the novice physicians tend to be somewhat reserved and insecure in their professional role. The more experienced physicians are, on the other hand, considered to be less socially oriented than the novice physicians as the field is changing at an ever-faster pace and as a result of a constant and increasing workload and stress, physicians tend to become over-worked, tired and cynical.

The leadership role (being authoritative, decisive, taking initiatives, delegating responsibility and clearly stating what is expected) is of central importance in the physicians' professional practice and their professional identity and in interaction with others, primarily patients, but also with the relatives of the patients, colleagues, senior physicians and other staff in the workplace.[108]

Personal characteristics and the relationship with the patients

For one group of physicians, the professional role is related to attitudes, personal attributes and a manner of being (in the interaction with patients and colleagues) and concerns how to act and behave, and how to be as a physician. General descriptions of a 'good' physician include statements such as: 'being able to handle people', 'being able to establish good contact with the patients', 'being nice', 'being open, calm and supportive and having a

[108] Further elaborated in sections 7.4.1 and 8.1.2.

positive attitude', 'showing involvement, dedication, commitment and interest in the patients and their situation', 'helping the patients with their problems', 'taking the patients seriously', and 'not treating the patients as objects'.

The professional role is related to, for example, how to establish trust with the patients, respecting the patients' integrity, not abusing this confidence or trust, respecting confidentiality and not sharing with others sensitive information (which the patients have not even told close relatives) they are entrusted with (cf. Macdonald 1995, Abbott 1988, Sarfatti-Larson 1977). A 'good physician' should not be hurried, be sensitive and listen to the patients and to their needs, and not 'just tell patients what they want to hear'. Generally, the physicians emphasise the importance of learning to simply be nice to the patients, listen to what they have to say and treat them with respect. It is also important to convey a calm and relaxed attitude to indicate that the physician is in 'control' of the situation.

An important aspect in the shaping of the professional role is the interaction with patients. Common conceptions of being a professional and how a 'good physician' should be include being service-minded and being able to establish good communications with the patients as well as having adequate medical knowledge. However, a physician may be medically competent, but the patients may be dissatisfied if the physician does not also have a good bedside manner and is informative. It is not considered to be enough to make an accurate diagnosis if the information is not conveyed effectively to the patients.

> You can never deviate from putting the patient at the centre. That is the only thing that I can see that is common for everyone. The patient at the centre! (Male physician, 25, Göteborg, interview person 9, interview 1)

> So there are two things that are very important, it doesn't matter if somebody is … I have also encountered people who are immensely competent and technically skilled and so on, but who really do not behave in a good way towards either personnel or relatives, and they are no role models and I don't think they are very good either really. So there should be a combination there. (Male physician, 28, Linköping, interview person 6, interview 1)

It is important to be pertinent in the interaction with the patients. This is also related to the 'caring' part of the profession by some physicians while others refer to it as being service-minded. In the quotation below, it is emphasised

that medicine is a service occupation aiming at not only making the patients healthy but also satisfied with their experience of the health care system.

> As a doctor, I think, of course, that generally you should be empathic and sensitive and listen to what people say and not be too … well, you should simply … you should be service-minded – that's what I think is important. That is somewhat forgotten sometimes in the health care system, that medicine is actually a service profession that aims at making patients satisfied and healthy! (Male physician, 31, Göteborg, interview person 28, interview 1)

A common understanding among the physicians is to always 'put the patients' at the centre of the practice. An important attribute of a physician is empathy, which includes the ability to really listen to and understand or 'read' the patients and their problems, to be compassionate and empathic, to always keep in mind what is best for the patient from a holistic perspective, to consider the whole person and their life situation and not to only consider the medical facts. This applies primarily to the patients, but also to relatives and staff at the hospital as well. One respondent emphasises the importance of not making decisions that the co-workers cannot handle.

> Primarily, you should be, you should try to be service-minded and understand that your task is to practise a service profession, to listen to the patients, to … well, listen to what the patient believes the problem to be. That you have the ability to listen to – what the patient believes the problem to be and not to what you, yourself, consider the patients' problem to be and … to some extent try to stay devoted to helping people with the problems they have. And you should be, you should have good judgement, you should realise what limitations you have and do what is appropriate, to carry out appropriate examinations, and provide suitable treatments and then … to do what both good judgement and medical judgement, or medical knowledge, calls for, so to speak. (Male physician, 31, Göteborg, interview person 28, interview 1)

Being a professional is often understood as maintaining an emotional distance to the patients and appearing calm and unaffected by the external situation, not displaying emotions yet being personal enough to establish a relationship of trust or confidence. However, being authoritative and partially giving the impression that the physician is objectifying the patient are also considered to be important. There has to be a balance between showing empathy and relating to the patients and their situation and keeping a professional distance. It is felt that this jeopardises the quality of the care for

both the individual patient, as focus may be lost, and other patients as it takes up too much time. This problem is also something that is emphasised even more in the follow-up interviews. One physician argues that a physician often prefers some patients over others, and it is important to be aware of this so that it does not effect the medical decisions. Being a professional involves giving the patients a serious impression, for example, one physician argues that she has to restrain her 'frisky' side and avoid behaving childishly and try to act authoritatively. This is perceived as a necessity for establishing a relationship with the patients characterised by respect, trust and confidence. However, despite the necessity of keeping a certain 'professional distance' it is still considered important to be open-minded, extrovert and emotionally involved in order to be able to establish a relationship with the patients marked by confidence and trust. One physician argues that different people have different demands and it is not possible to constantly be restrained or artificial (i.e. to 'play a role') in one's interaction with the patients in order to adapt to them, i.e. it is still important to be themselves.

> I think that a good physician, firstly, maybe has time to listen to the patient, has a certain amount of empathy, but shouldn't become over-empathic either because that is just embarrassing. Still you have to be empathic and really convey that to the patient verbally, that you can convey what you think. That means a lot to the patients. /…/ if you become to compassionate you lose the realism … that does not contribute to good care of the patients either. The patient is right, the patient's concerns are actually – actual concerns, but then you can't lose the realism in what could be the cause of the concerns. You can't always submit to the patient in theory as well. So that is what I mean by over-empathic, but there are few who are … rather I think that there is a lack of empathy among physicians really. (Female physician, 24, Linköping, interview person 5, interview 1)

Being knowledgeable

Thus, one aspect of the professional identity is related primarily to personal attributes or characteristics. Another aspect of being a professional relates to being knowledgeable in medicine and mastering medical knowledge. Becoming a doctor is related to being able to perform the tasks associated with working as a physician, i.e. the medical knowledge needed. The professional role or identity does not primarily have to be associated with mastering all the detailed discipline-specific knowledge, but rather with what one physician refers to as being fostered according to a 'medical logic' or to

get a 'sense of medicine'. With the acquisition of more knowledge, the identification with other senior physicians increases. One physician argues that at the beginning of the educational program, when the novice physicians have limited experience of practising medicine, it is easier to identify with the patients, but as more experience and knowledge is acquired, the physicians begin to identify more and more with the senior physicians.

For most physicians, having a solid foundation of theoretical knowledge is an obvious necessity. Although the importance of the theoretical knowledge in relation to personal attributes related to the ability to interact with others varies depending on the speciality in which a physician works. The physicians generally argue that for surgeons, for instance, the technical skills tend to outweigh the 'people skills', whereas there are other specialities, such as for the general practitioner, where the ability to interact and communicate with the patients may be more important.

> It depends a little on which specialisation you … if you work in an profession such as general medicine or psychiatry or if it … it is to a large extent about meeting people and being able to talk and listen and being empathic and sensitive without becoming too personal, that I think is the most important characteristic, in order to get the right information so you can make a decision. But I think that is … my opinion is that it is secondary, I think that listening and understanding and being compassionate is what is important. Then it varies a little bit, if you work in a surgical specialisation where technical competence is a bigger part … a more important part of who and what you are and have. SO it varies in the medical profession depending on what you chose. (Male physician, 26, Linköping, interview person 2, interview 1)

Many respondents emphasise that becoming a 'doctor', being fostered in to and taking on a professional role or identity as a physician, is one of the most important aspects of their education and is further developed in professional practice. The physicians tend to relate to their future profession to a large extent during their education. Furthermore, in the interviews the physicians emphasise the role of education, primarily the clinical courses, in the development of the role of 'doctor'. The educational program is seen primarily as a way of shaping their future professional identity (including medical knowledge as well as attitudes and personal characteristics).

Generally, the physicians seem to consider themselves to be relatively well prepared for their professional role when they graduate from higher education. Their clinical training and the sense of knowing what the work entails and what the patients expect of them by has also given them confidence in their professional role.

> A very good foundation to stand on and I feel rather confident, confident in being a physician. Even before I formally became a physician I felt like it, at least in the position you have at a primary care centre /…/ in the role of being a physician. I may not be all that confident when making a diagnosis or knowing what people suffer from, in that respect I am not as confident because I don't have broad enough knowledge yet. However, I am confident as a physician, about how to act, how to sit, how to behave towards people, how to treat people. In that sense, I feel confident and I have done so for quite a while. (Male physician, 29, interview person 2, interview 2)

The importance of role models

During the educational program, primarily during clinical training, the physicians have encountered many practising professionals. They have walked beside senior physicians, supervisors and mentors in different hospitals and wards. Role models play a crucial role in the construction of the medical students' own professional identity and their view of what kind of physician they want to become.

The physicians refer to both positive and negative role models when they discuss the influence of others on how their professional role is created and developed. Generally, the physicians tend to emphasise negative examples they have seen, rather than the positive one, as important for their own development of their professional role. The negative role models serve as good examples of how the physicians do not want to behave or be, for example, being arrogant and lacking respect for the patients.

> Of course you have seen many good physicians during your education and those you may not remember as much as the bad examples I have seen. (Female physician, 29, Stockholm, interview person 3, interview 1)

By observing mentors and supervisors in professional practice, the physicians learn, for example, how to, or rather how they want to, interact and communicate with the patients. The professional role is mainly considered to be derived from role models, but also the physicians' own experiences, and the experiences of relatives, of the health care system are mentioned as an inspiration for the formation of the view of what a physician should be like.

> It is both my own experience, when you have sought health care, and also relatives and friends and so on who have described how they have been

> treated. (Female physician, 33, Linköping, interview person 25, interview 1)

Another aspect of being a professional mentioned by the physicians is the separation and balance between the professional sphere and the private sphere. It is considered important to not get too deeply involved with the patients and be consumed by one's work. Having a rich personal life, with friends outside the hospital, is a way of coping with the work. This means having the ability to set up borders and clarify the distinction between personal life and work. Furthermore, it is important to ask for help so that the work does not become overwhelming.

> And then, of course, setting borders, that you have to … you can't sacrifice your whole life for this, for the patients, instead you have to say that now, now I can't give any more, and that is also important … well, being able to say that there are things you can't handle and being able to ask for help and, well, I think that is important. (Female physician, 26, Linköping, interview person 29, interview 1)

9.4.2 The engineers

The engineers do not talk a lot about their professional identity. There are, however, engineers who mention professional identity and professional pride during the interviews. However, generally the engineers have trouble defining what is specific for an engineer. Some of the engineers relate to this when they talk about their education as a 'brand' or certificate of quality that ensures that they have the capacity to study to become engineers and/or that have acquired some specific knowledge. This implies that they believe that other people assign legitimacy to the knowledge, which is certified as a result of their education. In a way, the most significant common bond between the engineers is not knowledge or a shared understanding of being professional, but the formal credentials acquired as a result of their education.[109]

The engineers consider their education to be broad and that it enables the graduates to get work in a very wide variety of different sectors and organisations, and end up working with a wide variety of different tasks. The engineers, therefore, generally think it is very difficult to characterise or describe what is specific for a 'good' engineer, they prefer to describe what should be imparted in higher education in general terms or what a 'professional' is expected to be like in general. Characteristics such as being

[109] See also section 8.2.4 and Collins 1979.

open to new ideas, being creative, being able to communicate their ideas, being able to understand the needs of a customer, being able to cooperate and other general socio-communicative competences are mentioned by the engineers as important for becoming a successful professional practitioner. Several engineers emphasise that this is not specific for engineers or an engineering education, but applies to work and higher education in general.

The engineers' education can also be viewed as something people with similar interests are gathered around, and it takes on a sorting function (cf. e.g. Ståhl 1974, Sorokin 1964). During their education, the similarities are then developed further, the individual is shaped by the group in the interaction with others (through socialisation, cf. e.g. Hall 1994, Giddens 1993, Parsons 1991). This creates an atmosphere in which expectations of how to be and act are implicitly created.

> Upper secondary school was a gathering, I chose a natural science profile, then people gathered who had some kind of ambition to … they thought natural science was appealing and had some ambition, it turned into some kind of elitism and power. In some ways, it is the same way at the university too, at least when it comes to engineering education in information technology. There was a certain category of people who wanted to work with this and it becomes more homogeneous which makes it rather … it is rather that way than some form of: an engineer should be like this… It is more the education in itself that is the main point. (Male engineer, 28, Uppsala, interview person 32, interview 2)

The engineers who expressed an opinion about what an engineer should be like, tended to talk in terms of stereotypes appropriated before his or her education, which was then heavily revised during the educational program. Alternatively, they describe a stereotype view they think the general public has of an engineer, which they then renounce. There are also several statements in the interviews concerning a general view in the academic institutions describing a certain status associated with the educational programs in engineering.

> It is a problem because there are people who think that you should not undermine the engineering aura, you shouldn't damage it, you should know what an engineer can and cannot do even if … three years later, now I am definitely not able to understand, or able to go in and work with either signal processing or electro engineering without needing to study for a few months. So that … but I understand that it is that way, it is about protecting titles and that may be interesting for some people as well. (Male physician, 28, Uppsala, interview person 32, interview 2)

Successful professional practice is generally associated with (generalist) knowledge and personal characteristics, especially attitudes and motivation, not specifically tied to engineering. As previously discussed,[110] this entails being able to identify, break down and solve any kind of problem, as well as not only solving problems the right way, but also solving the right problems. Furthermore, the characteristics of a 'good engineer' can include the ability to acquire the tools needed to solve different types of problems and to tackle a wide variety of possible tasks and problems, being flexible, adaptable, analytical, structured, critically reflexive, open to new ideas, seeing opportunities, taking initiatives and be willing to contribute to innovation (not only knowing how to use technology but also participating in developing it). This also represents in general the engineers' descriptions of their professional role or identity.

Some of the engineers argue that it is important to have acquired knowledge relevant to their field of professional practice, some kind of knowledge as a foundation, i.e. technical skills. However, what seems to be most important to the engineers is that they are knowledgeable in many different areas, that they have a broad foundation of knowledge. It is preferable not to be too specialised or only competent in one narrow field. Rather, the engineers stress that a 'good engineer' should be able to connect knowledge from many different areas and be able to solve widely differing problems. This is also a prerequisite of being able to work in many different areas. Thus, the engineers generally do not relate to their profession to any large extent. They do not primarily see themselves as professional engineers, but, rather, relate to the organisation they are working for, or the line of business or branch in which they are working.

When it comes to the client or customer-related aspects of their work, the engineers consider it important to display commitment/involvement and to have a genuine interest in the organisation and the products. Furthermore, personal characteristics such as being extrovert, being able to act correctly, having social skills (and not being a difficult person) are particularly emphasised. The engineers also refer to this as being service-minded.

9.5 Comparative analysis and summation

The need and opportunities for continuous learning and professional development vary according to the workplace as well as over time but are generally perceived as essential by both groups. The physicians' learning in the workplace is mainly related to updating and renewing discipline-specific

[110] See e.g. section 7.3.2.

knowledge (as there is a correspondence between the educational and the professional knowledge base), while the engineers' continuous learning is related to the workplace and project-specific knowledge (since the professional knowledge base is not the same as the educational knowledge base). A major obstacle to continuous learning and professional development is considered to be lack of time and heavy workloads. The engineers' learning is considered to depend to a large degree on their own initiatives and they often feel that there is a lack of formal support for further education in the workplace. The physicians, on the other hand, undergo a general training program, into which, for example, formal seminars and lectures incorporated, in the workplace after which their specialist training commences. For a rough overview of the main results from the chapter, see table 5.

Table 5: The table includes a schematic overview and summation of the most important results from chapter 9. As there is a considerable within-group variance the presentation should not be interpreted as dichotomous categorisations but rather as an orientation towards one of the endpoints of a continuous scale.

	Physicians	**Engineers**
Professional development and specialisation	Specialists. Development and learning in relation to the profession via role models	Generalists. Development and learning in relation to the work tasks/workplace/organisation/ branch of business
Learning in professional practice	Updating and renewing theoretical knowledge from the education	Learning new, the specifics are learned in the workplace

The physicians generally regarded their education as a vocational preparation for the work as a general practitioner. However, the novice physicians still undergo training and education in order to become specialists, which means that higher education is not a direct preparation for many specialisations in medicine. The physicians who chose the more general specialisations, considered broad but shallow (in e.g. general medicine), tend to emphasise the vocational or preparatory aspect of higher education, whereas for other specialisations (in for instance radiology or surgery), the importance of the educational program as a foundation for further development and learning in a specialist discipline is emphasised instead. As the physicians deepen their understanding of a narrower field, parts of their education becomes less relevant to their daily practice. When choosing a specialisation, several physicians also argue that the choice is between breadth and depth, to be a specialist in a narrow field or be a general practitioner.

The engineers have chosen a specialisation before they entered higher education, i.e. information technology. Throughout their education, the engineers are able to choose courses and create different kinds of sub-specialisations as well. This specialisation is, however, not generally considered to be so consequential when it comes to which jobs they consider themselves qualified to apply for after graduation. They think that the important specialisation takes place when they apply for a job, and when they start working. Their specialisation in a sense takes place in professional practice in relation to the work and the organisation they have chosen to work for. They see their education as a broad foundation for continuous learning and development rather than as a vocational education, and the specifics are learned in the workplace where the 'real' specialisation takes place in relation to the organisation or branch of business. The specialisation varies according to the workplace and the specific tasks the engineers encounter in professional practice. The engineers generally argue that their work requires broad and general knowledge, rather than in-depth specialised knowledge. It is generally considered more important to have generalist rather than specialist competence and to know a little about a lot of things rather than a lot about few things, as the work and the nature of the everyday practice constantly vary.

The engineers can get a job in an area that is more loosely related to their education. It is not uncommon for the engineers to argue that the employers are more interested in the fact that their education is proof that they are capable of learning and working hard. Thus, in this sense, the educational program primarily has a sorting function (see also Stiglitz 1975, Arrow 1973). Employment is related to the fact that the engineers have graduated rather than to the specific content of the educational program. The credentials or formal competence and the exchange value of education are emphasised rather than the competence itself. This means that different engineering programs can be considered a relevant background for the same jobs. The engineers argue that employers know what an engineer is capable of and do not focus on the specialisation or the specific courses that make up the educational program.

After graduation, the physicians are more specialised in relation to their future work, employers and organisations (and less heteronymous) than the engineers. However, a medical education gives the graduates the possibility to take on a wide variety of different tasks and specialisations. The engineers do not generally relate to their profession to the same extent as the physicians when it comes to learning and professional development. The engineers in this sense have a weaker professional identity than the physicians. In the interviews, the physicians emphasise a professional identity, the role of being

a doctor, which is characterised by being service-minded and knowledgeable. A central aspect of the educational program and professional practice is the shaping of the future professional, the creation of a (medical) identity. 'A physician is a physician', even if the physicians identify themselves according to speciality as orthopaedists or surgeons, the identification is based on a common background, i.e. a medical education. The physicians orient themselves towards the profession, while the engineers usually relate professional development to specific tasks, the workplace, organisation, branch of business or position rather than to the profession, i.e. they identify with engineering and their education. The engineers tend to identify more strongly with, for example, titles such as project manager, programmer, working in customer relations or sales, or the specific organisation for which they work, which can be related to educational backgrounds other than a degree in engineering (in information technology). In the interviews with the engineers, professional identity is not emphasised by the respondents and the engineers have trouble defining what is specific for an engineer. For some engineers, there is a sense of professional pride, but this is often associated with their education as a certification or a receipt showing that they have been able to graduate from a tough educational program and that they have proved themselves to be capable of hard work and have acquired some important generalist competence. Often, the engineers argue that others give their knowledge legitimacy, knowledge certified by the educational program.

Furthermore, the physicians are more often concerned with the distinctions between different occupational categories in the workplace, distinguishing between, for example, physicians and nurses. This is obviously partly due to the fact that the work and responsibilities in health care are regulated by law. However, the engineers are seldom concerned with the educational background of co-workers, but rather focus on the actual competence of their colleagues, legitimacy is established by producing results.

Chapter 10: Discussion

In this last chapter, the thesis will be concluded with a discussion about the results of the thesis in relation to the background of the study and the theoretical framework.

This thesis has been written in the light of the changes in working life in recent decades, mainly the 1990s, with increasing demands from industry for larger investments in lifelong learning and new qualifications in the work force regarding specific professional competence and creativity, the ability to learn and appropriate new knowledge, communicative competence, and the ability to cooperate. This trend has intensified in recent years, probably due to the dissemination of information and communication technology in different areas of society. There is pressure from different actors to restore the close relationship between work, learning and higher education. In order to address this there is a need for a greater understanding of mechanisms behind the interplay between higher education and work.

Different views of the functions of higher education have implications for the construction of higher education curricula and what and how the students in higher education are to learn. Higher education generally has several functions or consequences relevant to the world of work. Higher education supplies organisations with competent labour and assists in the recruitment processes by sorting and selecting individuals, and providing them with credentials. This is regardless of whether higher education strives for autonomy in educational goals or pursues a proactive policy aiming at shaping and leading innovation in the world of work (Brennan et al. 1996). From an individual perspective, longer education is beneficial and often leads to higher income as well as less risk of unemployment (Wolf 2002). In addition, education can lead to greater participation in society on account of more general knowledge.

In the theoretical framework, theories of professionalisation and professional knowledge are related with theories of the aim or purpose of higher education in order to relate professional education with professional practice. A central aspect of professionalisation is the knowledge of the professionals, the jurisdictional boundaries of the profession are based on the monopoly of knowledge of a specific domain (see e.g. Freidson 2001, Torstendahl 1990, Murphy 1988, Parkin 1979, 1974). However, in some professional fields, such as engineering, this construction is difficult to uphold as the professional knowledge base is undergoing rapid and constant change.

The professionalisation theorists are seldom concerned with the specific content of the knowledge that is monopolised or how this knowledge is appropriated by the professionals (see e.g. Abbott 1988). In order to establish a jurisdiction, the professionals' actual knowledge may be less important than the general public's acceptance of the professionals' claims to this knowledge (see e.g. Durkheim 1995, 1992, Macdonald 1995, Sarfatti Larson 1977). However, the relationship between the professionals' claims to knowledge (the formal credentials) and their actual knowledge is seldom problematised. The curriculum and content of higher education, or the educational knowledge base, is considered to correspond to the requirements of professional practice or the professional knowledge base. There seems to be an underlying assumption that the professionals unproblematically acquire competence relevant to professional practice through higher education. The fact that higher education constitutes a training function or direct vocational preparation for professional practice rests on a technical rational view of education and knowledge, in line with human capital theory. However, the training, qualifying or socialisation function of education can be questioned, and in theories on the functions of higher education, different aspects related to education can be discerned, which indicates that education also act as a sorting device allocating graduates different positions in society (see e.g. Arrow 1973) where the use value of education is subordinate to the exchange value.

10.1 Main results

In the following section, the aim of the thesis and the research questions will be revisited and addressed. The main results, presented in the three previous chapters, will be briefly summarised.

Reasons for educational and career choices

The first research question in the thesis relates to the individual reasons for the educational and career choices of the physicians and engineers.[111] In the descriptions of why the professionals chose a specific educational program or career path, some of the professionals attributed their choice to random events. However, overall, the physicians tend to attribute their choice of future professional career to altruistic or social motives also related to a use value of the education. The engineers, on the other hand, refer to either a general interest in the academic discipline and the educational program, or they express an employability rationale where their education primarily has

[111] Described in chapter 7.

an exchange value. The former rationale entails an interest in computers and information technology and little emphasis is placed on the future professional practice or what job they might end up with. They choose the education rather than the profession. From the latter rationale, the opposite choice is made, that is, the engineers choose the professional career rather than the education. However, their choice is not based on the specific content of the work as much as on the potential employability aspects, such as earning a high salary and getting a high status job, or the exchange value of the credentials, which their education generates. This may be associated with a lack of clear representations of what is specific to the professional practice of an engineer, that is, what an engineer actually does. This can also be associated with the relatively low level of professional cohesion among the engineers.

The reason generally given by the physicians for their career choice is their expectations of the content of the work associated with the profession, for example helping others, rather than medicine as an academic discipline. Their education is a way of shaping the professional and the competence developed in the educational program, which is expected to be useful and necessary for managing the tasks associated with their professional practice. Thus, the competence acquired in the educational program is expected to have a use value in relation to the professional practice.

What is learned in higher education

The second research question in this thesis concerns what physicians and engineers learn in higher education and relates to the actual and formal competence (see also e.g. Ellström 1998, Salling Olesen 1994) of the respondents or, in other words, the physicians' and engineers' educational knowledge base.[112]

The physicians interviewed in this study emphasise that they have acquired a foundation of explicit theoretical specialist knowledge (in e.g. anatomy, physiology and pharmacology) and implicit practical knowledge as well as generalist competence. Furthermore, the physicians emphasise the importance of socio-communicative competence developed in the interaction with patients during their clinical training in the educational program. The physicians also emphasise the role of education in the socialisation process and in becoming a doctor and the shaping of the future professional. The physicians in this sense construct a stronger professional identity during their studies in higher education than the engineers do.

[112] Described in chapter 7.

In their educational program the engineers have acquired theoretical specialist knowledge related to, for example, computers, programming and math. The engineers tend to place less emphasis on explicit theoretical specialist knowledge and instead emphasise the importance of generalist competence, which is considered to be peripheral in the educational knowledge base and mainly a 'side-effect' of the educational program. Furthermore, the engineers mention the importance of acquiring a social network during their studies, handling old social contacts and developing new ones, which is assumed to be beneficial for their future career opportunities.

Encountering the demands in professional practice

The third research question, focusing on the demands encountered in professional practice, relates to qualifications or requirements that characterise professional practice (see e.g. e.g. Ellström 1998, Salling Olesen 1994) or the professional knowledge base.[113]

The physicians generally emphasise that professional practice is characterised by demands on being knowledgeable in medicine and being able to update and renew this knowledge. However, a central aspect of the practice and the professional knowledge base is associated with being able to handle interaction with patients, colleagues and other occupational groups. Consequently, the importance of socio-communicative competence and leadership abilities is commonly stressed in the interviews with the physicians. This is an aspect that in some respects they generally feel relatively well prepared for as a result of their education. Nevertheless, the increased responsibility for making decisions and accepting the consequences is something the educational program has not fully prepared them for. The professional knowledge base is (like the educational knowledge base) related to a central phenomenon, that is, the human body and health. Having a broad theoretical knowledge base is considered important in order to be able to identify acute or alarming symptoms, to not miss important aspects and to determine if something is out of the ordinary and requires quick action. The physicians consider prioritising cases and to quickly determining the seriousness of the patients' problems to be a crucial part of their work. Primarily, general practitioners and physicians working in the emergency room emphasise the need to be able to ascertain which patients to refer and in what order, to sort what is important or relevant, and what is less important, i.e. what to consider first and what can be 'looked up' later. Knowing when

[113] Described in chapter 8.

and who to consult for e.g. assistance in performing practical tasks or how to acquire new knowledge is a central part of the demands in the day-to-day work of the professional practitioner.

Generally, the physicians' perceptions of the demands experienced in professional practice tend to converge. The physicians experience similar demands, prioritise in a similar order and emphasise the need for similar knowledge. The engineers' answers, on the other hand, tend to converge, which may not be unexpected due to the diverse nature of their work.

The engineers' professional knowledge base is related to the specifics of their work and the organisation in which they work. The implicit or tacit knowledge relevant to the tasks that characterise professional practice is contextual and considered to be learned experientially in professional practice. Thus, the most central knowledge the engineers perceive to be required in professional practice is generally generalist competence such as being able to learn, to find information, sort, structure and appropriate new knowledge, handle large volumes of information, and be able to quickly orient themselves in relation to new contexts and become familiar with new areas with little introduction. Furthermore, the engineers face demands on being able to plan and structure their work, adapting to new roles and being flexible and adaptable. The engineers also argue that their professional practice requires them to be innovative and creative and to develop techniques and solve problems. The engineers also emphasise the importance of attaining an overview of the organisation and the line of business to be able to see the whole picture and understand contexts and complex systems. The engineers usually argue that they prefer to be generalists rather than specialists. Being a generalist involves, for example, having a broad overview of the theoretical knowledge relevant to the professional field, which is more important than being able to master the specifics of a more limited field of knowledge. Their education is a moderator, enabling them to acquire the specific knowledge needed to perform their work. The acquisition of discipline-specific theoretical knowledge is considered to be an important way of developing generalist competence.

When describing the relationship between higher education and professional practice, both physicians and engineers describe a kind of 'gap'. However, the respondents in both groups argue that it is not possible for a professional education to prepare the graduates for all aspects of the professional practice.

The physicians claim that there is a need to reprioritise the knowledge learned in the educational program. The importance placed on certain knowledge in the educational program is disproportionate to the importance placed on the same knowledge in the world of work. The engineers argue that

the competence required to do the work is mainly acquired in the workplace; their education is a foundation, which facilitates the learning process by providing transferable generalist knowledge. The educational program also increases their employability and acts as an entrance ticket into the workplace. The discipline-specific knowledge, or the substance of the educational program, is considered to be less relevant in professional practice.

Both groups argue that the encounter with professional practice results in higher demands due mainly to heavy workloads and a lack of time, and leaves little time for reflection-about-action (cf. Schön 1983). The physicians also consider themselves unprepared for the increased responsibility associated with becoming a leader in professional practice. Furthermore, the physicians also emphasise the importance of having an insight into their own knowledge, of not over-evaluating their competence and consulting others if uncertainties arise.

Generally, the educational program is perceived by the physicians as vocational preparation for professional practice although there is an aspect of transforming some of the explicit book knowledge into implicit tacit knowledge. The engineers, instead, perceive their education as a general foundation, which facilitates their further development.

Continuous learning and professional development

The fourth research question relates to the perceived opportunities for learning and further professional development on the job and in the profession; what is learned or what competence is acquired in the workplace and how, the specialisation process, and development of a professional identity.[114]

Generally, professional development is oriented towards the profession in the case of the physicians and towards the specific tasks or the organisation in the case of the engineers. In this study, the physicians appear to have greater professional cohesion than the engineers. Furthermore, the physicians associate professional development with experiential learning in the interaction with others, primarily patients, while the engineers relate learning primarily to formal contexts.[115] The physicians orient their professional development towards the profession and emphasise the construction of a professional identity in which role models (both positive and negative) encountered during their studies play a central part. In their

[114] Described in chapter 9.

[115] It is not uncommon for the respondents to equate learning with formal education and regard work and learning as separate activities that never overlap.

educational program, the physicians are socialised into a professional role where their identification with the profession increases during their studies as a result of the influence of e.g. role models (cf. Becker et al. 2004). Generally, the physicians' continuous learning and the specialisation are related to knowledge of medicine that is specific to physicians, and they uphold the jurisdictional borders to other occupational groups. The engineers, on the other hand, relate continuous learning and professional development to specific tasks or unique organisation-specific knowledge. The engineers do not have monopoly or jurisdictional claims on the knowledge in their relatively broad field of practice, and their expertise is contested by others. The engineers in a sense specialise, not in relation to the profession or knowledge specific to the profession, but in relation to organisational positions in the workplace or knowledge specific to the organisation.

Both engineers and physicians argue that the degree of freedom and the opportunities to influence the organisation and structuring of the work as well as the opportunities for individual professional development and learning are restricted by a limited amount of time for reflection-about-action (cf. Schön 1983) due to a heavy workload, stress and insufficient resources. The engineers also mention competition for resources in this context. For both groups, specialisation essentially takes place after graduation. Engineering is a more diverse profession in relation to potential jobs and employers and engineers specialise in relation to the organisation for which they work while the physicians specialise in their professional field and with an orientation towards the profession.

Summation

Different kinds of educational programs may have little in common apart from consisting of interaction in which some form of learning is expected to take place. Education is incorporated in different social contexts and is tied to different institutions and practices (see e.g. Gesser 1985). There are differences in knowledge and knowledge traditions between different professions. Furthermore, the nature of the professional knowledge base may vary. Whereas the physicians' knowledge base, in this study, seems to be more stable over time in relation to the profession the engineers' professional knowledge base is constantly changing. In professional educational programs, the relationship with professional practice is of central importance and the students should be prepared for different practices. Higher education cannot be treated as homogenous when it comes to the functions or impact education has in relation to different professional practices and knowledge traditions. Different professional educational programs have different

functions and represent different views about how to prepare students for different practices. Thus, there obviously have to be differences between different educational programs and courses in the higher education system. In some professions, such as medicine, it is important to have close ties between education and training, whereas the engineers have a broader education in order to be prepared for a greater diversity of potential future tasks in the workplace. In the summary presented in table 6 below, the descriptions of the educational programs for engineers and physicians (derived from the results in the previous three chapters) are briefly summarised. The presentation is somewhat simplified and the categorisations should not generally be interpreted as dichotomous but rather as the endpoints of a continuous scale.

Table 6: In the table a schematic overview and summation of the main results of the thesis are presented. The presentation is a compilation of tables 3-5 presented previously in the text.

	Physicians	**Engineers**
Employer	The public sector	The private sector
Receiver	Patients, every citizen	Customers, organisations
Authorisation and Jurisdiction	Legal credentials, education required for formal authorisation	Legitimisation based on results or outcome of the work, no formal authorisation, different educations interchangeable
Orientation and specialisation	Profession	Organisation/workplace/branch of business
Motives	Altruism or a social project	Career or employability perspective
What is learned in the educational program	Theoretical and practical specialist knowledge, socio-communicative competence	Transferable generalist competence such as problem-solving, analytical abilities and flexibility
Educational knowledge base	Static	Static
Professional knowledge base	Static	Changing
Relation between the education and professional practice	The educational and the professional knowledge base are strongly coupled	The educational and the professional knowledge base are loosely coupled
The impact and use of education	Direct vocational preparation, use value	Indirect general foundation, exchange value

The professional groups and their descriptions are not homogenous and it should be noted that there is a considerable within-group variance in the physicians' and engineers' experiences and perceptions. The internal variation can also lead to some incoherence and inconsistencies within the groups, as described in the previous three chapters. Nevertheless, there are a number of prominent and illuminating general differences between the two groups and, essentially, the groups tend to relate more closely to or approach one end of the spectrum. The complexity of the categorisations in the table will be further elaborated and described in the remainder of the chapter.

10.2 The organisational context

The physicians have a public function in society where the clients are every citizen, as well as a moral responsibility regulated by law (Hälso- och sjukvårdslagen) and the National Board of Health and Welfare (Socialstyrelsen). The physicians mainly work in professional bureaucracies, with strong jurisdictional boundaries between different occupational groups (see e.g. Abbott 1988). The physicians argue that they have a limited influence over the organisation of the work and how the work is structured. Furthermore, the standardisation of the work is associated with the development of standardised programs that the professional can apply to known situations, a process called 'pigeonholing' by Mintzberg (1983). For a physician, this may entail compartmentalising standardised competence and different disease panoramas. A physician may, for example, in the meeting with a patient make a diagnosis, which indicates which standardised procedure to apply. Thus, the work entails creativity in the diagnosis. The treatment, on the other hand, could be characterised as routinized. Abbott (1992) refers to the acts of professional practice as diagnosis, inference and treatment. Diagnosis involves, for example, gathering information about the patient's condition and treatment refers to making a decision about what measures to take. Routine tasks require little inference in the form of, for example, deliberation with colleagues. Furthermore the physicians describe strong collegiality in the sense that they identify with the professional collective in their professional development. However, the physicians mostly work as the only physician in a team made up of members of other professional groups with an unequal distribution of expertise and power in contrast to the distinctive characteristics of a collegial organisation (see Lazega 2001).

The engineers, on the other hand, often work in collegial organisations, with less strict hierarchies and divisions of responsibility and an equal distribution of influence and power (see Lazega 2001). The engineers work

with other engineers with various backgrounds as well as other occupational categories. The engineers also describe resource interdependencies when it comes to, for example, information and the work of others. Social networks and informal relationships, which are the foundation of cooperation and exchange, which in turn, are attributes of a collegial organisation, are also of great importance to the engineers. There is an equal distribution of expertise in different areas and, consequently, of power and status (cf. Lazega 2001). Furthermore, the organisations in which the engineers work often also have an innovative character (see Mintzberg 1995). The professional practice is characterised by complexity and uncertainty with no predefined problems, standardised solutions or treatments and there is a need for constant inference in order to find solutions to new and unknown problems and develop new fields (cf. Abbott 1992). The organisations are often characterised by a focus on results and the actual competence of the professionals, and legitimacy is related to the market rather than to the profession. The engineers have a responsibility to the customer, which means that they are regulated primarily by economic sanctions and the logic of the market.[116] While the engineers' context is concerned with efficiency, the medical practice is oriented towards legitimacy. The welfare professionals, working with people, such as physicians, are not rewarded for the productive value of their work, but for the intentions and work descriptions. The market professions, such as engineering, are on the other hand more closely associated with the production of exchange values than human values (Svensson & Östnäs 1990). In the health care system, the patient is in a subordinate position to the physicians, who have the expert knowledge. The patients often have limited opportunities to choose alternative providers. The nature of the relationship and the power structure between the engineers and their clients is somewhat different. Although the professional may control the expert knowledge, the customer may control the framework for the work that is to be done. If the engineers fail to meet the demands made by the client in the form of specifications and financial restraints, the latter may turn to a competing provider.

[116] However, there are, of course, laws and regulations that may restrict the engineers' practice as well, but they are generally not as explicit as in the case of the physicians.

10.3 Theory and practice

The educational knowledge base and the professional knowledge base are closely associated in the case of the physicians. The educational knowledge base refers to the formal and actual competence of the professionals. The professional knowledge base, on the other hand, refers to the qualifications, which is associated with the competence required by the job as well as officially required competence (see Ellström 1998). In clinical training part of the educational programme, theory and practice are merged in the case of the physicians. The educational and professional knowledge base in the case of the engineers do not overlap, on the other hand. The formation of curricular requirements is loosely coupled to what the engineers actually do in the workplace (cf. Meyer & Rowan 1983, Weick 1976). There is a substantial gap between the competence acquired in the educational programme and the qualifications required in the workplace, or in other words ”*the knowledge of the profession is distinct from the circumstances and conditions in which it is applied*” (p. 357 in Freidson 1970b). This can be associated with separation of theory and practice in the educational programme, but also with the fact that the engineers’ professional knowledge base is perceived as being more changing, or less static, than in the case of the physicians. The field in which the engineers practise is undergoing constant and rapid change due to technological innovations, the development of new technologies and continuous advances in research and development that create new demands.

10.3.1 The physicians

The physicians work in a field where at least some knowledge, for instance, about the human body, is relatively static. Consequently, there is a static knowledge base that is relevant to their field of practice. Diagnosis leads to standardised applications of treatment and inference becomes less significant (see e.g. Abbott 1988, Mintzberg 1983). The physicians in this study also emphasise the importance of acquiring a general overview of explicit theoretical medical knowledge and having internalised facts about, for example, anatomy, physiology and pharmacology, in the educational programme. The foundation of theoretical knowledge is considered to be a frame of reference to relate to when examining and diagnosing patients, as well as when appropriating new knowledge. Having appropriated a solid foundation of theoretical medical knowledge is often considered so obvious to the physicians that they often only mention it in passing. They generally expect to learn how to do much of the work associated with working as a physician during the course of the educational programme. The educational

programme is considered to be concrete and closely related to the professional practice. The clinical training gives the physicians a clearer picture of how the knowledge they acquire can be more directly applicable. The physicians also tend to view their education as an apt direct vocational preparation for the world of work. After graduation, the physicians expect to be relatively ready to take on their work immediately, even though they still have to undergo general training and specialist training, which can be seen as a continuation or extension of their formal education. The primary function of higher education is to train, qualify or socialise, and convey appropriate transferable theoretical and practical medical knowledge to the students. Thus, the educational programme is perceived to be more closely related to the professional practice for the physicians than it is for the engineers.

The physicians also generally consider the advances in medicine and the new knowledge generated in medical research to be accumulative. This implies that in order to understand and appropriate new knowledge, it is important to have a 'grasp' of the basics. However, the physicians regard generalist competence, such as having the ability to quickly learn and appropriate new knowledge as well as being flexible and adaptable, as being relevant and sometimes even a necessary aspect of their education. Still, theoretical specialist knowledge and clinical competence are the most important aspects of the educational programme without which it would not be possible to practise medicine. The physicians emphasise the importance of transferable knowledge and being able to apply theoretical knowledge in practice. They tend to express themselves in terms of putting theory into practice or applying their theoretical knowledge in practice.

Furthermore, the physicians consider socio-communicative competence to be an important aspect of professional practice. According to many physicians, practising medicine is basically about being able to communicate and interact with patients, creating a relationship characterised by trust. Establishing trust with the individual patient is also associated with sustaining the general public's trust in and acceptance of the profession and their expert role, as well as their ethics and morals (see e.g. Macdonald 1995, Castro 1992, Sarfatti-Larson 1977). The general public assigns the professionals' authority on account of the association between professional knowledge, and science and higher education. This authority can, however, only be imparted to the profession, the physicians, through public opinion and trust (Durkheim 1995, 1992). The professionals have to convince the general public that the knowledge they possess and the services that they have to offer are both necessary and the best option for the needs of society (Hellberg 1978).

The clinical training and early contact with patients are viewed as perhaps the most important aspect of the educational programme whereas the pre-clinical courses are regarded by many physicians as less important in relation to their professional practice. The physicians believe that the education assists them in becoming more empathic, more comfortable in the interaction with the patients, learning how to interact in a respectful way and respecting the personal integrity of the patients. Furthermore, an important aspect of the professional practice is becoming a leader, being authoritative, delegating tasks and taking responsibility for the consequences of the choices that are made. The importance of socialisation or the development of a professional identity is also emphasised by the physicians (cf. e.g. Hall 1994, Giddens 1993, Parsons 1991). Role models play a central role in professional socialisation as well as when it comes to learning both tacit and explicit knowledge. The central role played by role models in organisational socialisation has also been underlined in previous studies (see e.g. Filstad 2004).

10.3.2 The engineers

In an increasingly complex and uncertain world of work, demands for knowledge are increasing and specialist subject knowledge is regarded as growing out of date more rapidly than in the past. The engineers also argue that professional practice is characterised by complexity, unpredictability, uncertainty and constantly changing working conditions where problems are often not easily definable or self-evident and few tasks are routine (see e.g. Barnett 2004, Schön 1983). The world of work is not as static as stated in the books the engineers read during their studies and conditions are not as conveniently arranged. Knowledge is considered to be relative, interpretations vary according to context, and different methods are used in differing ways in theory and practice. At university, assignments are clearly structured, problems or problem areas are often defined and the tasks are delimited, and the parameters are static (cf. e.g. Bowden & Marton 1998). This can be attributed to a difference in rationales in the school and the production context (see Helms Jørgensen 2004). As Barnett (2000a, 1999) argues, the demands for a lifelong and life-wide learning have increased and there is a growing need for adaptability and flexibility to cope with the new and changing demands. Consequently, the engineers in this study also emphasise the importance of the ability to handle insecurity, diversity and ambiguous situations, to quickly become oriented in a new context, adapt to new circumstances, and solve unexpected problems. Their knowledge is constantly becoming outdated and the discipline-specific knowledge (to the

extent that there is such knowledge), the tools, and methods used in everyday practice are often specific to the workplace and even to individual projects. A common understanding among the engineers is that the specialist knowledge required to actually do the work and to carry out the work assignments and tasks associated with professional practice are acquired in professional practice in the workplace. Many engineers' work is structured in the form of projects that they follow from beginning to end. During the projects, the engineers deepen their knowledge in the project-specific area and acquire specialist knowledge. The essential competence required in professional practice consists of the workplace and project-specific knowledge. Thus, because of the uncertainty regarding what specialist knowledge will be relevant in professional practice, the engineers generally emphasise the importance of generalist competence, such as the ability to learn, analytical thinking, being structured, general problem-solving abilities, analytical skills, learning to quickly appropriate new knowledge and the ability to identify and deconstruct a problem, developed during their studies, as this competence is considered to be transferable between contexts or different communities of practice. Higher education is regarded as providing a broad foundation, which facilitates professional development in the workplace. The importance and relevance of the relatively static specific discipline-related theoretical knowledge or substantive knowledge, such as certain computer-related knowledge, programming and math, learned in higher education is regarded as less important and relevant to the field of practice as it is considered to be contextually situated. The ability to apply the theoretical knowledge acquired in higher education in practice is considered to be limited or at least subordinate to generalist competence. Previous studies have also shown that different actors in the world of work, such as employers, consider generalist and socio-communicative competence, which lays a foundation for lifelong learning and further development in the workplace, to have become more important than theoretical knowledge and the subject content itself (see e.g. Knight & Yorke 2004, Shah et al. 2004, Warn & Tranter 2001, Harvey 2001, Barnett 2000a, Bowden & Marton 1998). However, this varies according to professional discipline and in medicine explicit discipline-related and subject-specific knowledge is still considered important. Whereas engineering is oriented towards change, the medical profession is more oriented towards sustaining or maintaining status quo.

10.4 Specialisation and differentiation

The physicians work with a delimited phenomenon in focus during their education and in professional practice, i.e. the human body. The engineers,

on the other hand, do not have a corresponding phenomenon during their education that is relevant to them in professional practice. It is not uncommon that the physicians have a holistic view of the educational programme in which all the separate parts and courses are considered contribute to creating a holistic overall meaning of their education. Different building blocks are necessary for the understanding of other parts of the education and, for example, the first pre-clinical part of the physicians' studies is regarded as a foundation for their further studies and clinical training. The courses build on each other and knowledge is considered to be accumulative and creating an in-depth understanding of the field. The novice physicians have a relatively pragmatic view of what their education should be as all courses and elements in the educational programme that are perceived to have little or no direct bearing on the professional practice are regarded as less important aspects of their education, it is not uncommon that they mention the pre-clinical (preparatory) parts of the educational programme in this context. The physicians note that the educational programme they have chosen is the only alternative for their future practice.[117]

The engineers, on the other hand, commonly view their education as compartmentalised and segmented. It is difficult to both discern how the different courses are related to each other and to acquire a holistic overview of the educational programme. The engineers argue that many courses are parallel rather than building on each other and that the programme broadens rather than deepen their knowledge.[118] The engineers also generally consider other alternative educational backgrounds as possible for managing the work and assignments associated with their professional practice.

The engineers constitute a relatively heteronymous collective on the labour market, working in a variety of different positions, employed in widely different organisations and sectors in the world of work, and working with widely different tasks and assignments as well as tackling a wide variety of different problems. The differentiation among the engineers, in this study, is considerable as the engineers tend to become widely dispersed in working life, both horizontally and vertically (cf. Hellberg 2002). The engineers are

[117] This is obviously also associated with the legal sanctions associated with practising medicine without a license, which can only be obtained via government-sanctioned educational programmes.

[118] As mentioned in section 10.2, the engineers tend to view their education as a broad foundation for further development and specialisation in practice, enabling the graduates to quickly learn what they need, which is also considered to imply that the engineers have acquired a lot of knowledge during their education that will not be relevant in their professional practice.

working for large international companies in the private sector, for small and medium-sized companies and in the public sector, while others are self-employed. This may necessitate an educational background that provides a broad foundation facilitating the acquisition of specialist competence relevant to the specific practice in the workplace, rather than highly specialised vocational preparation for a more limited field of practice. They generally believe the profession consists of generalists rather than specialists. In this sense, higher education has a different purpose and different impact for the two professional groups in this study.

The medical programme is in many ways narrower than engineering programme when it comes to mobility, for example, the variety of possible employers, workplaces and sectors. The physicians constitute a relatively homogenous collective on the labour market in the first few years after graduation from higher education as they generally end up in the same 'branch' or sector and in similar hierarchal positions (cf. Hellberg 2002). They go through their general and specialist training and are mostly in similar positions in the hierarchy of the organisations in which they work; few of them were in leading administrative positions, at the time of the interviews. The differentiation among the physicians increases with experience, but has not become as extensive as among the engineers. Thus, there is a greater differentiation among the engineers than among the physicians in this study. This observation is also consistent with the findings of Hellberg (2002).

As previously discussed, an increasingly complex world and labour market are leading to an increasing mass of knowledge, which is also associated with increased division of labour. The differentiation in the professions has resulted in hierarchies within the professional groups and the professionals are also forced to specialise in their professional field, as the scientific advances has made the growing mass of scientific knowledge unmanageable for the individual professional. The increased specialisation and differentiation in the professions also has consequences for higher education (Hellberg 2002). The individual professionals have to focus on a delimited part of the knowledge mass. Hellberg (2002) argues that the specialisations in the professions tend to become new scientific disciplines and in their application new occupational groups are formed. Professional identity thus becomes difficult to uphold and dissolves. This seems to be highly relevant in the case of engineers who are highly differentiated and have a low level of professional coherence.

The physicians have a relatively structured specialisation process and the discipline is structured into different, clearly defined areas of specialisation (e.g. surgery or general medicine). The professionals also have a kind of control over defining and structuring different specialisations within the

profession. For the engineers, on the other hand, specialisation generally seems to occur in relation to the organisation and the specific work by means of continuous professional development in the workplace. However, the engineers' professional education is in one sense specialised from the start (in e.g. information technology or mechanics) and they have considerable freedom when it comes to choosing specialisation courses during their education. Still, there is considerable differentiation among the engineers after the completion of higher education, and for the engineers the 'real' specialisation seems to occur in the workplace in relation to their work and the organisation, rather than in relation to a phenomenon common to all the professionals. For the physicians, specialisation takes place in professional practice, but within the field of medicine in relation to the profession. Thus, there are similarities in the physicians' trajectories when it comes to professional specialisation.

The need for further development and training in the case of the physicians is more closely tied to the discipline and viewed as development in the profession. For the physicians, further development and training is primarily a way of specialising and deepening their knowledge in a specific area in the discipline and a way of updating and renewing their knowledge. The engineers tend to specialise in relation to the organisation or workplace, alternatively, in relation to the branch of business, rather than in relation to the profession. For the engineers, the opportunities for career development and the acquisition of formal credentials are also considered to be a central aspect of their professional development. This is also consistent with previous research (Hellberg 2002). Generally, the orientation of the physicians is towards the profession rather than the specific workplace. The engineers, on the other hand, relate to the workplace, organisation or branch of business rather than orienting themselves according to the profession. In a study by Svensson (2006), the results showed a strong relationship between professionalism and knowledge, competence and skill. The respondents in this study also tended to emphasise a contextual competence rather than perceiving professionalism as a general capability. The community of practice the engineers relate to is the workplace or the work organisation and for the physicians, it is the profession. Knowledge is contextually situated and the learning takes place in the interaction with the workplace in the case of the engineers and in relation to the profession in the case of the physicians.

10.5 Professional knowledge, legitimacy and jurisdiction

An important characteristic of modern professions is the control of knowledge within a field of practice and a delimitation of a territory in which the professionals control the planning and performance of services, and have control over the members' education and other formal qualifications (see e.g. Castro 1992, Abbott 1988). The legitimacy of a profession and the jurisdiction of a professional field partly rest on a close association with the higher education institutions (see e.g. Eraut 1994). Thus, legitimacy is also related to the correspondence between the educational and the professional knowledge base. In addition to establishing an exclusiveness of the practical knowledge base, Wilensky (1964) has also argued that the jurisdictional claims of a profession depend on the knowledge base not being general or vague. For the engineers, the esoteric knowledge base of their education is perceived as being very broad and loosely coupled to the practice and legitimacy of the engineers as well as being shared with other occupational groups. Legitimacy instead becomes closely connected to displaying demonstrable results. The value of the academisation may therefore become questionable when it comes to the substance of the educational program, but also the symbolic value of higher education is debatable (see e.g. Alvesson 2006).

The physicians' knowledge base, on the other hand, is specific, distinct and related to the professional knowledge base. However, the medical knowledge base is in a way, but with a partly different content, shared by physicians and nurses although it is complemented in different ways. Nevertheless, there is still a clear division of responsibility between the two occupational groups based on distinct jurisdictional boundaries. Engineers, on the other hand, compete for the same positions in the private sector regardless of education, specialisation and level. Generally, a longer education leads to higher positions, but the engineers have still not been able to establish jurisdiction or closure, i.e. higher education becoming a prerequisite of certain higher positions (Torstendahl 1990).

The engineers' field of knowledge and practice (information and communication technology) is constantly changing and, thus, there is a lack of a static field of knowledge that can easily be controlled and monopolised. There is no perceived common knowledge base relevant to the professional practice for all engineers in information technology in the same way as in the case of the physicians, who share a common knowledge foundation. The engineers do not have control over a field of knowledge and the knowledge provided in higher education has only a loose relation to the practice, which

makes establishing jurisdiction and strong professional cohesion difficult. Thus, the engineers' expertise is contested, and they are subject to competition from other professional groups. They do not have uncontested authority over the practice within a certain field that others identify the group with and according to which the work is organised. According to Abbot (1988), those are the primary criteria for establishing jurisdiction. Abbot argues that the establishment of a profession is primarily based on the striving for jurisdiction and the competition with rival occupational categories for the claims to the work. The delimitation of an area where the professionals have a monopoly when it comes to exploring, planning and performing services and work, is a primary characteristic of the modern professions. A delimitation and control of a certain formal competence, in turn, also consolidates professional authority (Castro 1992). The engineers have formal competence in relation to certain work, but other occupational categories or professional groups contest and compete with the engineers for the work in the same fields and the same work. The engineers are less concerned with a distinction between different occupations, education and professions and some engineers also consider their education to be replaceable. The engineers in information technology work side by side (and compete for jobs and work assignments) with co-workers with other educational backgrounds (e.g. systems analysis, cognitive science). Thus, the engineers seem to have a limited interest in establishing jurisdictional claims as they do not primarily identify with the profession or the professional group, but rather with the work or specifically the organisation for which they work. Instead, the expertise and the legitimacy of the engineers seem to emanate from the demonstrable results of their work, and the actual competence that enables them to produce the results. The engineers' legitimacy is often associated with the results rather than formal credentials. Knowledge and collegiality are subordinate to efficiency as grounds for legitimacy and management control (cf. Svensson 2007).

In general the legitimacy of the professions, the professionals' claims of expertise in knowledge and occupational control, is also being increasingly challenged by a technical rationality, the logic of the market and rational management, which has lead to a de-professionalisation (Hyland 1996). The autonomy of the professionals as experts, based on knowledge, has been undermined by expert systems (Wilson 2000).

Nonetheless, the physicians still enjoy full jurisdiction (see Abbott 1988), alternatively, total exclusion or closure (see e.g. Hellberg 1999, Murphy 1988, Parkin 1979, 1974, Weber 1968) as regards their field of practice as the state as legitimated the professional practitioners and, in fact, it is a crime to practise in their field of practice without being authorised. Legitimising is

also associated with certain ethical rules the professional have to abide by. The physicians claim the right to define and solve all problems in a certain professional field. This is also the foundation of an unambiguous demarcation between different occupational categories within their field of practice. Other occupational groups with alternative educational backgrounds concerned with the human body and health (e.g. nurses and physiotherapists as well as practitioners in alternative and complementary medicine) are not allowed to compete for the same jobs and work assignments (see also e.g. Abbott 1988).

The physicians have both clear, legally based, jurisdictional claims to be the only competent practitioners in their field, as well as a foundation of theoretical and practical knowledge learned during their professional education that is considered relevant to the practice. Thus, the physicians have a formal competence related to their field of practice as well as a legal jurisdiction to fall back on. Thus, there is no external competition for the work. The physicians also tend to make clearer distinctions between different occupational groups in the work place and argue that their education is the only possible background for doing the work. This is obviously connected to the legal restrictions, but may also be associated with a closer identification with the profession and upholding of the jurisdictional claims. Nevertheless, the expertise of the physicians is also being questioned. Although the physicians can still be considered to have the general public's trust as being the only competent experts in their field of practice, this is being increasingly challenged. The patients are becoming, or at least perceive themselves to have become, more informed and knowledgeable. The physicians are no longer the unquestionable experts of the past, which also adds to the increasing demands and pressure in the physicians' professional practice.

10.6 Education for competence, qualifications or credentials– the use or exchange value of education

Concerns about an over-education can be raised when the educational program and professional practice are only loosely coupled and there is little overlap between the educational and the professional knowledge base, as it is in the case of the engineers. Over-education may result in the professionals being better equipped to tackle change, new and unexpected situations in the world of work, using their over-qualification to develop and change their work and create new work. This may be the case if education has a training, socialising or qualifying function where education is perceived as conveying and promoting knowledge and attitudes that may be (more or less) relevant to

the world of work.[119] In human capital theory, education is considered to be a rational strategy for qualifying individuals for the world of work or to increase individual employability. Knowledge relevant to professional practice is presumed to be conveyed by means of higher education in a relatively unproblematic way to ensure that the individual can perform tasks with greater efficiency and solve new problems that may arise (see e.g. Ståhl 1974). Human capital theory is based on a rationalistic and instrumental view of education and associated with a technological-functional perspective on knowledge.[120] Education from this perspective has a training and a qualifying function and this can also be related to the socialisation function of education. An alternative perspective on education is that education mainly serves as a filter, sorting and allocating individuals based on credentials or formal competence. The actual competence and the competence-in-use (Ellström 1998) become less relevant from this perspective. The competence acquired in higher education is not presumed to be relevant to professional practice and it is questionable whether education increases the individual's productive capabilities. The proposition that higher education actually leads to increased productivity, development and change in working life is viewed with scepticism (see e.g. Abrahamsson 2002a). Education is an institution that serves mainly as a symbolic meriting ritual (see e.g. Meyer 1977, Arrow 1973). The concepts used in educational sociology, such as selection, sorting and filter regarding the functions of education, are primarily used in theories referring to a system or a macro level. On an individual level, they may be less pertinent, but can still be useful when describing how individual motivations and the impact of education are to be understood on the group level, and the exchange and use value of education may be more appropriately applied.

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[119] However, Collins (1971) maintains that there is no support for the assumption that better educated individuals are more productive. The available evidence is indirect and based on relationships between educational levels and overall productivity on a societal level. Furthermore, more highly educated individuals tend to receive a higher wage, and wages are regarded (in a circular reasoning) as an indicator of the individual's contribution to productivity.

[120] When this perspective on knowledge is applied to the development of competence, the focus is not on general qualifications but specific, and implies an adaptive perspective on qualifications (Ellström & Nilsson 1997). Thus, theoretical knowledge is viewed as a product that is transferable from one context to another and learning becomes a passive process where the objective is to solve specific, definable problems using prearranged procedures to reach expected outcomes (Ellström & Nilsson 1997, Rolf et al. 1993).

Hence, education constitutes a formal credential, which increases individual employability and the education acquired acts as an 'entrance ticket' to professional practice. For the physicians, formal credentials and authorisation are a direct prerequisite of practising the profession as the practice is regulated by law. Formal credentials or licensing, on the other hand, are not a formal requirement for working in the professional field of the engineers. Engineers compete for the same positions with people from various other backgrounds and different educational levels. Still, on an individual level, the function of education or rather the impact or use of their education, can be interpreted in a different way. The engineers' reasons for choosing the specific educational program are fairly closely associated with the employability aspects. Education is perceived as an indirectly, if not formally, necessary entrance ticket to desired positions. The physicians' reasons are, on the other hand, more closely related to the specific professional field, but they are also obviously subject to the requirement to attain the formal credentials. The primary reason or motive for choosing medicine is not the acquisition of credentials useful on the labour market, but the educational choice is rather based on an intellectual interest in the specific discipline (cf. Dyrdal Solbrekke & Karseth 2006). For the engineers, their education generally has little value in itself in relation to their professional practice as little competence acquired in the educational program is used in practice; instead, their education is primarily a means to reach attractive positions on the labour market and in society. The competence used in the workplace is not coherent with the primary focus of the educational program and discipline-specific theoretical knowledge for the engineers in the same way as it is for the physicians. This also implies that alternate routes and backgrounds could lead to and be relevant to performing the work of an engineer. While the physicians relate to their professional practice, the engineers relate to their education. Thus, for both physicians and engineers, their education has a symbolic legitimating function and acts as an entrance ticket to the labour market, but on different levels, that is, having an education and using the competence acquired in the educational program. In the case of the physicians, this is related to formal requirements regulated by law and the engineers regard the title as being associated with increased employability. Furthermore, while the physicians' education in one sense has a symbolic value, it also acts as a rational preparation for the world of work, where the competence acquired in the educational program has a use value. The engineers, on the other hand, view their education in terms of a ritual that has to be passed in order to increase the chances of acquiring the sought-after positions. Their education has an exchange value, as there is no connection to a specific context of application, whereas the competence acquired in the

educational program does not have a use value, or is at least subordinate to the symbolic value of the credentials.

A dominant representation of a technical rationality is expressed by the physicians in this study (and is also present among the engineers). There are expectations of higher education providing competence that is transferable and applicable in professional practice. In this study, the physicians' preparation for working life takes place in a rational way where substantive, contextually situated, specialist knowledge is considered to directly relate to the demands encountered in professional practice. Thus, the physicians emphasise the qualifying and socialising function of higher education. The engineers, on the other hand, argue that the main function of education is the acquisition of generalist competence; transferable between contexts; which is transformed in professional practice or acts as a foundation for further development in the workplace, and the formal credentials which enables the graduates to obtain desirable positions on the labour market.[121] The demands on formal competence needed to get employment have increased, although the competence required in the workplace still seems to be acquired in professional practice. Education is a way of showing that they have the capacity to learn difficult things. Their education may act as a selection device because as the engineers have undergone a tough education, they are perceived to be able to cope with stress, high strain, hard work, and to be adaptable, flexible and have the ability to quickly orient themselves in new contexts and learn. This is the presumed to be the case regardless of whether their education has actually had any enduring effects or not (cf. Meyer 1977).[122] Consequently better educated employees may still be more productive than those with less education. Nonetheless, the engineers also argue that generalist competence developed in higher education may be transferable and therefore facilitate the acquisition of the specific competence

[121] According to Collins (1971), this supports Weber's conflict perspective in which the formal requirements for employment are an expression of the conflict and competition between different occupational groups trying to monopolise jobs by controlling the selection process.

[122] Collins (1971) argues that the educational upgrading, increased formal demands, may only to a small extent be attributed to changes in the occupational structure and that the educational level has risen more than demanded by the knowledge requirements in the jobs, which has resulted in an over-education and maintains that there is no support for the assumption that better educated individuals are more productive. However, if education serves as a sorting mechanism, the graduates from higher education may still be more productive, even if the educational experience per se had no enduring effects, due to the initial values that ensured they were capable of completing the tough educational program.

needed in the workplace and thus facilitate the transition into productive employees. The profession is learned in the workplace and the engineers' education mainly serves as a general broad foundation and formal entrance ticket to the profession. This reasoning is more in line with the sorting function of education. Aspects of the engineers' professional education are considered to have a limited correlation with or relevance to demands encountered in professional practice and their education can be considered to mainly serve a ritual function (see Abrandt Dahlgren et al. 2006, 2007). Abrandt Dahlgren et al. refer to ritual knowledge as knowledge "*where the connection to the specific context of application is lacking and the most important feature is instead the exchange value of knowledge*" (p. 584 in Abrandt Dahlgren et al. 2006). The physicians, on the other hand, regard their education more as a rational preparation for professional practice. What they learn in their professional education is used and has a direct impact on or constitutes a direct preparation for a professional field of work. Their knowledge is utilised in professional practice without being re-contextualised or transformed. The actual competence comes into focus for the physicians and for the engineers their formal competence may become more relevant. Abrandt Dahlgren et al. (2006) suggest that all educational programs have both a rational and a ritual component where one aspect may be more or less dominant as is also the case in this study where higher education can be construed as mainly rational preparation for the physicians and as a ritual and a general preparation or as rational generic for the engineers.

To summarise, the training, qualifying and socialising function of education is considered central for the physicians as a rational preparation for the world of work. For the physicians, their education is a necessary credential, but it also has a use value as it promotes a direct instrumental competence use. For the engineers, on the other hand, the credentials acquired via the educational program are not formal requirements. However, they are generally regarded as an informal requirement for professional practice, and their education mainly has an indirect symbolic exchange value analogous to the sorting function of education.

10.7 Practical implications and suggestions for further research

The concern of this thesis is two professional programs and the relationship between professional education and practice. Thus, the 'bildung' aspect of education is outside the focus of the study and also not apparent in the empirical data, where the focal point is instead mainly on education as a preparatory institution in relation to the world of work. However, generalist

competence, such as for example critical reflection and problem-solving, as well as the construction of a professional identity can be related to critical enlightenment, active democratic citizenship, and other aspects of the 'bildung' perspective associated with education as a liberating process (see e.g. Barnett 1990). Still, the educational curriculums of the professional programs in focus are specialised educational profiles with a vocational character where the employability aspects are at the centre.

As indicated by the results from this study, differences between educational programs and varying contexts of the professional practice, as well as the connection between the educational and professional knowledge base, may have implications for the construction of educational curriculum.

It has been suggested that different pedagogical structuring of the curriculum such as project- and problem-based learning may be a way of bridging the gaps between theory and practice (see e.g. Bowden & Marton 1998, Boud & Feletti 1997). The pedagogical structure of the individual educational programs was not considered in this study. A consideration of the curriculum would require additional empirical data, not available in this study, concerning delimitation and thorough descriptions of how the curriculum was actually implemented in the practical setting through for example observations and interviews with teachers. The study was therefore limited when it comes to exploring differences between pedagogical structures that might further illuminate the results.

The two professions in focus in this study have also generally been described on a group level, where the results are portrayed as characteristics of a professional group, and certain background variables, such as gender, have been outside the scope of the study. The view on the functions of education, what is learned during education, the experiences of demands encountered in the workplace, as well as the opportunities for further development and learning may also be related to gender structures in different professions and different organisations (see also e.g. Einarsdottir 1997). For example, the status of physicians seems to have become increasingly challenged also this may be related to the gender aspects. Abbott (1998) has for instance noted that the conceptual difference between semi-professions and full professions can probably mainly be ascribed to gender differences. Thus a gender perspective may also lead to an increased understanding of the results presented in this study.

Another possible continuation of this study is to take as the starting point descriptions of the possibilities graduates have to be agents of innovation and change. In other words, to focus on what prerequisites and possibilities the graduates have to influence and shape the organisation and the content of the work. In order to further illuminate the opportunities professionals have to

contribute to innovation and change in their practice, the organisations in which they work and the profession, an alternative approach may be to consider the specific contexts within which the individuals interviewed in this study actually are working. This would also require additional data collection.

10.8 Concluding comments and reflections

As stated in the introduction, this thesis has set out to attempt to take a comprehensive approach in the exploration of the transition of physicians and engineers from higher education to professional practice. The focus is on the interrelationship between the professionals, the professional knowledge base, and the professional practice, including the organisational context in which the professionals work (Daley 2001, Eraut 1994). In order to tackle this, some questions were initially posed in the thesis, and have been addressed throughout the text and summarised in this last chapter. What is learned in higher education and what happens in the encounter with the workplace? What is the point of professional education? What function, or impact, does higher education have as far as the physicians and engineers are concerned? Is it mainly a ritual or symbolic credential-generating process or is it a rational training, qualification and socialisation process? Do the educational programs promote generalist or specialist competence? Do the educational programs have a use or exchange value?

What is learned in higher education and the demands that characterise professional practice differ between the physicians and engineers. Whereas the engineers predominantly emphasise their education's role in the development of generalist competence relevant to professional development in the workplace, the physicians consider expertise of explicit theoretical specialist knowledge to be a central aspect of what is learned in the educational program and highly relevant to their professional practice. In the case of the physicians, there is a close relationship between professional education and practice whereas the relationship is somewhat 'looser' in the case of the engineers. Consequently, the educational and the professional knowledge base are not closely linked in the case of the engineers while they overlap for the physicians. This could be associated with medicine as a classic profession with a foundation of static explicit knowledge relevant to the practice on which the physicians are experts and which, in turn, reinforces the legitimacy of their competence. The engineers, on the other hand, have no similar foundation of static knowledge on which they are experts. The theoretical knowledge, which is central to the engineers' field of practice, is constantly changing and therefore difficult to control, thus the ability to

update, learn and adapt becomes more important and legitimacy is related more to demonstrable results.

In one sense, specialisation for many engineers takes place after graduation, when they choose what they specifically want to work with. While the novice physicians perceive their education to be a vocational preparation for professional practice, characterised by low degrees of freedom and standardised applications, the engineers refer to their education as a general foundation for learning the profession through practical experience in the workplace. The engineers tend to characterise their education as broad and emphasise the benefits of being generalists with the possibility of getting a job in a wide range of organisations and to become active agents of change. Their education has given them a foundation, but is generally not considered to be directly vocational. The knowledge needed to perform the actual work is necessarily acquired in the workplace.

There has been a long and ongoing debate regarding the functions of higher education or what the purpose of education is and should be. There are different ways of characterising or describing this debate and drawing out distinctions from previous research and there are alternative approaches or different ways of viewing knowledge and approaches to how learning takes place in a formal educational setting. The results of this study have shown that the learning processes and transition to the workplace vary between different professional groups and, thus, that different functions of education seem to be more important than others in the two professions focused on in this study. For the engineers, their education is in part a ritual as the coupling between higher education and professional practice is loose, due in part to the incoherence between the knowledge base of their professional education and the knowledge base of the professional practice or between competence and qualifications.[123] The physicians, on the other hand, instead view their education as a rational preparation since the knowledge base of their educational program is closely related to the knowledge base of their professional practice.

Medicine is a 'classic' profession and readily fits into the definitions sketched out in professional research where professional education prepares the graduates and has a clear relation to professional practice (see e.g. Hellberg 2002, 1999, 1997, Castro 1992). However, in this study the engineers are more difficult to characterise as a professional group. Professional theory seems inadequate when it comes to illuminating the relation between knowledge, higher education and practice. The focus should

[123] This may be inevitable as the knowledge base is constantly and rapidly changing due to rapid technological developments and advances.

be shifted towards what the professionals actually do and what they know (Abbott 1988, Freidson 1970b). The engineers constitute a very diverse group of professionals with low professional cohesion. The engineers relate their personal and professional development to the discipline as students and to the organisation or branch in professional practice when they start working. They do not relate to or identify primarily with the profession, there is no definite foundation of knowledge specific to the practice, which they control or monopolise, and their professional education only has a loose relation to the practice (cf. Hellberg 2002). While the physicians tend to choose the profession when they chose the educational program, because they want to become physicians, the engineers chose their educational program, partly because it would give them a broad education, and take less account of the specific work that awaits them after graduation.

Thus, there seems to be differences between the knowledge bases, or knowledge traditions, associated with the two professions focused on in this study. The physicians' knowledge base can be regarded as more stable over time and in relation to the profession, whereas the knowledge central to the engineers' professional practice is non-static, constantly changing, and more 'fleeting' (in contrast to the knowledge base of the educational program). The engineers' educational programs are based on a relatively static knowledge base as is the physicians'. For the engineers, this knowledge base consists of, for example, math and physics. However, the knowledge base of the educational program is only loosely associated with the professional practice and their education is often regarded as a having a symbolic value.

To summarise, the function and impact of the professional education seems to differ between the professions and can be characterised as substance versus symbolism. The engineers generally claim to not utilise the explicit knowledge learned in their educational program to any considerable extent in professional practice. Their educational program is instead characterised mainly by a sorting and meriting function or as a ritual where the educational program is something that has to be passed in order to reach a desirable position. The education instead has an exchange value (cf. Abrandt Dahlgren et al. 2006, 2007). For the physicians, their education is a necessary credential, but the competence learned and developed in the educational program is also generally considered to be transferable and relevant to as well as used in professional practice. Thus, the physicians perceive the educational program in a more rational way with a focus on the use value. It is considered to be more vocational in nature with a preparatory function clearly related to the profession and specifically defined and standardised tasks in the workplace.

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Appendix A: Interview guide 1

Interview guide 1 in Swedish

1. Berätta varför du har valt det här yrket.
Vad gjorde att du sökte och fick detta arbete?

2. Berätta om hur en arbetsdag ser ut – Vad gör du?
(Vad gjorde du igår?)
(Hur typisk var denna arbetsdag för dig?)

3. Finns det någon form av arbetsbeskrivning (eller liknande dokument) för ditt arbete?
Vad förväntas av dig enligt denna arbetsbeskrivning?
Hur stämmer arbetsbeskrivningen överens med det du faktiskt gör?

4. Vad upplever du att arbetet kräver av dig?
- kunskapsmässigt (Vad måste du kunna?)
- som person (Måste du vara på ett visst sätt?)
- för att fungera socialt (Måste du fungera på ett visst sätt?)

5. Vilka möjligheter till lärande och utveckling erbjuder ditt arbete?
Vad lär du?
Hur lär du? (på vilket sätt/i vilka situationer?)
(Lärande i det dagliga arbetet respektive lärande på sikt?)
(utveckling i yrket respektive personlig utveckling)

6. Vad uppfattar du som angelägna problem inom ditt område idag?
Hur förhåller du dig personligen till detta?
(Varför finns det egentligen läkare/civilingenjörer?)

7. Hur är det att vara nyutexaminerad läkare/civilingenjör?

8. Hur ser din bild ut av hur en läkare/civilingenjör ’skall’ vara?
Vad tror du har påverkat Din syn på detta?

Vem/vilka tror du har påverkat din syn på detta?
(Vad är en ’bra’ läkare/civilingenjör ’bra’ på?)

9. Har du någon bild av organisationen/verksamheten? Berätta hur den ser ut.
(Hur tänker du/resonerar du kring sådant som tid & effektivitet?)
Hur vill du placera dig själv i det sammanhanget?
Hur uppfattar du din egen roll/plats/funktion i organisationen?

10. Vad värderas högt på arbetsplatsen?
(Vilken typ av kunskap, kompetens eller egenskaper värderas högt på arbetsplatsen?)

11. Hur uppfattar du förändringsklimatet i organisationen?
Om du vill förändra något som rör dina arbetsuppgifter - hur går du då tillväga?

12. Vilken grad av frihet har du i arbetet?
Vad/vem/vilka styr över ditt arbete?
I vilken utsträckning känner du dig begränsad av föreskrifter, procedurer och liknande?

13. På vilket sätt får du feedback/återkoppling på det du gör?
Vad får du återkoppling på… och av vem/vilka…?
Är det denna typ av återkoppling du vill ha?
(rätt sätt/rätt saker)

14. Hur uppfattar du att relationer och samarbete med kollegor och arbetskamrater fungerar?
(På vilket sätt…?)

15. Berätta om hur du upplevde den första tiden i arbetet.
(eventuellt de första dagarna)
(Vilka känslor dominerade dig då?)

16. Hur skulle du vilja beteckna övergången från utbildning till arbete?
(Hur upplevde du övergången från utbildning till arbete?)

17. På vilket sätt introducerades du på arbetsplatsen?

18. Om du tänker på den bild av arbetet som läkare/civilingenjör som du hade med dig från utbildningen - Hur stämmer den bilden överens med hur det är

att vara läkare/civilingenjör?
Vilka förväntningar hade du på arbetet/yrket innan du började arbeta?
Hur stämmer denna bild med hur det 'faktiskt är'?
För vilka situationer eller uppgifter har den, respektive har den inte, gett en realistisk bild?

19. Uppfattar du dig som väl förberedd för ditt arbete - På vilket sätt?
Vilka situationer känner du dig förberedd inför?

20. Finns det situationer i arbetet du känner dig oförberedd inför – Vilka…?
Vad är det då du saknar?

21. Vad bär du framför allt med dig från din utbildning in i arbetslivet?
(Vad har du med dig från annat håll?)

22. Vilken typ av kunskap/kompetens tillvaratas i arbetet?
(I vilken utsträckning känner du att den kunskap/kompetens du besitter efterfrågas och tillvaratas i arbetet?)
Vad tycker du själv att du kan tillföra i arbetet/på arbetsplatsen?
(I vilken utsträckning känner du att du saknar den kunskap och kompetens du behöver i arbetet?)

23. Sammanfatta kort vad du menar är väsentlig kunskap/kompetens i ditt yrke och nuvarande arbete.

24. Kan du berätta om din utbildning?

25. Vad anser du att syftet är med universitetsutbildning?
(i allmänhet och mer specifikt/i samhällsperspektiv och i ett individuellt perspektiv?)
(Skillnaden mellan gymnasieutbildning och universitetsutbildning?)
Vad tror du att din arbetsgivare anser att syftet är…?

26. Om du ser tillbaka på din utbildning – Vad uppfattar du som särskilt värdefullt?

27. Vad i utbildningen betraktar du som mindre värdefullt?
På vilket sätt/Varför anser du att detta är mindre värdefullt?
(För lite, för mycket av något, något som har tagit för stor plats?)
Har du något förslag till förändring av utbildningen?

28. Vad har du (då) lärt genom din utbildning? – Sammanfatta kort.

29. Är det något annat du vill ta upp som rör din utbildning, ditt arbete eller övergången däremellan?
Är det något som vi pratat om under intervjun som du har uppfattat som särskilt intressant eller som du vill utveckla?

Interview guide 1 in English translation

1. Describe why you have chosen this occupation.
What made you apply for, and get this job?

2. Describe an ordinary working day – What do you do?
(What did you do yesterday?)
(How typical was that working day for you?)

3. Is there some form of job description for your job?
What is expected from you according to this job description?
How does the work description correspond to the work you actually do?

4. What do you experience that the work demands of you?
-knowledge-wise (What do you have to know?)
-as a person (Do you have to be in a certain way?)
-socially (Do you have to behave in a certain way?)

5. What opportunities for learning and development does your work provide?
What do you learn?
How do you learn? (In what way? In what situations?)
(Learning in the daily work respectively learning in the long term?)
(Development in the occupation respectively personal development?)

6. What do you consider to be urgent problems within your field today?
How do you personally relate to this?
(Why are there physicians/engineers?)

7. What is it like to be a novice physicians/engineer?

8. What is your view of how a physician/engineer 'should' be like?
What do you think have influenced this view?
Who do you think has/have influenced this view?
(What is a 'good' physician/engineer 'good' at?)

9. Do you have a vision of the organisation/the operations? Describe what it looks like.
(How do you reason about things like time & efficiency?)
How do you want to position yourself in that context?

How do you perceive your own role/position/function in the organisation?

10. What is valued in the workplace?
(What type of knowledge, competence, or characteristics is valued in the workplace?)

11. How do you perceive the potentials for change in the organisation?
If you want to change something that concerns your work assignments – how do you proceed?

12. What degrees of freedom do you have in your work?
What/who controls your work?
To what extent do you feel restricted by directives, procedures and such?

13. In what way do you receive feedback on what you do?
What do you get feedback on… and by who…?
Is this the kind of feedback you want?
(In the right way/on the right things)

14. How do you perceive that relationships and cooperation with colleagues and co-workers function?
(In what way…?)

15. Describe how you experienced the first time period at work?
(Possibly the first days)
(What feelings dominated?)

16. How would you like to characterise the transition from education to work?
(How did you experience the transition from education to work?)

17. In what way were you introduced to the workplace?

18. If you think about the picture you had of working as a physician/engineer from the education – How does that picture correspond to how it is to work as a physician/engineer?
What expectations did you have of the work/occupation before you started working?
How does this picture correspond to how it 'actually is'?
Regarding what situations or tasks has it, respectively has it not, provided a realistic picture?

19. Do you consider yourself well prepared for your work – in what way? What situations do you feel prepared for?

20. Are there situations in the work you feel unprepared for – What kind…? Then what is it you are lacking?

21. What is it that you primarily bring with you from the education into working life?
(What have you brought with you from other contexts?)

22. What kind of knowledge/competence is utilised in the work?
(To what extent do you feel that the knowledge/competence you hold is demanded by and utilised in the work?)
What do you think that you can contribute with in the work/in the workplace?
(To what extent do you feel that you lack the knowledge and competence required by the work?)

23. Summarise briefly what you mean by essential knowledge/competence in your occupation and in your present work.

24. Can you describe your education?

25. What do you consider the purpose of university education to be?
(generally and more specifically/from a societal perspective and from an individual perspective)
(The difference between secondary education and university education?)
What do you think you employer consider the purpose to be…?

26. If you look back on your education – What do you consider to be particularly valuable?

27. What aspects of the education do you consider to be less valuable?
In what way/why do you consider this less valuable?
(Too little, too much of something, something that has taken up too much room?)
Do you have any suggestions for changes in the education?

28. What have you learned through your education? Summarise briefly.

29. Is there anything else you would like to talk about that concern your education, your work, or the transition there between?
Is there anything that we have talked about during the interview that you have perceived as particularly interesting or that you would like to elaborate on?

Appendix B: Interview guide 2

Interview guide 2 in Swedish

1. Vad har hänt sedan vi sågs sist? Berätta…
Berätta om ditt arbete som läkare/civilingenjör…
Hur skulle du vilja beskriva din arbetsplats?

2. Berätta om hur du har hamnat där du är nu…
(utbildnings- och yrkesval etc.)
Vilka motiv/drivkrafter har varit betydelsefulla för dig?
Kan det finnas annat som har påverkat dig?
När bestämde du dig för att bli läkare/civilingenjör?
(Finns det någon specifik händelse som gjorde att du blev civilingenjör/läkare?)

3. Hur viktigt är arbetet för dig i förhållande till andra saker i livet?

4. Hur ser dina framtidsplaner ut?

5. Nu när du har arbetat ett tag, hur ser du då på din utbildning?
Hur har utbildningen förändrat ditt sätt att tänka? …att vara? …ditt sätt att förhålla dig till andra människor?

6. Vad anser du har varit mest värdefullt i Din utbildning?
Vad anser du har varit mindre värdefullt? På vilket sätt?
Tycker du att utbildningen förberett dig för arbetet? På vilket sätt?
Har det varit situationer som du har varit mindre förberedd för? Vilka?

7. Sammanfatta vad du tycker att du lärde under din utbildning.

8. På vilket sätt är det möjligt för dig att använda kunskaper från din utbildning i ditt arbete?
Vilka problem har du haft med att omsätta det du lärt dig under utbildningen i arbetet?
Vari består problematiken som du uppfattar det?

9. Berätta vad du måste kunna i ditt arbete?
(Krav i förhållande till utbildningen, kunskap, yrkesfärdigheter; identitet, mognad, utveckling)

10. Vad tycker du själv att du kan tillföra i arbetet/på arbetsplatsen?

11. Utvecklas du i det dagliga arbetet? Hur?
Som person?
Som yrkesmänniska?
När och i vilka situationer tycker du att du utvecklas?
Vad betyder andra personer för ditt lärande och din utveckling?

12. Finns det några hinder för din utveckling i arbetet?

13. Vilka krav ställer arbetet på att du tar till dig ny kunskap?
När du (hamnar i en situation då du) saknar kunskap, hur går du då tillväga?
(Hur tillvaratas din kunskap/ditt kunnande i ditt arbete?)
(Vad är det som tillvaratas?)

14. Har du kunskap/kompetens som inte används i ditt arbete?
(På vilket sätt tror du att det skull kunna ha betydelse för verksamheten?)
(Vad är det som gör att du inte kan använda all din kunskap/kompetens?)

15. Känner du dig under- eller överkvalificerad?

16. Vad är det du framför allt har lärt dig sedan du började arbeta?
Vad kan du göra idag som du inte kunde innan du började arbeta? (Ge ett exempel?)
Hur har du lärt dig det?
(Vad lär du i det dagliga arbetet? På vilket sätt lär du? Hur? I vilka situationer lär du?)

17. Vad tycker du att poängen (syftet) är med universitetsutbildning?
(Vad är universitetsutbildningens uppgift?)

18. Vilka är de främsta utmaningarna i ditt arbete?
(Vad är svårt i ditt arbete?)

19. Berätta hur det är att vara läkare/civilingenjör…

20. På vilket sätt skulle du vilja beskriva dig som läkare/civilingenjör?
(Hur är du som läkare/civilingenjör?)

21. Vad tror du främst har påverkat dig att vara på det sätt du är (som läkare/civilingenjör)?
Hur betydelsefull tycker du att din utbildning har varit för hur du är som läkare/civilingenjör idag? På vilket sätt?

22. När var första gången du kände dig som läkare/civilingenjör?

23. Vad tycker du är kännetecknande för en bra läkare/civilingenjör?
Vad tror du har påverkat din syn på detta?

24. Vilka förväntningar upplever du att andra har på dig?
Vilka är de andra som du upplever har förväntningar på dig?
Hur/på vilket sätt upplever du kraven?

25. Hur har du förändrats som person sedan du blev läkare/civilingenjör?

26. Vilken betydelse har det för ditt liv i stort att du är läkare/civilingenjör?
På vilket sätt?

27. Hur ser dina framtidsplaner ut?
Hur ser du på din framtid som läkare/civilingenjör?

28. Nu när du fått lite distans till din utbildning… Hur ser du idag på övergången från Din universitetsutbildning till arbetslivet?
Vad är den största skillnaden mellan att vara student och att vara läkare/civilingenjör?

29. I vilket utsträckning har du möjlighet att påverka din egen arbetssituation?
På vilka sätt kan du påverka?
Vad kan du påverka?

30. Vad finns det för begränsningar eller hinder för dina möjligheter att förändra och utveckla verksamheten?

31. Hur skall man vara för att passa in här?
Finns det något som 'sitter i väggarna' på den här arbetsplatsen?
(Upplever du att du organisationen ställer krav på att du ska vara på ett visst

sätt?)
(Upplever du att du formas av organisationen? På vilket sätt? Upplever du att du anpassar dig i sättet du beter dig på?)

32. Vilken grad av frihet har du i arbetet?
Vad/vem/vilka styr över ditt arbete?

33. Hur uppfattar du förändringsklimatet i organisationen?
Om du vill förändra något som rör dina arbetsuppgifter - hur går du då tillväga?

34. Vilka är de främsta utmaningarna inom ditt yrkesområde idag?
Hur hanterar du den 'problematiken'?
(Vilka möjligheter har du själv att förhålla dig/påverka etc.?)

35. Är det något annat du vill ta upp som rör din utbildning, ditt arbete eller övergången däremellan?
Är det något som vi pratat om under intervjun som du har uppfattat som särskilt intressant eller som du vill utveckla?

Interview guide 2 in English translation

1. What has happened since the last time we meet? Elaborate…
Describe your work as a physician/engineer…
How would you like to describe your workplace…

2. Describe how you have ended up where you are…
(educational and occupational choice, etc.)
What motives/driving forces have been significant for you?
Can there be anything else that have influenced you?
When did you decide to become a physician/engineer?
(Is there any specific event that led you to become a physician/engineer?)

3. How important is the work in relation to other things in life?

4. What do your plans for the future look like?

5. Now that you have been working for a while, how do you perceive your education?
Has the education changed your way of thinking?...of being? … your way of relating to other people?

6. What aspects of your education have been most valuable?
What do you consider to have been less valuable? In what ways?
Do you think that the education has prepared you for work? In what ways?
Have there been situations you have been less prepared for? Which?

7. Summarise what you think you leaned during your education

8. In what ways is it possible for you to use knowledge from your education in your work?
What problems have you had with transforming what you learned during the education in work?
Wherein does the problem lay as you perceive it?

9. Describe what you must know in your work?
(Requirements in relation to the education, knowledge, occupational skills, identity, maturing, development)

10. What do you think that you can contribute with in the work/in the workplace?

11. Do you develop yourself through the work? How?
As a person?
As a professional?
When and in what situations do you think you develop yourself?
What significance do other people have for your learning and development?

12. Are there any obstacles for your development at work?

13. What requirements do the work place on you to acquire new knowledge?
When you (end up in a situation where you) lack knowledge, how do you proceed?
(How is your knowledge/proficiency utilised in your work?)
(What is being utilised?)

14. Do you have knowledge/competence that is not used in your work?
(In what ways do you think this could be significant for the work?)
(What is it that contributes to you not being able to use all your knowledge/competence?)

15. Do you feel under- or overqualified?

16. What is it that you primarily have learned since you started working?
What can you do today that you could not do before you started working?
(Give an example?)
How have you learned this?
(What do you learn in the daily work? In what way do you learn? How? In what situations do you learn?)

17. What do you think the point (aim) of university education is?
(What is the purpose of university education?)

18. What are the primary challenges in your work?
(What is difficult in your work?)

19. Describe what it is like to be a physician/an engineer…

20. In what way would you like to describe yourself as a physician/an engineer?

(How are you as a physician/an engineer?)

21. What do you think primarily have influenced you to be the way you are (as a physician/an engineer)?
How significant do you think that the education has been for the way you are as a physician/an engineer today? In what way?

22. When was the first time you felt as a physician/an engineer?

23. What do you characterises a good physician/engineer?
What do you think has influenced you view of this?

24. What expectations do you experience that others have on you?
Who are the others that you experience have expectations on you?
How/in what ways do you experience these demands?

25. How have you changed as a person since you became a physician/an engineer?

26. What significance does it have on your life as a whole that you are a physician/an engineer?
In what ways?

27. What do your plans for the future look like?
How do you view your future as a physician/an engineer?

28. Now that you have a little distance to your education… How do you today view the transition from university education to working life?
What is the biggest difference between being a student and being a physician/an engineer?

29. To what extent do you have opportunities to influence your own work situation?
In what ways can you influence?
What can you influence?

30. What are the limitations or obstacles for your opportunities to change and develop the organisation?

31. How are you supposed to be in order to fit in here?
Is there something that is 'built into the walls' at this workplace?

(Do you experience that the organisation demands that you should be in a certain way?)
(Do you experience that you are shaped by the organisation? In what way? Do you experience that you adapt in the way you act?)

32. What degrees of freedom do you have in your work?
What/who controls your work?

33. How do you perceive the potentials for change in the organisation?
If you want to change something that concerns your work assignments – how do you proceed?

34. What are the primary challenges within your occupational field today?
How do you handle this 'complex of problems'?
(What opportunities do you have of relating/influencing, etc.?)

35. Is there anything else you would like to talk about that concern your education, your work, or the transition there between?
Is there anything that we have talked about during the interview that you have perceived as particularly interesting or that you would like to elaborate on?

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