

**The value of IT skills certification in
selection processes and professional
development –
An empirical study based on
perceptions of IT professionals**

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This dissertation is submitted in part fulfilment of the M.Sc. in Management.

I declare that this dissertation is the result of my own independent investigation and
that all sources are duly acknowledged in the bibliography.

Date: _____

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*

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*

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Abstract

Product- and technology-specific IT skills certifications are increasingly recognised as an instrument which supports the effective management of organisational selection processes and professional development. However, only few academics have examined the organisational and personal value of certification, so far. Furthermore, their research focused on different aspects of certification use or yielded conflicting findings. Therefore, this work aimed to capture all relevant aspects and to produce authoritative findings which are relevant for both researchers and practitioners.

Founded on related literature and previous research a model of certification value in the organisational context was elaborated. Considering the importance of an agreement on certification value, it was decided that the model first needed to be confirmed by perceptions of IT professionals using a survey strategy. An ideal certification programme was given to ensure that the respondents' perceptions wouldn't be influenced by concrete certification programmes and their deficiencies. It was hypothesised that the respondents would generally confirm each of the model's proposed use situations and that there wouldn't be significant differences in the perceptions of respondent groups determined by certification status, personnel responsibility and attitude towards certification.

According to this research framework an online-questionnaire was created. The questionnaire was completed by 92 members from the national and regional electronic mailing lists of a German professional association of system administrators. The quantitative data was supplemented by 41 electronic messages from 22 individual participants, which were extracted from the electronic group discussions triggered by the survey.

The analysis of the quantitative data showed a strong influence of the moderator 'attitude towards certification' on the acceptance of an ideal certification programme's use. Respondents from the negative attitude group tended to disagree significantly more often to all certification related statements than those of the positive attitude group.

This unexpected result led to twofold conclusions. Based on the responses of the positive attitude group most of the proposed model's elements could be confirmed and the findings might allow further refinement of the model. The particularly controversial use situations involved certification as job requirement or the organisational use of certification tests.

The qualitative data from the electronic discussions revealed that the deficiencies of current certification programmes are not the only reason for the respondents' adverseness. It's the concept of certification in general which is being refused for various reasons. To achieve an agreement on certification value among all involved parties, the organisational use of certification might need to be made more transparent and comprehensible.

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1. Introduction

In today's rapidly changing business environment, talented people have become a critical success factor for organisations. Accordingly, the management of both people and their competencies has become of strategic importance (Dieleman 2005, p. 748). Among the major HR practices highlighted by Mullins (2005a, p. 755), 'strategic training and development' and 'effective recruitment and selection' ensure and develop those required competencies. Training is also an important potential motivator as it can increase confidence, commitment, recognition and satisfaction of staff.

Effective management of training and selection is a huge challenge, though. Planned and systematic training involves assessment of training needs, creation of the training programme, choosing of training methods and evaluation of training outcome (Mullins 2005a, p. 757). Similarly expendable is the process of resourcing the organisation. A job analysis is conducted in order to produce job description and person specification. Suitable applicants are attracted and an appropriate selection process is chosen. Finally, a selection decision is made based on the collected information (Mullins 2005b, p. 801).

In the fast-paced IT field these challenges are even more critical. Product- and technology-specific IT skills certifications are increasingly recognised as an instrument, which supports organisations with these tasks. This is illustrated by the growth of the worldwide market for IT certification and its aftermarket from 2.5 billion US dollars in 1999 to about 5 billion US dollars in 2005. Certification programmes are tailor-made for a specific set of job tasks and provide certificants with the immediately applicable skills which are demanded by the IT industry (Bartlett *et al.* 2005, p. 52).

The concept of certification is likely to get even more relevant in general: On the European and German level, the challenges of life-long learning are encountered by the call for transparent, permeable and skill oriented qualifications (Hanf and Rein 2006). The weak link between Germany's exemplary initial vocational education and continuing ed-

education needs to be systematically bridged by the growing continuing vocational training system, which is partly market driven (Colardyn and Bjørnåvold 2005, p. 41).

Apparently, certification of persons plays a bigger role than one could assume from the textbooks. Mullins (2005a, p. 759), for instance, doesn't mention the term at all, but just suggests to consider standards of occupational competence for training to improve employment opportunities. In the context of the selection process he touches common criticism of selection tests and applicant reactions to tests, concluding with the good but obvious advice to use tests to supplement the selection process, but never as a substitute for it (Mullins 2005b, p. 810). The possibility to short-list applications based on formal qualifications is mentioned, but the controversial issues arising from it are neglected.

These gaps indicate that IT certification is a means to a practical need of vendors, organisations and professionals rather than a result from the findings of research literature. All the more pressing is the need for research to follow contemporary practice in order to explain and improve organisational and personal certification use.

1.1. Background

The author is involved with an international certification body, Linux Professional Institute (www.lpi.org). The not-for-profit organisation develops certification programmes for job tasks, related to the administration of the GNU/Linux computer operating system. The perspective of the certification body with its strong link to certified professionals and certification supporting organisations is not sufficient to assess the value of certification, though.

There are stakeholders who are not directly involved in the certification system, but who contribute to the determination of its value: non-certified applicants, peers of certificants and professionals and managers who disregard certification. The social system underlying certification is likely to be very complex. Additionally, actual certification programmes are of variable quality, their potential use situations are manifold and the concept of certification is rather vague and controversial.

The desire to gain a better understanding of certification in the organisational context drives this research.

1.2. Aims and Objectives

The aim of this research is to examine the value of IT skills certification in selection processes and professional development.

Specifically, a clear understanding of certification, its characteristics, potential use situations, and value destroyers in the organisational context shall be elaborated with the help of related literature and previous research.

These exploratory efforts shall yield a preliminary model of certification value which captures and illustrates the major findings. The model shall be empirically tested in order to refine it and to produce authoritative findings, which might be acknowledged by researchers and practitioners. Particular attention shall be paid to the fact that each use situation of certification usually involves at least two parties and thus requires a common agreement on its value.

As this work adds to the sparse body of knowledge about certification value, it is deemed to be valuable for subsequent research. Furthermore, the results might serve as guidance for the organisational and personal use of IT certifications.

1.3. Research Design

Due to the time-constraints of a student research project, a cross-sectional study will be employed to test the proposed model. Considering the importance of an agreement on certification value, the various identified use possibilities shall be confirmed by perceptions of the involved parties. The findings of previous perception-based research differed considerably in general and among respondent groups. Therefore, an ideal certification programme shall be given to ensure that perceptions are not influenced by concrete certification programmes and their deficiencies. Based on the model, a questionnaire will be created and used as survey instrument.

It is hypothesised that the respondents generally confirm each of the model's proposed use situations, i.e. there are no significant differences in the perceptions of respondent groups determined by certification status, personnel responsibility and attitude towards certification. As both the model and questionnaire are newly created, a purposive sample is seen as an efficient first step to scrutinise them. The national and regional electronic mailing lists of a German professional association of system administrators is chosen to

collect 100 completed online-questionnaires from IT professionals, line managers and certificants. Any discussions on the mailing lists which might be triggered by the invitation to the survey are used to complement the quantitative results.

2. Generic Literature Review

2.1. Towards an Understanding of Certification

IT certifications are for the most part unregulated and their market value heavily relies on consensus. So, “*like currencies, IT certifications require a leap in faith*” (Donovan 2003). Before the value of such a vague concept can be examined, it is necessary to elaborate a common understanding of certification.

2.1.1. Confusion Surrounding the Term Certification

The term ‘certification’ is used in several contexts in the IT field. Among others, there are certified organisations, processes, products, and persons. According to WordNet (University 2003), certification can be “*validating the authenticity of something or someone*”, a “*confirmation that some fact or statement is true*”, or a “*document attesting to the truth of certain stated facts*”. These underlying lexical concepts reflect the versatility of certification serving as process, result of a process, and documentation of a result.

In an attempt to establish a coherent terminology the competence standard ISO/IEC 17024 assigns different terms to these different meanings. Here, a ‘certification process’ yields a ‘proof of competence as defined in the respective certification scheme’ and is documented by a ‘certificate’ (Facklam 2002, p. 32). In the glossary of the European Centre for the Development of Vocational Training (Cedefop) this process is simply called ‘certification’. It results in ‘formally validated knowledge, skills, and competences’ for which a ‘certificate or diploma’ is awarded (Tissot 2004, p. 40). However, such broad definitions don’t provide a solid basis for an examination of certification of persons. There are ambiguities which have the potential to directly influence the perception of certification value and which need to be examined in detail.

In the NOCA Guide to Understanding Credentialing Concepts, for instance, [Durley \(2005, p. 6\)](#) avoids to associate the term ‘certificate’ with the concept of certification, as a ‘certificate programme’ is a training programme with an end-of-course test or documentation of attendance and, thus, insufficient to demonstrate professional competence. Consequently, her glossary lacks a word for the certification document—commonly known as certificate. Such efforts illustrate the importance of the recognition of quality standards and the related terminology in the certification field. Indeed, confusion about certification terms is a reoccurring theme in the literature, as [Durley \(2005, p. 3\)](#) points out: “*Despite the widespread use of professional designations, credentialing terms are often misused and general concepts often misunderstood*”. [Kemp \(2003, p. 159\)](#) confirms this observation and ([Phillips 2004, p. 65](#)) assumes that organisations don’t know the difference between professional certification, a certificate of completion, and an academic course. The following definition is presented as a starting point towards further clarifications:

“Certification is often viewed as the practice whereby an individual demonstrates a minimal level of competence through successful completion of a sampling-performance measurement tool based on a profession’s set of standards.”

([Mulkey and Naughton 2005](#); cited by [Anderson et al. 2005b](#), p. 282)

2.1.2. Clarification of Related Terminology

As seen above, the terms ‘competence’, ‘skills’ and ‘knowledge’ usually appear in the context of certification of persons. As those are some of the qualities which certification attests and as they are similarly ambiguous, it is important to examine them first.

From the perspective of the testing and training field as described by [Wang et al. \(2005, p. 20\)](#) knowledge, skills, and abilities (KSAs) are qualities which are required for performing a job task but which are detached from the actual task performance. In his review of historical literature [Clark \(2005\)](#) concludes that the original learning domains abbreviated as KSAs might be knowledge, skills and attitudes, as they directly relate to Bloom’s Taxonomy (Cognitive, Psychomotor, Affective). He assumes that attitude was later substituted by ability, as it became politically incorrect to change somebody’s attitude. [Stasz \(2001; cited by Nakayama and Sutcliffe 2005a, p. 8\)](#) offers a

broad categorisation of skills into academic/cognitive skills, generic skills like problem solving, specific technical skills needed in occupation, and work-related attitudes or soft skills. Skills obviously don't refer anymore only to psychomotor tasks. The term KSA seems to have lost its traditional meaning and, thus, a clear definition.

Nakayama and Sutcliffe (2005a, p. 9) build on recent definitions of skill and define it as “*the delivery of competent, expert, rapid, and accurate behaviors to complete goal-directed, predefined tasks that are usually assessed through observation*”. Here, skill is not detached, but it is a demonstrated capability to accomplish a given job task, which is acquired through experience. Consequently, ability as a potential factor and knowledge only support skill in Nakayama and Sutcliffe's (2005a, p. 9) integration of KSAs. This definition of skill is very similar to the UK-Irish view of the term ‘competence’ (Jeris *et al.* 2005, p. 381). In the term knowledge, skills, and competences (KSCs) used in the Cedefop glossary (Tissot 2004, p. 40) cited on page 5, ‘competence’ is likely to refer to behaviour and attitude, though.

Jeris *et al.*'s (2005, p. 380) framework of professional competence uses adjectives to clarify the components of competence: They differentiate between cognitive competence (knowledge), functional competence (job related skills) and social competence (behavioural and attitudinal, including meta-competencies, e.g. reflection and learning). Similarly, the action competence approach of the German education system introduced in 1996, categorises vocational action competence into general cognitive competence (knowledge and skills), domain or subject-competence (attitude), personal competence, social competence (behaviour), and method and learning competence (meta-competencies) (Delamare Le Deist and Winterton 2005, p. 38).

In the German literature ‘qualification’ is another unclear term. One view is, that job proficiency became qualification and later competence by adding flexibility and self-organisation to the KSA mix (Bunk 1994, p. 9; cited by BMBF 2004, p. 38). Another view is that qualification is formally verified by tests, whereas competence is the individual's real knowledge and abilities. Some find that qualifications consists of various competences and others that there is no real difference between the two (BMBF 2004, p. 39).

As a clear terminology is needed for this work, the author pragmatically chooses those definitions which fit best with the task-oriented IT certification field. Skill, expertise and competence are seen as equivalent (University 2003). Skill is defined in the sense of the UK-Irish competence and of Nakayama and Sutcliffe's (2005a, p. 9) definition,

i.e. as demonstrated capability to perform a specific task. Qualification is used when referring to a record of achievement. The use of its second meaning as job requirement (Tissot 2004, p. 37) is avoided for the sake of clarity.

2.1.3. Certification Concepts

In order to find a usable working definition for IT certification, the concept of certification is examined from several perspectives and in relation to similar concepts.

Regulation, Scope and Orientation

Certification is usually contrasted to licensure and registration (DiIanni 2003; Durley 2005; Kemp 2003; Phillips 2004): Licensure is a mandatory process which ensures skill standards for professions where the protection of the public is desired, such as medicine or law. Registration ensures legal protection of professional titles, such as Chartered or Incorporated Engineer in the UK or Professional Engineers in the US. Both processes are government-mandated and require specific formal education, practical experience, adherence to a code of ethics, and passing certain tests. Certification, on the other hand, is voluntary and not regulated. It is this very characteristic which makes the concept of certification vague.

The distinction between input- and output-orientation serves as an important characteristic of certification. In the literature seems to be a consensus that certification is first of all output-oriented, i.e. that it involves an assessment of the individual's job skills (BMBF 2004, p. 46; Durley 2005, p. 6; Raymond 2005, p. 29, Tissot 2004, p. 40). Input-oriented programmes, on the other hand, specify the curriculum and the corresponding teaching hours (Colardyn and Bjørnåvold 2005, p. 74). Here, it is assumed that mainly participation in formal learning results in attainment of the intended skills. Due to its limited validity, this approach can't be considered certification (BMBF 2004, p. 46). Even combined with a knowledge- or curriculum-based end-of-course test such a programme can't stand alone as a legally defensible tool for selection decisions (Durley 2005, p. 8). Job applicants successfully argued at court that their ability to perform the task rather than their theoretical knowledge should be essential for an employment decision (Durley 2005, p. 9).

The scope of certification is generally not taken into account when certification value is examined. Traditional professional certification programmes define a profession as comprehensively as licensure, registration or formal vocational qualifications, but they are run by independent organisations, some of which are internationally oriented. The reviewed literature included such traditional programmes in the fields of records management (Phillips 2004), health and safety (Adams *et al.* 2004), geographic information systems (Kemp 2003; Somers 2004), and accounting (Hutchison *et al.* 2003; van Zante 2005). Here, it is conceivable that one such regularly updated certification is all that an individual needs to succeed in the respective profession. IT certification programmes, however, are much narrower in scope. They focus on technical skills without even attempting to define the breadth of the respective profession. The US vocational education system similarly differentiates between occupational certification and skills certification (National Center for Education Statistics 2000, p. 86). CompTIA's TechCareer Compass (CompTIA 2006a), for instance, maps 100 job role descriptions to 750 IT certifications. And as a job position usually consists of several job roles (Nakayama and Sutcliffe 2005a, p. 11), the certification of all required skills for a regular IT position might involve dozens of certifications. So, it is obvious that the role of IT certification differs from that of traditional professional certification. Nevertheless, the reviewed literature on certification value doesn't mention that there could be difference. Anderson *et al.* (2005b) even mixes them when researching the value of IT certifications.

Governance and Psychometric Standards

International standards for certification bodies and their programmes, such as ISO/IEC DIS 17024 (Facklam 2002) and NCCA (Durley 2005), demand that a programme complies with certain psychometric standards for reliability and validity, that it complies with lifelong professional development principles, and that its administration is impartial.

The psychometric standards primarily demand that test use and interpretation is supported by validity evidence. This "*is based on a chain of inferences from job analysis (or practice analysis) through test specifications, and eventually to the pass/fail decision*" (Wang *et al.* 2005, p. 15). The extend of efforts, the frequency and the approach to create such evidence can vary greatly, though. To ensure the job relatedness of certification criteria, a panel of subject matter experts could be asked, or an extensive empirical study could be conducted (Raymond 2005, p. 30). Similarly, the process to establish a

standard for passing a test (cut score) can be conducted more or less rigorously (Cizek *et al.* 2004, p. 46). The endeavour to maintain validity during test delivery can even multiply all previous test development costs.

While there seems to be an agreement on certain standards for test taker authentication and supervision, other aspects of test security are vague. The reuse of specific test items (item over-exposure) leads to test compromise and high cheating potential due to item preknowledge—especially in the commercial test preparation field and among well-connected test takers with an IT background (Foster 2003; Foster and Mulkey 2004; Mulkey and Fremer 2006; Smith 2004). Institutional and individual cheating is a major source of construct irrelevant easiness and thus a substantial threat to testing validity Haladyna and Downing (2004, p. 20). So, a certification body could sacrifice validity and decide to use the same items for years and to employ on-demand computer-based testing in order to keep development and delivery costs low. The other extreme would be periodical testing with newly developed test forms for each administration date. This is considerably costlier due to the additional test development and due to the bad usage rate of the testing infrastructure (Segall 2002, p. 163). But it is demanded by test security experts (DiIanni 2003) and employed by major test services (Do and Brummel 2006; ETS 2002). Unfortunately, most IT certifications employ on-demand tests, while keeping their evidence for or against validity confidential. Already in 2002 Foster (2002) criticised the lack of published test quality metrics. Without transparent validity evidence, certification bodies might only pay lip-service to psychometric standards.

CompTIA’s TechCareer Compass (CompTIA 2006a) is an influential resource in the IT certification field. The entrance criteria of the database also include compliance with psychometric standards. Additionally, there are some requirements which should ensure a certain level of impartiality, e.g. courseware must be available from five different publishers and training must be delivered in multiple formats such as self-study and instructor led. Furthermore, the programme must be accepted by employers and receive media attention (CompTIA 2006b). CompTIA’s criteria are in so far problematic as they consider recognition and success of a certification programme rather than the underlying processes and policies as international standards do. Recertification, transparency, and other governance issues are left out. This leaves much room for what Kleinke (1998, p. 205) calls ‘fiat validity’—namely validity which is based on claims of the certification body rather than evidence. But as CompTIA is an association of IT vendors, it is no wonder that their criteria fit with the certification programmes of

their members and that they don't create the burden of any additional regulations of international standards.

2.1.4. Working Definition of Certification

Based on a definition of Durley (2005, p. 5) and on the role and usage of certification elaborated so far, the working definition of certification is as follows:

Certification is the voluntary process by which a non-governmental entity (the certification body) awards a record of achievement (the certificate) to an individual (the certificant) whose job skills have been tested against a set of publicly available, predetermined, and standardised criteria (certification criteria). A certification body can offer several certification programmes each of which has a certain set of certification criteria.

This definition implicitly states that certification is output-oriented as job-skills are tested regardless of how the skills were acquired. Therefore a certain level of impartiality with respect to training can also be expected from a certification body. Generally, output-orientation enables certification to be a legally defensible tool. The level of awareness, impartiality, transparency, criteria relevance, and test use reliability and validity vary, though. All of these variable characteristics might influence certification value.

2.2. Context and Relevance of Certification

Now that the concept of certification is sufficiently defined, its context and relevance in today's working environment will be examined.

2.2.1. Certification Drivers

Due to the pace of technological innovation in products and processes, there is a growing need for continuing professional development and recognition of informal education, i.e. education acquired outside of educational institutions (Colardyn and Bjørnåvold 2005, p. 11, Delamare Le Deist and Winterton 2005, p. 28). Consequently, in many

countries there have been major reforms of vocational education and training (VET) such as the National Vocational Qualifications (NVQ) introduced in the UK during the 1980s (Delamare Le Deist and Winterton 2005, p. 34) and the National Skill Standards Act of 1994 in the US (Wikipedia 2006). Similar new reforms are the European Qualifications Framework (EQF) (Colardyn and Bjørnåvold 2005, p. 41) and the National Qualifications Framework in Germany (Hanf and Rein 2006). This global shift to a job-related and output-oriented perspective of qualification supports the notion of certification in general.

The complexity, diversity and the rapid dynamic nature of IT induce a perpetual challenge both for IT professionals to keep their skill portfolios relevant (Anderson *et al.* 2005b, p. 281; Fang *et al.* 2005, p. 58; Schambach and Blanton 2002, p. 83) and for HR managers to manage the recruitment and development of needed skills (Fang *et al.* 2005, p. 58; Nakayama and Sutcliffe 2005a, p. 4). Somers (2004, p. 37) highlights that the “*business environment requires constant development and involvement beyond specific job titles*”.

Being also driven by the IT industry, certification plays well with these characteristics of IT. Taylor-made programmes for a specific set of job tasks are capable of providing certificants with immediately applicable skills (Bartlett *et al.* 2005, p. 52).

2.2.2. IT Skill Research

Generally, a wide spectrum of users employ IT skills which interact with various organisational functions and structures. Due to the dynamics and manifoldness of IT skills, a unified classification or even the determination of fundamental skills is difficult. Regarding this vague understanding of IT skills, Nakayama and Sutcliffe (2005a, p. 21) suggest that fundamental IT skills vary between companies, as they are dictated by the critical business goals of individual companies, and that IT skills planning and management should be task-driven. Nevertheless, there are many attempts to categorise IT skills and to weight their importance in order to provide orientation to IT training and managers.

Lee (2005, p. 84) confirms the difficulty to anticipate IT skill requirements. He even suggests that previous skill research hasn’t changed much in this regard. Lee’s (2005) contribution to the field—an unobtrusive empirical study based on job ads about skill requirements for systems analysts in large business organisations—provides a high-level

view on requirements for education, system-, business- and technical skills. The analysis of up to 4-year-old data is in contradiction with his own assertion that “*IT skills tend to become obsolete even faster than ever before*” (Lee and Lee 2006, p. 111), though. Fang *et al.* (2005) employ a survey to investigate the skill requirements for entry-level IT positions based on recruiters’ perceptions. Even though the data was contemporary and included both general and more detailed skill domains down to the level of specific software tools, this approach doesn’t examine the depth of specific skills needed by individual companies. As opposed to the two previously mentioned studies, Prabhakar *et al.* (2005) focus exclusively on technical IT skills. Their longitudinal analysis of job ads is based on 39 specific skills and shows their demand across time. While they can provide a general trend of most demanded skills, they can’t determine skill details and their individual development over time.

The three presented works examine IT skills across companies and even industry sectors resulting in three different skill categorisations. The respective findings might be useful to adapt initial IT education to predominating industry needs, but they are not necessarily applicable to the practical needs of one particular company.

2.2.3. Standardisation of Job Tasks and Skills

In order to improve the management of the professional development challenge at firm and individual levels, a more focused approach to IT skill research is required. Nakayama and Sutcliffe’s (2005a, p. 21) advice to acknowledge the unique skill requirements of a company suggest that research should also consider the process of job requirement creation. As these requirements are relevant for employee allocation, selection, development and performance assessment (Nakayama and Sutcliffe 2005a, p. 8), the process should be legally defensible. According to (Robertson and Smith 2001, p. 445) this usually involves a task-oriented job analysis. Based on those identified tasks, a worker-oriented job analysis determines the skill requirements for the job. In the changing IT field this process is not only expendable but also particularly difficult Robertson and Smith (2001, p. 444). So it is comprehensible that the industry drives the standardisation of common job roles via certification programmes. Continuous skill research—or job task analysis respectively—is a core activity of certification programmes (Facklam 2002; Raymond 2005; Wang *et al.* 2005). The resulting IT certification criteria and other standardised job role descriptions are a valuable resource for the training industry and HR

managers, as they do not only reflect the job role at hand but also spread best practices. Certification programmes hereby act as exchange platforms which are often open and thus visible to researchers.

Delamare Le Deist and Winterton (2005, p. 28) find it paradoxical that HR development is concerned about transferable standardised skills while management strategists emphasise unique organisational competences. And Lievens *et al.* (2002, p. 580) even doubt that today's jobs are stable enough for HR management to rely on a job analysis. On the other hand, there might be ample unique combinations of clearly defined and well-understood technical skills along with social skills, industry-specific knowledge and general education. Such a modular approach might be even flexible enough for dynamic IT jobs. In practice, standardised IT skills as part of certification programmes seem to be recognised as a useful concept (Anderson *et al.* 2005b, p. 282). This observation is affirmed by the interest in skill passports and meta certifications (BMBF 2004; Colardyn and Bjørnåvold 2005), which aim to provide a standardised skill and certification portfolio.

2.2.4. IT Skills and the Profession

Findings about requirements apart from technical skills seem to be less volatile, as the literature generally agrees on the nature of education and soft skills and their role as indicator for job performance (Bartlett *et al.* 2005, p. 55; Fang *et al.* 2005, p. 63; Lee 2005, p. 88; Litecky *et al.* 2004; Nakayama and Sutcliffe 2005a, p. 7; Robertson and Smith 2001, p. 443). Even though these relations are very important to human resource management (HRM), they are not examined any further, as this is beyond the scope of this work.

Instead, initial vocational education and soft skills are seen as foundation on which IT skills certification is based. This view is particularly strong in Germany, where the concept of 'Beruf' (vocation) requires initial formal education and training for a job position (Colardyn and Bjørnåvold 2005, p. 41). In Germany IT certification is therefore far away from creating such a "*parallel universe of postsecondary credentials*" as Adelman (2000, p. 1; cited by Bartlett *et al.* 2005, p. 52) noticed in the United States.

For the same reason traditional occupational certification programmes as presented on page 9 aren't known in Germany. Some commonly cited certification benefits only

apply to traditional certification, though. A narrow IT skills certification programme can't "*reflect the breadth and depth of the profession as currently practised*", (Adams *et al.* 2004, p. 28) or even substantially define, grow and improve the profession (Durley 2005, p. 4; Facklam 2002, p. 34; Somers 2004, p. 40). Similarly, the enforcement of work ethics and experience requirements (Adams *et al.* 2004, p. 28) are limited. On the other hand, IT certification is safe from potential drawbacks of a monolithic approach such as the risk that a profession is controlled by a single organisation, that suited professionals are excluded (Kemp 2003, p. 161) or that the development of the profession is limited by the very try to define it (Somers 2004, p. 40). Nevertheless, IT certification programmes can help creating practitioners (Schneier 2006) and thus grow the IT field at least in certain areas.

3. Previous Research on Certification Value

3.1. Literature Search

An extensive literature search in the vast electronic databases of academic journals yielded only few empirical studies on IT certification value and some more opinion articles from enthusiastic experts of the certification field. So the search was expanded to studies published on websites and in books. The list of previous related research is compiled in table 3.1. Magazines and the press were searched for recent publications from practitioners to complement the studies' findings.

The lack of available previous research was surprising given certification's practical suitability as instrument for HRM as outlined above. Since Novell created the first IT certification programme in the early 1990s (Foster 2004) IT certification's impact on professional development and selection could have been examined in detail, but obviously it hasn't been attractive for HRM researchers for a long time. Accordingly, no comprehensive theoretical framework but only studies with a rather narrow focus were found. These works' distinct aspects and use situations of certification need to be integrated, so that the available findings can be better understood and related to each other.

In the few related studies providing a literature review (Anderson *et al.* 2005a;b; Bartlett *et al.* 2005; Cegielski 2004; Cegielski *et al.* 2003) references to anecdotal studies and descriptive salary surveys predominate. This confirms the detected lack of empirical research and affirms the need for more research work in this field.

The various use situations of certification shall be examined based on an ideal certification programme according to the working definition on page 11, i.e. the certification

criteria are relevant for the job and the certification test is a reliable and valid measure for the respective skills. Value destroyers will be regarded separately in a later section in order to avoid mixing characteristics of particular programmes with the value of certification as a concept. It is a common major shortcoming of the presented related research, that this distinction is not explicitly made.

3.2. Certification Value at the Workplace

3.2.1. Perspective of Managers

Prometric's Training and Certification Study includes information about certification value from the perspective of 3,000 IT managers who were surveyed after a certification exam. Choosing from a set of nine listed benefits more than half of the respondents feel that certification provides a higher level of service (63.6%), credibility among clients (60.8%), competitive advantage (58.8%) and increased productivity (57.1%) (Prometric 2001, p. 16). These four major benefits are also confirmed by Anderson *et al.*'s (2005b, p. 282) review of related studies. In the following year 887 managers were asked in a similar study to choose only one major organisational benefit from the list (Prometric 2002, p. 23). This resulted in the same top four benefits with each of them selected by around 20% of the respondents. Only 3% felt that certification provides no value, but in the face of certification's versatility it is no wonder, that almost anybody finds a certain value. As the majority of respondents were certification candidates the numbers might not be very expressive. Indeed, the results of a control group of 136 randomly sampled managers differ in the relative importance of the top benefits. More of them opted for credibility among clients (26% versus 17%) and less of them for competitive advantage (10% versus 21%) (Prometric 2002, p. 22).

The findings become even more ambiguous when compared with the results of related questionnaire items on managers' perceptions of certification value in the same study (Prometric 2002, p. 25). Specifically, managers are generally neutral on the statements that certificants solve problems faster and that certifications accurately measure technical knowledge and skills. This contradicts to the perception of internal organisational benefits (productivity, service level). Employee benefits (development, career) and external organisational benefits (credibility among clients, competitive advantage), on the other hand, are confirmed (Prometric 2002, p. 25). The contradiction might be reserved

Table 3.1.: Previous Related Research on IT Certification Value

Study	Approach	Source of Data	Key findings
Anderson <i>et al.</i> (2005a)	survey; Q	perceptions of 100 HRP's	positive organisational and employee benefits; unique value compared to education & experience
Bartlett <i>et al.</i> (2005)	survey; Q	perceptions of 33 HR executives and 245 IT employees of large firms	certification's influence on recruitment: main benefit is identification of job skills; certificants perceive greater influence
Cegielski (2004)	survey; Q,O	92 matched pairs of HRP's and ITP's of Fortune 1000 firms	perceived value of certification in selection: HRP's perceive greater value; only 4 out of 27 ITP's see correlation to ability
Cegielski <i>et al.</i> (2003)	survey; Q	perceptions of 299 end-users of IT networks	certified ITP's are not more skilled than non-certified
Prometric (2001)	survey; Q	3,000 ITMs, 14,800 ITP's (candidates/certificants)	manifold: perceived benefits delivered to individuals and organisations
Prometric (2002)	survey; Q,I	887 ITMs, 7,356 ITP's (candidates/certificants)	manifold; perceived high value; proliferation of certifications and certificants; lack of link to experience and to job performance
Domingo (2006)	survey; Q	salary of 1,280 certified Microsoft ITP's	less value of certification if market is saturated
Sosbe <i>et al.</i> (2005)	survey; Q	salary and perceptions of 35,167 ITP's	manifold; high value of certification
Jones <i>et al.</i> (2006)	survey; Q	salary and perceptions of 35,573 ITP's	manifold; high value of certification

Q – questionnaire; I – in-depth interview; O – online-chat; ITMs – IT managers; ITPs – IT professionals; HRP's – HR professionals

to internal organisational benefits, as the managers' practical experience with certified staff dominates here, whereas perceived benefits in unfamiliar areas remain more ideal.

Anderson *et al.* (2005a) employ the concept of customer value to explore the value of IT certification from the perspective of HR managers in their role of the organisation's gatekeepers. According to their findings from a survey of 100 HR professionals in the US state North Carolina, IT certification is a unique selection criterion which can't be substituted by education or experience. So, certification offers a unique value which is mainly carried by value drivers such as organisational benefits or employee benefits. They suggest a conceptual framework where an HR manager's willingness to pursue an application depends on the value creation system of the three components education, experience and certification Anderson *et al.* (2005a, p. 225). Certification's merits in the selection process itself aren't considered in this research configuration.

At large, HR managers perceive certification to provide their organisations and employees at least some benefit for each of the 18 presented benefit factors. The top three organisational benefits are credibility, competitive advantage and higher level of service. As for employees, certification is most beneficial to increase credibility, to prepare for a new position or responsibility, and to increase compensation (Anderson *et al.* 2005a, p. 220). Anderson *et al.* drew those benefit factors from Prometric's (2001) study. While the general approach seems promising, the presented uni-dimensional value creation system might be insufficient to explain certification value. Their identified drivers of certification value are scattered all over Woodruff's (1997, p. 142; cited by Khalifa 2004, p. 654) customer value hierarchy model: product characteristics (e.g. vendor-neutral), desired consequences in use situations (e.g. higher level of service) and organisational goals (e.g. competitive advantage). Obviously, some value drivers are potential outcomes of others. Such interdependencies need to be acknowledged in a conceptual framework for certification value.

As determined on page 14, it is evident that education constitutes a distinct concept from certification. But Anderson *et al.*'s (2005a) disjointed conception of certification and experience is interesting, as the working definitions on the pages 8 and 11 suggest, that certification *implies* experience, as it is a proof for skills acquired through experience. They don't explain *what* makes certification unique, though. Many of their identified value drivers of certification, such as 'Increase productivity' or 'Ability to sell a bigger solution' (Anderson *et al.* 2005a, p. 220) can also result from experience. Identifying those value drivers, which are related to certification alone, might be worthwhile. An

evident one is ‘Increase credibility’, as it is the main function of certification. The notion of certification without experience is also conveyed in a manager’s statement reported by Wunder (2006): “Well, if I can’t get an experienced person, I might as well get a knowledgeable certified person”. This suggests, that he differentiates between experience gained through professional practice in a job and that gained through other means such as self-education. Eventually, the resulting skills should be the same, *if* certification works as advertised.

3.2.2. Compensation as Value Indicator

A positive impact of certification status on compensation is both a major benefit for certificants and a measure for employer-perceived organisational benefits.

Therefore, IT certification-related organisations and magazines regularly conduct salary surveys among certificants. The pro-certification publication, Certification Magazine, conducted a salary survey of over 35,000 IT professionals all over the world and found that the average salary increase of certificants was 12 percent higher than the national average (Jones *et al.* 2006). The latest Microsoft survey of 1,280 U.S.-based certified Microsoft professionals yields a slightly more than 10% higher base salary than the corresponding national average in the field (Domingo 2006). The results of those surveys are prone to bias and the self-selected respondents might not be representative, but it seems that certification has a certain impact on compensation.

Furthermore, the findings help to broaden the understanding of the certification value creation system. For instance, in the Microsoft study, one third of the respondents state that their certification status has no impact on their compensation. Prometric’s (2002, p. 22) study also finds only a neutral position of managers towards a reward for certification. So, certification does not necessarily increase the salary. Especially, when the labour market is saturated with certificants of a specific certification programme and if the certification criteria only correspond to the minimum job skill requirements, there is no reason for a premium pay: “While it can help you gain or maintain expertise, which can in turn get you hired, there’s often no lasting impact beyond that” (Domingo 2006). This might especially be true for entry-level certification programmes which set a minimum bar. Sometimes, this leads to the argument that certification establishes mediocrity, but Ritchey (2000) rightfully points out that the opposite is true, as certification programmes usually encourage certificants to pursue higher levels of certification.

The executive manager, who stated that certification doesn't affect the starting job offer, but that the development path via certifications usually pay off financially (Jones *et al.* 2006), confirms this view.

A presumably representative study is the 'Hot Technical Skills & Certification Pay Index', which compares pay trends for 94 non-certified and 95 certified technical skills (LLC 2005). As the skills of the compared IT professionals are categorised and matched, this approach promises to be a better measure of the real impact of certification. Between 2003/Q2 and 2005/Q3 premium pay in percentage of base pay for certified skills was at least 1 percent point higher than that of non-certified skills (LLC 2005, p. 10), which indicates a certain monetary value of certification. However, the findings of the same study for the time before 2001/Q3 render the research findings ambiguous. During that time average premium pay for certified skills was *lower* than that of non-certified skills. One would expect that premium pay for a certified skill approaches that of a non-certified skill, when there is a high demand for that skill or when the corresponding certification programmes are not perceived as value adding, but not that it falls below it. One possible explanation is that the study doesn't distinguish age groups, education and skill levels. During the labour market shortage before 2001 there might have been, for instance, more certificants among career changers and entry-level IT workers than among high-paid senior workers. Without equivalent groups of certified and non-certified IT professionals conclusions about certification's impact on compensation are limited.

Domingo (2006) also reports that in previous salary surveys certificants earned less than others. As this survey focused on entry-level certification programmes, a lower income of certificants was to be expected. Some infer from such a survey, that certification negatively impacts on compensation. But this is obviously a logically wrong inference, which can be easily illustrated: IT professionals with a certain skill level don't get paid less when they add a certification to their portfolio. Still, such arguments are usually used against certification (Ritchey 2000). Even worse, they are repeated by researchers such as Anderson *et al.* (2005a, p. 214) who state that academics pursued certification "*despite the fact that certifications have historically had a negative impact on their salaries*". There is obviously a need for a more careful approach to certification value research which builds upon an initial, commonly accepted theoretical framework.

A different measure of certification value from the perspective of the employer is the amount of financial support an employer provides for an employee's certification expenses. Certification Magazine's salary surveys of 2004 and 2005 found that over 40%

of the certified respondents reported that their employer paid the entire certification costs and that 43.6% of the respondents believed that their companies strongly support certificants (Sosbe *et al.* 2005). In Bartlett *et al.*'s (2005, p. 57) study 22 out of 33 HR managers indicated that they would financially support employees to pursue certification. And in Prometric's (2002, p. 13) Global IT Training and Certification Study 43% of randomly selected IT managers report that their employers pay for certification. These findings confirm that organisations see a value in certification but also that there is a lot of confusion and uncertainty.

3.2.3. Perspective of Clients

The evidence for certification value in the studies presented so far only relies on the beliefs of managers. Hereby, a higher level of service and increased productivity are the major perceived benefits of certified staff (Anderson *et al.* 2005a, p. 220; Anderson *et al.* 2005b, p. 282; Prometric 2001, p. 16; Prometric 2002, p. 23). Cegielski *et al.* (2003) aim to verify those allegedly superior skills of IT certificants. Therefore, they survey end-users of information systems networks (ISN), which are administered by either certified or non-certified network administrators. Based on the end-users' 'perceived usefulness' and 'perceived ease of use' of the network they measure the service level provided by ISN administrators. As the perceptions of both end-user groups don't show significant differences in this study, Cegielski *et al.* (2003, p. 103) conclude that certified IT professionals are not more skilled than others. And due to this finding they propose that IT certification can't justify premium pay or preference in hiring decisions (Cegielski *et al.* 2003, p. 104). Depending on the context the same skills can be regarded as high or as low. And some might associate high skills only with guru-like skills. This doesn't make it easier to discuss minimally required or high skills.

On the one hand Cegielski *et al.* cover the neglected perspective of certificants' clients and add a critical stance to the existing certification value literature. On the other hand there are several limitations of their research framework and of their conclusions. They themselves acknowledge that their means to assess the performance of administrators limit the study's findings and they relativise their conclusions in that they concede a certain value of certification in the hiring process as long as it is employed in combination with education and experience (Cegielski *et al.* 2003, p. 104). They don't give any reasons for this concession, though. In a later three-page-article Cegielski (2004) repeats four

times that according to previous research “*certification is not a positive predictor of one’s ability to manage organizational ISN resources*” and references the study at hand each time as evidence. Such inconsistent statements might have a negative impact on the study’s credibility.

It is tempting to question the relevance of the whole study. First of all, the chosen indirect measure of ISN administration skills is obviously rather unreliable. Even though it is known that the level of skills positively impacts the performance of IT professionals (Schambach and Blanton 2002, p. 84), it is conceivable that a mediocre administrator can run an out-of-the-box IT solution just as well as a highly skilled one. To find differences additional performance-related characteristics like work efficiency, client demand, or job difficulty should be regarded. Furthermore, the study compared certified and non-certified employees both of which groups had certainly already been selected based on the skills needed for the given job. It is not even clear, if the certifications were earned on the job, if they were actively maintained, or if they covered only the minimum set of skills which are required for the job. This makes a big difference as outlined in the section on entry-level certification on page 21. For the same reasons, inferring from the value of certification in a job position to that in a selection decision is ill-founded. All in all the study presented above is of only limited use as a theoretical base, but it shows some potential pitfalls of which researchers need to be aware and hopefully encourages other researchers to empirically measure the client’s share of certification value.

3.3. Certificant Benefits

Certificants themselves might know best how certification impacted on their own skills. In a survey of the Certification Magazine certificants report an improvement of their problem-solving skills (47.3%) and an increased job productivity (45.6%). The percentage of respondents who agree that they gained greater confidence in their own skills is substantially higher (77.2%) (Sosbe *et al.* 2005). An explanation might be that certification doesn’t necessarily improve skills but that it mainly confirms them. Already sufficiently skilled candidates aren’t likely to improve their skills very much during the certification process.

An earlier survey conducted by Prometric in 2002 confirms certification’s impact on confidence (87%) and on productivity and skills (77%) (Prometric 2002, p. 6). Just one

year earlier, a similarly conducted study showed a different picture. The percentage of candidates who report a positive impact of both training and certification on skills and job productivity was lower (39%) whereas more reported an increase of knowledge (73%) and only 6% reported an increase in confidence (Prometric 2001, p. 12). At that time certificants may have felt, that certification included more unwanted theory (knowledge) than practical skills. Or the corresponding questionnaire item might have been put in a different context. The variety of certification programmes and the change in the labour market don't allow to draw a specific conclusions about certificant skills from such broad surveys. All in all, certification usually involves a systematic engagement with job related tasks and thus should positively affect skills.

Certificant benefits not only add another perspective of certification value to the literature mix, but are essential due to their major role in the certification process. After all they are the ones who decide to get certified and who thus enable certification to develop value for all other stakeholders. Table 3.2 shows a compilation of certificant benefits identified by previous research. A tentative grouping of related benefits resulted in six broader categories of purposes.

Accordingly, individuals might use certification for a 'systematic development of relevant skills'. Then, they might want to 'assess their skills'. While these two purposes are more personal in nature, a 'credible proof of skills' in form of a certificate is usually acquired to present it to others—often in order to ensure 'career progression'. The primary motivation for pursuing certification is not clear, though. Individuals could develop their skills just because it helps them achieve a career goal. Or they could mainly aim to develop their skills, but they go the whole certification route, because it is "*the fastest way to learn the most*" (Jones *et al.* 2006). The benefit of certification as a means to 'fulfil a job requirement' is reported to be much lower. This might result from the controversial use of certification as job requirement discussed in the next section. The least benefit seem to provide certification alumni services. Given the vast free resources and forums in the internet, this might be a less important benefit indeed.

The interdependencies of the identified certificant, organisation and client purposes and benefits can be easily recognised, as the respective elements widely correspond to each other. Skilled and productive individuals enable the staff to be productive and to provide a high level of service, so that a high customer value can be attained. Similarly, individuals' certificates can prove a certain skills standard to organisations, and organisations can use certificates to raise their credibility among the clients. Just as career progression

Table 3.2.: Certificant Benefits Grouped by Major Purposes

Benefit Factors	Sources
<i>Systematic Development of Relevant Skills</i>	
Expertise, Knowledge	1,3
Stay current with new technology	4
Problem-solving skills	2,3,4
Productivity	1,2,3,4
Development	1
Design a career path	4
Prepare for a new position	4
Common language among IT professionals	4
Networking with others in the field during training	4
<i>Self-assessment</i>	
Assess knowledge/skills	4
Gaining greater confidence in my own skills	2,3,4
Great achievement	4
Proving to myself that I can get the credential	2
<i>Credible Proof of Skills</i>	
Credibility	1,4
Qualification for job	3
Gaining qualifications for future position	2
Improving/confirming qualifications for current job	2
Becoming eligible for more responsibility	2
<i>Career Progression</i>	
Compensation / Salary	1,3,4
Career opportunities	1
Earning prestige and recognition from my colleagues	2
Speed up Professional growth after certification	4
Help find a job	4
Job promotion or new job	3,4
<i>Job Requirement (least value)</i>	
Fulfil job requirement	2,4
<i>Alumni Benefits (least value)</i>	
Being part of a community of certified professionals	2
Gaining advanced access to technical data	2
Receiving additional support from IT vendors	2,4

Key to sources of benefit factors: 1 – (Anderson *et al.* 2005b, p. 282); 2 – (Sosbe *et al.* 2005); 3 – (Prometric 2001, p. 12); 4 – (Prometric 2002, p. 5)

depends on both certificant and organisations, organisational goals depend on organisation and clients. Prometric's (2002, p. 25) researchers call this the 'certification value chain'.

3.4. Certification in Recruitment and Selection

Research on IT job advertisements found that employers predominantly require technical skills whereas traditional survey based research often emphasises the importance of soft skills (Litecky *et al.* 2004, p. 69). In their simplified model of information systems hiring Litecky *et al.* (2004, p. 73) explain this with two stages of recruiting. In the filtration stage candidates' technical skills are matched against the set of advertised skills required for the job. Those who are not filtered out are passed to the choice stage. Here, the candidates' soft skills perceived by the recruiter are compared with the required set of soft skills. It is assumed that in the filtration stage decision-makers really use the same requirements as the advertised ones, but there is no empirical research. Furthermore, interviewers often short circuit the advertising process by using the technical reputation of schools or programmes or the job experience in a particular position as filtration criteria (Litecky *et al.* 2004, p. 74). So, technical skills are an essential component of IT hiring and certification plays a certain role as supplier of skill standards and qualifications.

3.4.1. Certification Signals

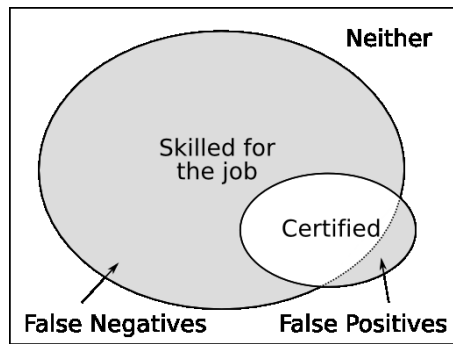
Compared to Anderson *et al.*'s (2005a) study, which focus on certification benefits at the workplace from the perspective of HR managers, Bartlett *et al.*'s (2005) study offers a nearly complementary research aim: They examine the perceptions of IT employees and HR managers regarding the influence of certification on cost, ease and time efficacy of the recruitment process. To examine the role of qualifications during selection, they draw on signal theory, which refers to alterable, observable attributes as signals. For HR managers qualifications are signals for making conclusions on the probable aptitude and performance of an applicant. For applicants, on the other hand, signals are the importance an organisation attaches to different qualifications (Bartlett *et al.* 2005, p. 53). Unfortunately, Bartlett *et al.* don't elaborate on the specific signals of certification, but they just use it as introduction of the role of formal qualifications. An understanding of

certification's unique signals would contribute to the identification of its value drivers. Somers (2004, p. 41), for instance, proposes that “*the greatest value of certification programs is the requirement for continuing professional development and recertification*”. Anderson *et al.* (2005b, p. 299) also highlight that HR professionals see a main value of certification in staying up to date with needed technology. So, an applicant with a continuous certification history would signal a commitment to continuing professional development. Or certificates “*signal to the market that these individuals (...) will jump through hoops to demonstrate how much they care about being seen as top notch*” (Somers 2004, p. 40). The concept of signals is also elaborated in a review of applicant reactions on page 31.

Bartlett *et al.* (2005, p. 57) find that the majority of HR managers require applicants for certain positions to be certified and that they rate certifications to be important for their hiring decision. Furthermore, most asked HR managers report an increasing number of certified applicants. The importance of certification to hiring practice is supported by the perception of the majority of HR managers and employees, that certifications make recruitment easier, cheaper and more time efficient and that an applicant's skills can be identified more easily (Bartlett *et al.* 2005, p. 59). The underlying, specific reasons, use situations and conditions for those benefits are not examined, though. Presumably, certification benefits beyond the mere qualification signal—such as standardised skill requirements as outlined on page 14—are acknowledged for their value in practitioner creation and candidate attraction and selection. The current research efforts in this field seem to yield more questions than answers.

3.4.2. Certification as Selection Criterion

Certification benefits need to be signalled to potential applicants, so that they take certification into consideration. Job ads are a common means to do this. Lee's (2005, p. 87) analysis of job ads published on websites of Fortune 500 organisations yields that only 7.4% of the 902 job ads for systems analysts mention certification at all—and most of them only as a plus rather than a requirement. This is a sharp contrast to the 22 out of 33 HR managers who name certification as qualification of choice reported by Bartlett *et al.* (2005, p. 56). This might be explained by the respective type of IT position. In the latter study the IT position is not specified and might include helpdesk and administration jobs, whereas Lee (2005, p. 87) concentrates on system analyst positions most

Figure 3.1.: Certification as Predictor of Job Skills

of which require at least a bachelor's degree. Another explanation might be the use of a non-representative sample. Even though [Bartlett *et al.* \(2005, p. 56\)](#) had invited 3330 large US firms to participate in the study, only 33 HR executives returned completed questionnaires. Such a response rate is close to a self-selection sampling resulting in the limitation that participants might take part in the study due to their own interest in the subject ([Saunders *et al.* 2003, p. 177](#)).

[Somers \(2004, p. 38\)](#) clearly states that a hiring decision shouldn't be based exclusively on certification. As certification is voluntary, this would be unfair and a misuse of it. But she acknowledges that it might be considered as a bonus. [Schneier \(2006\)](#) acknowledges that certification is not a perfect predictor of adequate skills for a job position, as there are inadequately skilled individuals who are certified (false positives) and highly skilled ones who are not certified (false negatives) as shown in figure 3.1. The first category relates to the quality and the characteristics of the respective certification programme and will be examined below on page 33. The latter category results from the voluntary nature of certification, which makes it difficult to completely outsource the assessment of technical skills to certification bodies, even if they provide perfectly fitting certification programmes and highly credible testing. Under certain circumstances, though, it is conceivable to use certification as job requirement. In an abundant labour market companies can demand that applicants get certified. A successful certification programme which belongs to the portfolio of most of the sufficiently skilled applicants would also allow its use as screening instrument.

While in [Bartlett *et al.*'s \(2005, p. 59\)](#) study employees are stronger in their belief that certification helps in the recruitment process, [Cegielski \(2004, p. 104\)](#) finds the opposite in the 92 paired responses of IT and HR professionals from Fortune 1000 US companies. In the first case employees might have overestimated the help of certification,

as they were not familiar with the challenges of HR work. In the second case employees might have focused on defective certification programmes or on a use situation, where certification's value is limited. Unfortunately, Cegielski (2004) doesn't provide the used questionnaire. Bartlett *et al.* (2005, p. 60) find that the group of certified employees perceives certification to have more influence on recruitment than the group without certification does. They explain this with the assumption that certified employees justify their efforts to get certified and attribute their success partly to certification.

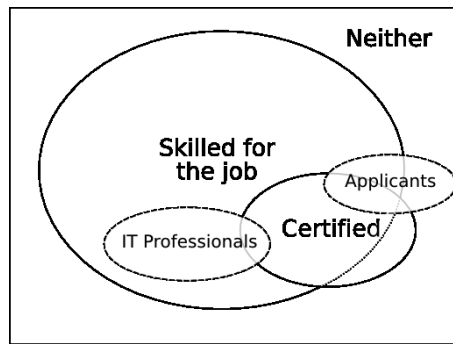
The results of an online chat, which Cegielski employed to qualify his findings, reveal some potential issues of the study's design: All of the 27 IT professionals indicate that certification doesn't justify a hire and only four believe that certification is related to ability (Cegielski 2004, p. 104). If Cegielski examined certification's use as sole decision instrument for hiring, the result is obvious, but it shouldn't be generalised. The dismissal of certification's relation to ability might be explained by a focus on malfunctioning certification programmes, which produce certificants who are merely qualified on paper (Cegielski 2004, p. 104). Furthermore, common sense suggests that highly skilled, non-certified professionals are likely to believe that certification is not related to ability, as they themselves are their best example and as they are likely to meet many certified less-skilled colleagues. As anecdotal evidence for this selective perception a quote by the IT security guru, Bruce Schneier, is presented:

“I've long been hostile to certifications—I've met too many bad security professionals with certifications and know many excellent security professionals without certifications.”

(Schneier 2006)

Figure 3.2 illustrates that certification is no differentiator among professionals who are able to do their job. The bare confirmation of skills doesn't necessarily improve their skills, as explained on page 23. From the perspective of HR managers this view only considers a subset of the total applicant population. HR professionals are confronted with the larger group of applicants, many of which lack the adequate level of skills. Screening or filtering these by requiring certification or any other equivalent proof makes the number of applicants more manageable. In their literature review on certification value Anderson *et al.* (2005b, p. 282) list ten references which support that managers believe that certification serves as a useful prescreening heuristic.

Certification's usefulness in selection is also reflected by the explanations which HR professionals gave during Cegielski's (2004, p. 104) qualitative discussion of the survey

Figure 3.2.: Ability and Certification

results. They favour certified applicants because they believe that those are more skilled on average and because they can minimise their responsibility for the assessment of technical skills. Cegielski (2004, p. 105) concludes from these findings, that organisational hiring practices need to be improved, i.e. HR professionals wrongfully rely on certification. Considering the critique of Cegielski’s research framework above, though, it seems more likely that the needs of HR professionals haven’t been fully understood by the researcher.

Schneier (2006) has reconsidered the value of certification and now he regards IT security certification as a valuable assessment tool and as a learning path towards the creation of practitioners. As a reason for his change of attitude he names the improved contents relevance of the certification programmes, i.e. the demanded skills to become certified are more relevant for today’s jobs. The perceptions of both HR and IT professionals are important to determine certification value in recruitment, as both parties are involved. If IT professionals are asked, the questions need to be crafted more carefully and use situations mustn’t be lumped together.

3.4.3. Reactions to Certification Requirement

Requiring applicants to get certified could negatively effect them up to a withdrawal of the potential applicant, due to the costs of certification and due to their potentially negative attitude towards the certification procedure. In a guide to find a Linux expert Haas warns:

“Keep in mind, however, that many Linux gurus do not care much about formal certifications. (...) [R]equiring a certification in a job description

(...) may backfire, as Linux administrators with certifications may actually not have the level of expertise you are looking for."

(Haas 2005)

The reasons for a negative attitude are manifold. The German concept of vocation and the related qualifications define an individual's rights and responsibilities which have been negotiated for the labour market over a long time (Colardyn and Bjørnåvold 2005, p. 41). Certification has the potential to disturb the familiar system, so professionals might perceive certification as threat to their position. Additionally, applicants usually rate tests as least adequate to present themselves (Baker and Cooper 1995, p. 6; Hausknecht *et al.* 2004, p. 639; Robertson and Smith 2001, p. 452). But there are also different preferences with respect to the employed test format such as multiple choice or hands-on tests (Ryan and Greguras 1998, p. 195).

Attribution theory adds a less apparent source of negative attitude. Individuals can perceive the main cause for their test performance as an either internal or external force (Mullins and Hicks 2005, p. 455). According to Ryan and Ployhart (2000, p. 596) a failed candidate is likely to blame an uncontrollable, external cause such as a particular feature of the selection procedure rather than the own skills. An ironic remark of Robertson and Smith (2001, p. 453) with respect to these findings demonstrates the limited possibilities to achieve full acceptance of a selection procedure: As major possible means to improve candidate perceptions they propose to offer more candidates a job.

The body of literature which examines "*attitudes, affect, or cognitions an individual might have about the hiring process*" is termed applicant reactions (Ryan and Ployhart 2000, p. 566). The sensibility for applicant reactions depends on the labour market, as the themes of the testing research literature illustrate over time: In 1995 Baker and Cooper (1995, p. 15) found in their study about occupational test practices, that many companies only paid lip-service to the fair use of tests, as their position in their relationship with applicants was too powerful. At that time companies didn't seem to care about applicants' attitude towards testing. After the labour market shortages in the late 1990s Lievens *et al.* (2002, p. 582) noticed that the 'war for talent' has decreased the employers' power, in so far as applicants wouldn't accept practically all job offers anymore. In such an environment organisations need to consider issues like applicant attraction strategies and company image. After all, the perceived selection procedure influences the intention of applicants to accept an offer and their attitude towards the company (Hausknecht *et al.* 2004, p. 642).

In the certification context pre-test reactions are likely to be the most relevant theoretical concept related to applicant reactions, as applicant withdrawal already happens, when an applicant refuses to pursue a certification which is required by a job offer. Hausknecht *et al.* (2004, p. 671) lists several theories as explanation for applicant reactions. Among those, Spence's (1973) signalling theory fits very well, as the concept of certification involves many kinds of signals which are used by companies, applicants, and customers to compensate the lack of information about each other. Signalling theory is mentioned in several works on applicant reactions (Lievens *et al.* 2002, p. 589; Ryan and Ployhart 2000, p. 566) and on certification value (Bartlett *et al.* 2005, p. 53), but according to Hausknecht *et al.* (2004, p. 671) the theory has not received much attention and its theoretical and empirical value should be examined by future studies.

Thus, when requiring certification for a job position, the implied signals to applicants need to be acknowledged. Ranum (2006) calls HR managers "lazy and ignorant" if they rely exclusively on certifications and he assumes that they don't understand the open job position. Instead, certification should be only one possible criterion among many others, such as recommendations, references, work portfolio, past accomplishments, and the interview. In Prometric's (2002, p. 26) qualitative study a similarly cynical view of certification as 'easy way for HR staff' surfaced among managers.

Many highly-skilled applicants might think similarly and wonder if the company relies on external skill assessment because it has no adequately skilled workforce. Or applicants might feel that their real accomplishments are not valued enough compared to the certification. Adams *et al.* (2004, p. 27) describe certification as "a tool to indicate professional skill when other means of establishing credibility are either impractical to demonstrate or nonexistent". The question is, though, if applicants have the same perception of impracticability as the companies. And Sackett (1998, p. 129) points out, that applicants might be more willing to earn a 'reusable' certificate than to go through extensive skills tests as part of each company's selection process.

A less controversial alternative to certification as screening instrument could be online skills tests. Bartram (2005, p. 667) presents such tests as a cost-efficient screening instrument within a larger selection process. An honesty contract in combination with an announced supervised reassessment reduces the incentive to cheat. This transforms the selection instrument into a valuable self-assessment tool which can be used in a familiar environment. Certification bodies could offer such services based on their recognised

certification programmes and companies could integrate them directly into the organisational selection process.

Still, any use of certification in selection runs the risk of negatively affecting applicants and should be handled very carefully. Certification's role in the selection process needs to be clear to all involved parties in each use situation—be it as a substitute for job experience or as a bonus for a history of professional development or as an additional 'hoop to jump through'.

3.5. Value Destroyers and Magnifiers

So far, the value of certification and its various use situations have mainly been discussed with respect to an ideal certification programme. Some external factors influencing certification value have been identified in the previous sections, though. Both the labour market and the respective distinction between minimally expected and acknowledged higher-level skills determine certification use and thus its actual value (see pages 31, 21). Now the impact of major certification characteristics is examined.

A theoretical model for the examination of certification characteristics on its value would be Khalifa's (2004, p. 658) value dynamics model, which helps explain the concept of customer value within the marketing field. It distinguishes between implicitly expected (taken-for-granted), explicitly expected (performance-related) and unexpected (innovative) product features and links the absence and presence of those to the corresponding level of customer satisfaction.

Starting from the CompTIA's (2006a) entrance criteria for their TechCareer Compass, job relatedness of the certification criteria and a valid and reliable test might be regarded as taken-for-granted features. After all, skills which are not related to the given job role and test results which are not related to the real skill level considerably diminish the applicability of certification in the identified use situations. The level of awareness and recognition might be seen as a performance-related feature, as an unknown programme surely as a certain value, but it grows with the support of all stakeholders.

Given the amount of criticism which IT certification receives, most certification bodies don't even fulfil those implicitly expected features. Reports about 'paper certifications' decrease the certification value perceived by employers (Tittel 2003): Prometric's

(2002, p. 22) study finds that IT managers are neutral on the statements that “*certification testing provides a fair and adequate reflection of an employee’s skills*” and that “*certifications are accurate measures of technical knowledge*”. And in the qualitative part of the study (Prometric 2002, p. 27) managers demand “*more assurance or proof that a certification translates into the skills and abilities necessary to function in day-to-day IT life*” (Prometric 2002, p. 27). Almost all IT professionals interviewed by Cegielski (2004, p. 104) even deny that certification is related to ability. Unspecified research by Caveon Test Security Services shows that 15 to 25 percent of all taken IT tests conform to a pattern which suggests cheating has taken place (Foster and Mulkey 2004). Due to the voluntary nature of certification it can be assumed that in most of the cases only a limited amount of criminal energy was necessary, i.e. that careless test security measures were in place.

Any harm to certification process integrity and testing security negatively affects the credibility of the programme and, thus, the public trust and authority granted to the certificant (Adams *et al.* 2004, p. 27). Nevertheless, many certification bodies don’t seem to strive for an ideal programme. So far, their perspective has been neglected here, but they have their own interests in certification, of course.

Vendor-controlled certification programmes primarily aim to create “*knowledgeable, enthusiastic champions for their products*” and additional sources of revenue through training and testing (Tittel 2003). This profit motive is often seen in conflict with a certification ‘gold standard’. The IT skill researcher David Foote suggests that vendors want to make it not too difficult to get certified, whereas vendor-independent certifications “*exists solely on their quality*” (Summerfield 2006). Vendor-independent certification bodies are sponsored by the industry to “*help establish certain basic levels of skill and knowledge specific to certain job role*” (Tittel 2003). They are still dependent on testing as source of revenue and limited by their financial resources, though. Thus, they might favour candidate-friendly and low-cost processes at the cost of certification validity as outlined on page 9.

Other certification characteristics are often discussed, but their impact on certification value can be neglected compared to the need for validity evidence. Technology certification, for instance, provides broad-spectrum long-term expertise, whereas product-specific certification is highly relevant and immediately applicable (Anderson *et al.* 2005b, p. 282). Both approaches have their value and can be combined as needed (Salois 2003).

Similarly, there are constant battles over the test format. Authentic (hands-on) performance assessment or experience-based prerequisites are desired (Prometric 2002, p. 26), as “*it is statistically possible for someone with minimal subject knowledge to pass a multiple-choice examination*” (Adams et al. 2004, p. 28). Such statements reflect the frustration about the lack of comprehensible validity evidence (face validity). Ryan and Greguras (1998, p. 185) trace them back to a content-format confusion. There are easy multiple-choice tests which cover factual knowledge, but test items can also be designed so that respondents need to execute the task in order to select the correct option (Messick 1998, p. 60). While the validity of traditional multiple choice testing has been studied in detail, many aspects of alternative approaches are still to be examined (Guion 1998; Messick 1998; Outtz 1998; Ryan and Greguras 1998). Therefore, (Guion 1998, p. 15) suggests to stick to traditional testing. Obviously, any approach is in vain, unless the need for validity evidence is taken seriously.

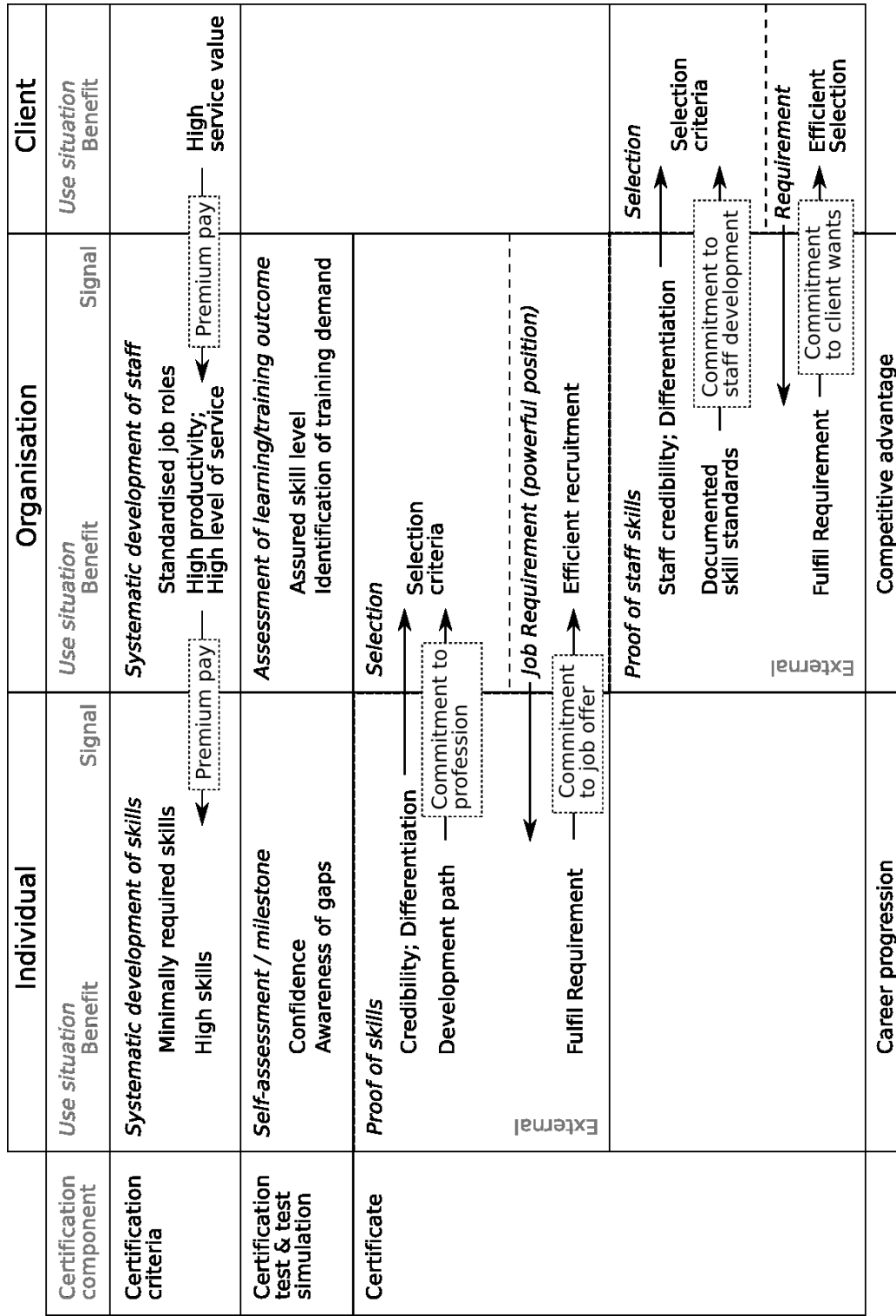
4. Integration of Findings from the Literature

The structure of the previous literature review already prepared the integration of the major findings. Following Woodruff's (1997; cited by Khalifa 2004, p. 654) customer value hierarchy model, it was attempted to identify major certification characteristics, desired consequences in the respective use situations and goals. Hereby, it became obvious that the various potential use situations and benefits are often lumped together but need to be examined separately. Furthermore, each use situation involves the three groups individual, organisation or client, all of which should agree on the appropriateness of the specific use to achieve an optimal value. Incentives and use of certification are signalled between those groups. A symmetric arrangement of all identified elements and their grouping by main use and by the major components of a certification programme yielded a suitable configuration. Figure 4.1 presents the model which considers the mentioned distinctions and interdependencies.

Certification criteria are used for systematic development of relevant IT skills. Depending on the organisational context such skills can be considered as high or as minimally required skills. Accordingly, an organisation can only expect benefits such as high productivity and high level of service from staff members who are regarded as highly skilled. This constellation allows a premium pay, as the organisation and the client profit from the skills. This is not the case, if only minimally required skills are met. Any efforts to develop baseline skills are not acknowledged but expected by the employer. Certification still remains valuable as instrument which supports skills development towards this minimal skill level and beyond (see page 21). Organisations can directly benefit from the certification criteria as they support the management of staff development (see page 14).

Certification tests and test simulations are valuable for self-assessment and as milestone in a learning process leading to confidence and awareness of gaps (see page 25). On the

Figure 4.1.: Conceptual Model of IT Skills Certification Value



organisational side, these benefits can be applied on staff level. Thus, tests can be used to assess learning and training outcome in order to assure a certain skill level and to identify further training demand.

The use of a certificate as proof of skills is more complex due to its asymmetric characteristic. The certified side primarily profits from external signalling benefits, such as credibility, differentiation, and a documented path of professional development (see page 25). Those benefits are directed towards a selecting group, which again profits from the additional selection criteria in order to make the best selection decision. If the selecting group is in a powerful position, it can even require certificates in order to optimise selection process efficiency (see section 3.4.3). These use situations can be applied to both pairs of groups where proof and selection is essential: individuals and organisations, and organisations and clients. The overall goals and incentives of certification use are career progression on the individual's side and competitive advantage on the organisation's side.

The addition of certification characteristics to the model would make it unnecessarily complex. The failure to ensure job relatedness of the certification criteria and test validity and reliability have the potential to destroy the value of the presented main certification components including the recognition of the certificate. Any certification characteristics beyond those implicitly expected ones don't need to be considered as long as the minimal expectations aren't met (see section 3.5). Now, the elaborated preliminary model of certification value needs to be tested.

5. Research Methodology

5.1. Research Philosophy

In research there are two contending views of the social sciences, which “*stem from different conceptions of social reality and of individual and social behaviour*”—an objective, positivistic view and a subjective, interpretive view (Cohen *et al.* 2000, p. 5). This has direct implications for the methodological concerns of researchers: Positivists who treat the social world “*like the world of natural phenomena as being hard, real and external to the individual*” will choose traditional quantitative methods like surveys. Interpretivists “*who view the social world as being of a much softer, personal and humanly created kind*” will choose humanistic qualitative methods like case studies (Cohen *et al.* 2000, p. 6).

As for a compromise of these two viewpoints, there are different opinions. Hirschman (1986, p. 239), for instance, refuses to merge the viewpoints captured in table 5.1:

“Because each is based on an essentially dialectic set of fundamental beliefs, humanistic inquiry and positivistic inquiry can no more be merged or integrated than can Buddhism and Mohammedanism”

(Hirschman 1986, p. 239)

. She is in favour of interpretivism, but recognises the “*need for conscious pluralism in research practice*” (Hirschman 1986, p. 248). Other opinions resulted in various schools between positivism and interpretivism. Saunders *et al.* (2003, p. 84) present realism as the main school of compromise: The positivists’ objective nature of society is seen in the context of the interpretivists’ subjective perception of people.

Current literature on business research encourages to be flexible in choosing research approach and strategy, as both inductive and deductive approaches and the corresponding qualitative and quantitative techniques might be required to advance a research project (Berman Brown 2006, p. 12; Saunders *et al.* 2003, p. 84). The researcher is still likely

Table 5.1.: Contrasts between the positivistic and humanistic philosophies; adopted from [Hirschman \(1986, p. 239\)](#)

The humanistic metaphysic	The positivistic metaphysic
Human beings construct multiple realities.	There is a single reality composed of discrete elements.
Researcher and phenomenon are mutually interactive.	The researcher and the phenomenon are independent.
Research inquiry is directed toward the development of ideographic knowledge.	It is possible and desirable to develop statements of truth that are generalizable across time and context.
Phenomenal aspects cannot be segregated into causes and effects.	Elements of reality can be segregated into causes and effects.
Inquiry is inherently value-laden.	It is possible and desirable to discover value-free objective knowledge.

to feel more comfortable with one or the other and bases the research on the respective philosophical foundation. As this influences the recognition of limits and validity and the understanding of a piece of research ([Berman Brown 2006, p. 15](#)), it is important to know the researcher's philosophical position.

As an engineer the author is attracted by positivism's highly structured methodologies. But he acknowledges the complexity of social structures and processes. Using a selection of research philosophies by [Saunders *et al.* \(2003, p. 85\)](#) the author's position is best described as realism. His ontological view is, that one shared reality exists, but that it is highly complex. As epistemological consequence, knowledge about that reality can be gathered, if the employed process acknowledges the complexity of all involved elements. Thus, research often yields preliminary results, which do not perfectly reflect reality, but which indicate how the research framework can be improved. The challenge of complexity also includes issues arising from the field of axiology. The researcher is certainly biased, but needs to make it transparent and to strive for objectivity.

Being a member of the Board of Directors of an international certification body, the author is convinced of certification's value as valuable instrument for professional development. Nevertheless, an objective research process is aspired—mainly driven by the existing literature and conducted independently from any external interests. The specific certification body, for instance, is not aware of the research project.

5.2. Research Methods

Given the author's preference for a structured deductive approach, he initially searched related literature and previous research for suitable theoretical frameworks, tested operationalisations and standardised data collection instruments in order to apply them to the given research aim. The lack of an adequate theoretical base and the availability of ample anecdotal evidence and opinion articles led to a first exploratory phase, in which a conceptual model of certification value has been developed. The employed inductive analytical procedure wasn't consciously chosen, as it evolved while elaborating the critique of the previous research. But in retrospect the 'data display and analysis' approach as outlined by (Saunders *et al.* 2003, p. 394) fits the undertaken reduction and visual organisation of the given information.

At this point the model could be expanded by further inductive research and the collection of primary qualitative data. However, an essential part of the research aim is to produce authoritative findings in order to provide a more solid base for subsequent research and for practitioners. (Saunders *et al.* 2003, p. 90) report, that in their experience, "*most managers are familiar with the deductive approach and much more likely to put faith in the conclusions emanating from this approach*". Therefore, the model shall now be tested using a deductive approach.

Typical major characteristics of both approaches are contrasted in table 5.2. The presented research strategies for each approach are not mandatory, though. For the test of the given model a case study could also be employed. For instance, the researcher could conduct a longitudinal study and examine the identified organisational use situations in their real life context. Similarly, a deductive approach doesn't rely on quantitative data. Saunders *et al.* (2003, p. 390) presents several procedures for the test of a conceptual framework based on qualitative data. So, in principle, there are many options.

Owing to the time-constraints of a part-time student research project, there is only a limited choice of available research strategies, though. A cross-sectional survey-based study would suit best to the researcher's inflexible and late research working hours. Furthermore, all previous related studies employed a survey strategy. Following their example would make it possible to directly build upon their findings and to learn from their procedures.

The major reason for their choice might be the characteristics of the concept certi-

Table 5.2.: Major differences between deductive and inductive approaches to research and corresponding typical research strategies; adapted from [Saunders *et al.* \(2003, p. 89\)](#)

Deduction emphasis	Induction emphasis
scientific principles; the need to explain causal relationships between variables	a close understanding of the research context
moving from theory to data; the application of controls to ensure validity of data	gaining an understanding of the humans attached to events
the collection of quantitative data	the collection of qualitative data
a highly structured approach; the operationalisation of concepts to ensure clarity of definition	a more flexible structure to permit changes of research emphasis as the research progresses
researcher independence of what is being researched	a realisation that the researcher is part of the research process
the necessity to select samples of sufficient size in order to generalise conclusions	less concerned with the need to generalise
experiment, survey	case study, grounded theory

fication. After all, certification involves several parties and its value relies on their consensus ([Donovan 2003](#)). This suggests to employ a strategy which allows to collect data or opinions on all value aspects from several groups independently from their direct involvement.

The advantages summarised by [Saunders *et al.* \(2003, p. 92\)](#) strengthen the decision to conduct a survey:

- highly economical data collection
- perceived as authoritative
- controllable research process

It is accepted that the development of alternative explanations are limited by the resulting structured research design.

5.3. Data Collection Techniques

[Saunders *et al.* \(2003, p. 83\)](#) offer a helpful guide for the selection of appropriate data

collection techniques. The main choices are the use of secondary data, observation, interviews and questionnaires, all of which could be employed to test the given model following the survey strategy.

They suggest to take a look at secondary data first, as the results of previous surveys, documentary data or the combination of existing data sets could already assist the research. Except for the salary surveys which have been covered in the course of the literature review, no adequate and available secondary data could be found. Comprehensive access to organisational records about professional development initiatives and selection procedures might be granted to a within-company research project. In this case, however, it is more feasible to collect primary data from members of organisations, than to struggle for access to secondary data.

The collection of primary data through observation would be helpful within the case study scenario outlined in the prior section and could facilitate the examination of real social processes. But it could also be used for a survey. Structured observation, for instance, is a quantitative method, which focuses on the frequency of actions. Including the recording of the needed metrics would be as problematic as getting access to organisational secondary data. And even though structured observation allows delegation, it involves continuous and thus slow and costly data collection, and is therefore not feasible in this case due to time constraints.

Unstructured and semi-structured interviews could be conducted to collect opinions supporting or rejecting the model's elements. But those are rather inefficient instruments to collect an authoritative number of responses. They fit better to an inductive approach where an area needs to be further explored. They might be valuable as a supplement to the main instrument, though.

This leaves the large group of structured data collection techniques as most suitable instruments to test the model. First of all, the structured design of a questionnaire can be easily mapped to the model's structure. Thus, the perceptions of several involved parties regarding the various use situations of certification can be equally considered. This is in congruence with the research aims and the nature of certification.

Table 5.3 compares the major attributes of self-administered questionnaires (online, postal, delivery & collection) and interviewer administered questionnaires (telephone, structured interview). The need for a most efficient data collection technique in terms of time and costs and the fact that the targeted respondents are computer-literate suggests

Table 5.3.: Comparison of Available Structured Data Collection Techniques; adapted from [Saunders et al. \(2003, p. 284\)](#)

<i>Attribute</i>	<i>Self-administered</i>			<i>Interviewer administered</i>	
	<i>Online</i>	<i>Postal</i>	<i>Delivery & Collection</i>	<i>Telephone</i>	<i>Structured Interview</i>
Population's characteristics	computer-literate; email address	literate; postal address	literate; postal address	reachable via telephone	any
Size of sample	large	large	~ field workers	~ interviewers	~ interviewers
Likely response rate	internet $\leq 10\%$; within orgs 30%	30%	30-50%	50-70%	50-70%
Feasible length	conflicting advice	6-8 A4 pages	6-8 A4 pages	up to half an hour	variable
Suitable types of questions	closed, not too complex, must be of interest			open and closed, but simple	open and closed, complicated fine
Duration of data collection	2-6 weeks	4-8 weeks	~ sample size, field workers	~ sample size, than self-administered	interviewers; slower
Financial resources	low (survey service)	postage, handling	travel, handling	interviewers, telephone, handling	interviewers, travel, handling
Role of field worker	none	none	delivery & collection	enhance participation; answer questions	guidance;
Data input	automated	mark readers	mark readers	at time of collection	at time of collection

the use of an online questionnaire. It is likely that respondents even prefer online forms over paper-based ones or over intrusive, interviewer-administered enquiries.

Major disadvantages of online questionnaires are the need for clear questions and a likely low response rate. While the response rate can be compensated by choosing a larger sample size, the clarity of questions is a major issue—especially, as certification is prone to confusion, as found in section 2.1.1. However, the other advantages are seen to outweigh this issue and great care will be taken to ensure that adequate instructions will guide the respondent.

Saunders *et al.* (2003, p. 99) offer the advice to use several data collection techniques within one study. This allows to cancel out method effects and helps to further explain the results. On account of the challenge of creating an unambiguous structured questionnaire, its results should definitely be triangulated by a less structured technique which supports the collection of qualitative data. The non-directive group interview, being one variant of unstructured interviews, might be a valuable supplement in this regard. This would be feasible using the common means of online communication, such as discussion boards or mailing lists. Group interaction might result in a rich flow of data Saunders *et al.* (2003, p. 271)—including formal or content-related issues with the questionnaire.

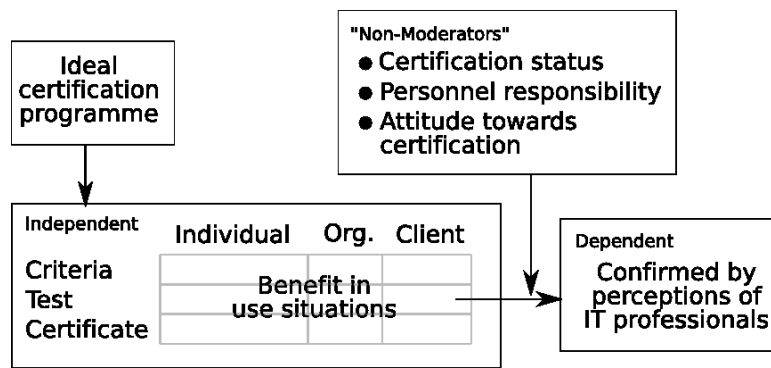
The online questionnaire is realised by means of the commercial online service Survey-Monkey.com. As the questionnaire templates of this service are tested by many similar research projects, they are considered to be adequate in terms of usability and form. To accommodate the privacy concerns of the respondents, a secure connection to the service is offered.

5.4. Theoretical Framework

In the literature review chapter it was suggested, that the conflicting research findings about IT certification value result from unclear use situation and the variable quality of actual certification programmes. The model presented in figure 4.1 in the previous chapter aims to clearly distinguish the various use situations and is based on an ideal certification programme.

The strict separation of the model's three involved parties 'individual', 'organisation' and 'client', is difficult to be found in a real setting. Depending on the situation individuals

Figure 5.1.: Research Framework Overview



could act in any of the three roles—be it as employee, line manager, or purchaser of services. The model's signals between the involved parties highlight that a common agreement on the benefit of certification in a certain use situation is essential to achieve a high value. Therefore it is deemed appropriate to collect data on perceptions of use situations independently of one's actual role. Previous research similarly relied on certification value perceptions of employees regarding HR work or on perceptions of HR managers regarding personal benefits. Thus, each proposed use situation, which can be generally confirmed by organisational members, might be sufficiently clear and valuable in the organisational context.

As previous research found that HR managers are not very critical towards IT certification (see section 3.4.1), they are not considered in this study. Line managers or IT professionals with personnel responsibility usually team up with HR managers (Mullins 2005a, p. 753), so their perceptions are seen as similar important but more valuable to test the model. The attribute 'personnel responsibility' is therefore chosen as one moderator. Another one is 'certification status' which was found to have a significant impact on value perceptions in previous research (see section 3.4.2). Furthermore, the 'general attitude towards IT certification based on existing certification programmes' is considered in order to verify, if the presented notion of an ideal certification programme actually eliminates all known weaknesses.

Use situations which are confirmed irrespectively of these three attributes, are seen as confirmed by the respondents.

The resulting research framework is illustrated in figure 5.1.

Accordingly, the following working hypotheses are used:

- H1:** Given an ideal certification programme, each of the presented use situations is confirmed by the respondents.
- H2:** There are no significant differences in the perceptions of respondent groups determined by certification status, personnel responsibility and attitude towards certification.

5.5. Operationalisation of Major Variables

In their chapter about questionnaire design [Saunders *et al.* \(2003, p. 287\)](#) list three types of data variables, which can be collected by questionnaires: opinion, behaviour and attribute. As the proposed model of certification value is based on an ideal, possibly non-existent certification programme, the questionnaire shall measure the respondent's opinion. Therefore, the model's elements are transformed into statements, to which the respondent can agree using an ordinal four-point Likert-type scale ("strongly agree", "agree", "disagree", "strongly disagree"). The need for a separated, fifth response category "unclear / don't know" came out of a pilot test, where test respondents explained that they couldn't assess some statements. This response format is used for the largest part of the questionnaire in order to keep it uniform and thus easy to answer for the respondent.

Alternative response categories were also considered. To maximise the simplicity of coding and analysis, the choice was limited to closed-ended item types, though. This way the influence of the moderating variables can be statistically examined. A five-point Likert-type scale with a neutral response category is intentionally not employed, as respondents shall be forced to take a position and as the ambiguity of the middle category shall be avoided. Related previous research used response categories indicating decreasing value ("high value" ... "no value") or agreement ("strongly agree" ... "not agree"). Those categories are rejected due their asymmetry: only one response category would be available to express disagreement to a statement. Moreover, restricting the response to a level of value would limit the statements to a list of certification benefits without the possibility to test all aspects of the model.

The statements are grouped by certification component and by the involved groups (individual, organisation and client). This structure shall keep the stem of the respective item groups small. Despite such efforts, the questionnaire is rather wordy due to the

Table 5.4.: Statements on the Value of IT Certification Criteria and Standardised Competences

Personal Value	
01	Certification criteria help with the systematic development of minimally required skills.
02	Certification criteria help with the systematic development of high skills.
03	High skills increase the market value of a professional.
<hr/>	
Organisational Value	
04	Certification criteria and their standardised job task descriptions support the personnel development in organisations.
05	Highly skilled employees are more productive.
06	Highly skilled employees provide a higher level of service.
07	Highly skilled employees increase the market value of the offered service.

Table 5.5.: Statements on the Value of IT Certification Tests

Personal Value	
08	Certification tests are suitable as milestones for learning processes.
09	Certification tests are suitable for the self-assessment of skills.
10	Passed certification tests increase the confidence in own skills.
11	Test simulations help identify gaps.
<hr/>	
Organisational Value	
12	Certification tests are suitable for the organisation assessment of informal learning and organisational training outcome.
13	Certification tests help assure organisation skill levels.
14	Test simulations help identify organisational training demand.

Table 5.6.: Statements on the Value of IT certificates for Individual and Organisation

Personal Value	
15	Certificates increase the credibility of an individual's skills.
16	Certificates allow differentiation from competitors.
17	Certificates document the path of professional development.
18	Continuing professional development signals a high commitment to profession.
19	Certificates fulfil job requirements.

Organisational Value	
20	Certificates serve as supplementary criteria for selection decisions.
21	In an abundant labour market companies can use certificates as job requirement in order to optimise selection process efficiency.

Table 5.7.: Statements on the Value of IT Certificates for Organisation and Client

Organisational Value	
22	Certificates increase the credibility of staff skills.
23	Certificates allow differentiation from competitors.
24	Certificates document organisational skill standards.
25	High organisational skill standards signal high commitment to staff development.
26	Certificates fulfil requirements for an order.

Client Value	
27	Certificates serve as supplementary criteria for selection of a service provider.
28	Clients can demand certificates as requirement for placing an order.

amount of items representing the given model and the amount of explanations to convey the notion of an ideal certification. See tables 5.4, 5.5, 5.6 and 5.7 for the employed statements. The use of additional items or forms to test the questionnaire's reliability are not considered. Given the exploratory background of the tested model, such efforts might be inept and would extend the questionnaire further. A primary goal is to keep the respondent's time investment as low as possible.

The remaining part of the questionnaire consists of simple items relating to attribute variables for demographic data and moderators. The demographic items were inspired by questionnaires of related research (Bartlett *et al.* 2005; Fang *et al.* 2005) and serve as background information on the survey sample.

The following items correspond to the research framework's moderating variables:

- Based on the certification programmes I know, my general attitude towards IT

certification is – “rather positive” “negative”

- Participate in personnel decisions – “yes” “no”
- Number of held IT certifications – “none” “1” “2” “3 or more”

For demographic purposes the response categories of the latter item are more detailed but get collapsed to a binary yes/no value for the moderator ‘certification status’. Thus, all moderator variables are suitable for statistical two-sample tests and for contingency tables.

The online-questionnaire consists of 8 pages, two of which are used for explanations. The structure of the questionnaire acknowledges that the attitude towards certification is based on existing programmes, so it is asked first. Then, the concept of an ideal programme and four pages with the model-related statements are presented. Following [Saunders *et al.*](#)’s advice, the easy to respond, demographic items are put at the questionnaire’s end. This might also be advantageous due to the sensitiveness of IT professionals with respect to their personal data. After all, security and confidentiality issues are an essential part of their job. For this reason, the demographic items only use broadly categorised responses for ‘age’, ‘work experience’, ‘company size’ and ‘gender’. Questions about the educational background of respondents are deliberately left out, as they might be seen as inadequate. In order to ensure a complete set of response data, all items are marked as required, i.e. the respondents can only proceed to the next page, if all items of the current page are completed.

In a small pilot test among a group of five IT professional most of the model’s elements were confirmed. The completion time ranged from six to ten minutes, which the respondents considered acceptable. The content was even found to be informative. The notion of an ideal certification programme and the term ‘competence’ was not clear to one respondent, though. He assumed that competence refers to knowledge rather than tasks and experience. As a consequence, the questionnaire’s explanations were adapted accordingly.

The complete original wording of the questionnaire can be found in appendix [A](#) and the translation in appendix [B](#).

5.6. Design

In their study about the perceived influence of IT certification on recruitment, [Bartlett et al. \(2005\)](#) focused on large firms with 500 or more employees and with stand-alone IT departments, as such firms are usually more involved with objective recruitment criteria concerning qualifications, education and work experience ([Bartlett et al. 2005](#), p. 56). Of the 3,300 invited U.S. based firms only 50 representatives agreed to participate and of those 33 completed the self-administered questionnaire.

For the present research project, similar efforts to achieve a representative sample can't and won't be made given the likely inefficiency demonstrated above. It is questionable if this research should pursue any attempts for subsequent generalisation, at all. The omnipresence and heterogeneity of the organisational IT work would make it very difficult to find a statistically representative sample of the whole IT related organisational field. For a first test of the proposed model any group of IT professionals is therefore deemed to be sufficient, as long as the number and attributes of its members satisfy the research framework's requirements.

So, instead of trying to reach members of the IT field through their firms, a professional association of IT system administrators in Germany shall be approached. As IT certification originated from programmes for system administration ([Foster 2004](#)), the association's members are likely to comprise certificants. Furthermore, it is assumed that some of them participate in personnel decisions in their firm. This purposive sampling is justified by the exploratory nature of the research. Consequently, no broad inferences about the IT field in general can be drawn from the results. But the collected perceptions about the proposed model can indicate elements which might be suitable for generalisation.

By reason of convenience the author chooses an association of which he is a member. An enquiry from inside might help increase the response rate and thus to decrease potential effects of self-selection. Additionally, the author is already familiar with the groups culture and can communicate appropriately. From three possible opportunities the association with the highest number of members is chosen. In acknowledgement of the members' privacy, electronic mailing lists are used to send the invitation letters. These lists also serve for the feedback on the survey and for related discussions. A national and the two largest regional lists with 687 members in total are used. As some individuals

are members of national and regional lists the number of the target population can only be estimated. It is assumed that 500 individuals receive the invitation.

According to the characteristics of online questionnaires in table 5.3, the response rate of internet surveys is usually 10% or lower whereas that of surveys within organisations can be 30%. As the present case lies between those two scenarios, the response rate is estimated with 20% or 100 responses.

Depending on the pattern of responses and the employed statistical tests 60 responses could already be sufficient. Ideal would be if the attributes of each moderating variable divided the population almost evenly into two independent samples. Based on the research framework and the type of variables a Wilcoxon rank sums test or a chi square test could be employed to examine if the perceptions of the independent samples significantly differ from each other. The first test can be used with less than 30 values per sample (Bender *et al.* 2002). For a chi square test on a four-cell contingency table of the accordingly grouped responses a minimum number of 10 values per cell is required, though (Saunders *et al.* 2003, p. 358).

The data collection period will be kept short, as respondents are assumed to complete the online questionnaire shortly after the reception of the invitation. After three days a reminder will be sent to the mailing list and after another three days the survey will be closed.

6. Findings

6.1. Data Collection Background

After the announced data collection period of six days, 137 responses to the self-administered online-questionnaire were collected. Given the estimated population size of 500, this corresponds to a theoretical response rate of 27% (all percentages are rounded to integers). However, there is a large number of incomplete responses. Of the 42 incomplete responses 30 stop already at page 3 (Definitions and explanations) or page 4 (The Value of IT Certification Criteria and Standardised) of the questionnaire. Nine responses stop in the middle of the model statements and three responses lack only the demographical data.

Via e-mail three respondents reported problems with the online-questionnaire. It turned out that the Likert-type response format of the survey service relied on an internet browser with activated Javascript technology and that the service was sometimes overburdened and thus difficult to reach. This is unfortunate, as a professional subscription of the service has been acquired to avoid any technical problems. Besides technical problems, an incomplete response could have been caused by distraction or by dislike of the questionnaire content.

Other three respondents commented on the response categories. One asked for an additional category “not relevant”. The second demanded that the category “unclear / don’t know” should be in the middle of the Likert-type scale. And the third pointed out that the preferred but missing category “not agree” has a different meaning than the available option “strongly disagree”. All three issues have been considered during the questionnaire design phase. It is interesting that they were brought up by the respondents.

As the demographical section at the end of the questionnaire comprises two important moderator variables, all incomplete cases are deleted. This leaves 92 complete responses

for the statistical analysis. Due to the commitment to the respondents' privacy, the data don't allow to recognise multiple responses of the same person. However, the data and the situation suggest that each participant generated only one complete response. The resulting response rate of 18% is very close to the aim of 20%.

The announced time for completion of eight minutes, which has been estimated in the pilot study, was supported by the actual survey. Leaving out eleven cases with a duration from 30 minutes to over 24 hours, which have obviously been caused by distraction, the average response duration was seven minutes and 46 seconds. This is seen as very important, as the author didn't want to steal too much time from the respondents.

6.2. Demographics and Moderators

The collected data of the respondents are neither a representative sample of IT professionals in general nor of the survey population. So, from the demographic data no generalisations can be made. The summary in table 6.1 merely allows an overview of some of the sample's characteristics.

Most respondents are male and belong to the age groups 30–39 and 40–49. More than half of the respondents have 10–20 years of professional IT experience. The sample evenly covers companies of all sizes from under 10 to over 10,000 employees. 34% of the respondents hold three or more IT certifications and 29% hold none.

The data for the three moderators of the research framework turn out to accommodate the intended statistical analysis. The data about the number of IT certificates are used for the moderator 'Certified' resulting in 71% certificants and 29% non-certificants. Based on the certification programmes they know, 37% of the respondents tend to a positive attitude towards IT certification and 63% to a negative one.

Of those who tend to a negative attitude 36% have no certificate, 19% have one, 21% have two and 24% have three or more certificates. So, most of them already made personal experiences with certification. Among the respondents with a positive attitude 18% are not certified and 50% gained three or more certifications. This group has a higher percentage of young respondents (20–29 years old: 21% vs. 5%) and a lower percentage of very experienced respondents (more than 20 years: 9% vs. 24%).

The frequencies of attitude and certificates presented in table 6.2 suggest that certified respondents are a bit more likely to have a positive attitude towards certification than non-certified. But the results of Pearson’s Chi-squared test [$\chi^2 = 7.2061; p = 0.0656$] and the Wilcoxon rank sum test [$W = 1279; p = 0.0138$] don’t clearly indicate a statistically significant difference.

The moderator ‘Participation in personnel decisions’ divides the sample almost perfectly in two halves. Even the frequency distribution of the other two moderators are close to be maintained in each half.

6.3. Confirmation of the Model’s Elements

It was hypothesised that, given an ideal certification programme, each of the presented use situations is confirmed by the respondents (H1). For an assessment of this hypothesis the responses to the 28 statements are recoded to the two groups ‘agree’ and ‘disagree’. Table 6.3 presents the collapsed responses and figure 6.1 visualises the agreement to the statements directly in the proposed conceptual model of certification value.

The analysis of the survey data is conducted with the statistical computing language and environment GNU R. The tutorials by Verzani (2002), Muenchen (2007) and Logan (2003) have been of great help while learning the basics of GNU R. A listing of the commands used for the present analysis is presented in appendix C.

Among the statements representing the use situations items 3, 5, 6, 7, 18 and 25 are only indirectly linked with certification. They are highlighted in table 6.3. Interestingly, all of those belong to the group with which the highest percentage of respondents agree. The lowest percentage among those (70%) shall be used as criterion for general agreement. Among all remaining statements only one passes this threshold: 72% agree that certificates allow individuals to differentiate themselves from competitors. Some other statements come close, but generally the visualisation in figure 6.1 illustrates that the model is far from being confirmed by the respondents. Besides the statements with an agreement of over 70%, those with very low percentages stick out (item 2, 12, 19, 21).

The statements with a high number of missing (“unclear / don’t know”) responses seem to be unclear. Their wording might be improper or they describe unusual use situations of certification. This will be analysed and discussed later.

Table 6.1.: Demographics

Total sample						
Frequency	92					
Percentage	100%					
Age group						
	< 20	20–29	30–39	40–49	50–60	> 60
Frequency	0	10	56	20	6	0
Percentage	0%	11%	61%	22%	7%	0%
Gender						
	male	female				
Frequency	87	5				
Percentage	95%	5%				
Professional IT experience in years						
	< 5	5–9	10–20	> 20		
Frequency	4	23	48	17		
Percentage	4%	25%	52%	18%		
Company size (number of full-time employees)						
	< 10	10–99	100–499	500–999	1,000–10,000	> 10,000
Frequency	19	24	14	6	16	13
Percentage	21%	26%	15%	7%	17%	14%
Number of held IT certifications						
	none	1	2	> 2		
Frequency	27	17	17	31		
Percentage	29%	18%	18%	34%		
Participation in personnel decisions						
	yes	no				
Frequency	47	45				
Percentage	51%	49%				
General attitude towards IT certification						
	positive	negative				
Frequency	34	58				
Percentage	37%	63%				

Table 6.2.: Relation of Attributes ‘Certificates’ and ‘Attitude’

Attitude Towards Certification	Number of Certificates				total
	none	one	two	three+	
positive	6	6	5	17	34
negative	21	11	12	14	58

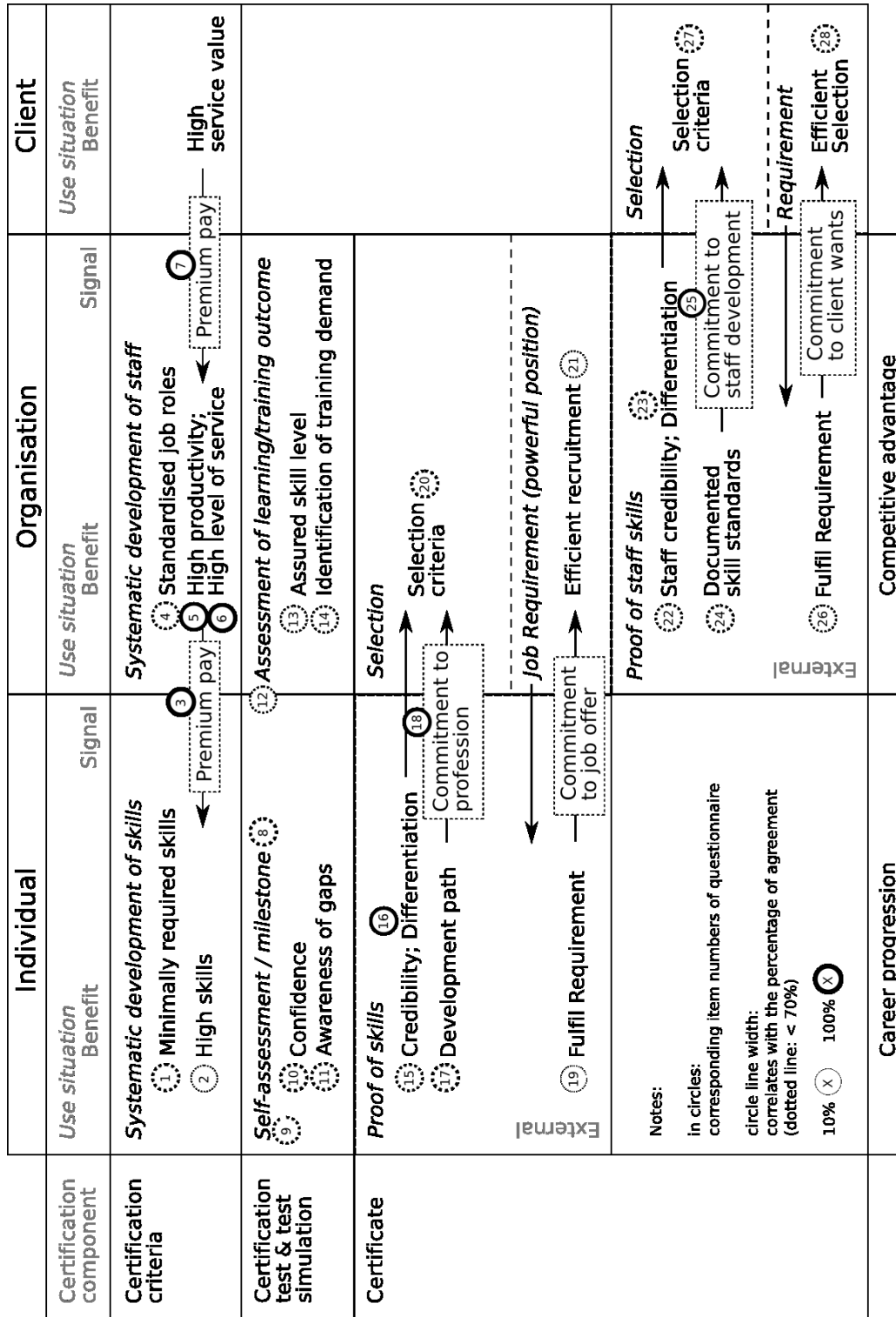
Table 6.3.: Collapsed Results of Overall Sample

Item	n	NA	Frequency		Percentage	
			agree	disagree	agree	disagree
1	86	6	53	33	62%	38%
2	88	4	27	61	31%	69%
3	92	0	87	5	95%	5%
4	80	12	43	37	54%	46%
5	85	7	64	21	75%	25%
6	86	6	74	12	86%	14%
7	86	6	76	10	88%	12%
8	91	1	63	28	69%	31%
9	91	1	55	36	60%	40%
10	85	7	58	27	68%	32%
11	81	11	51	30	63%	37%
12	79	13	34	45	43%	57%
13	87	5	39	48	45%	55%
14	77	15	38	39	49%	51%
15	85	7	47	38	55%	45%
16	83	9	60	23	72%	28%
17	83	9	57	26	69%	31%
18	87	5	68	19	78%	22%
19	87	5	21	66	24%	76%
20	86	6	56	30	65%	35%
21	88	4	30	58	34%	66%
22	87	5	46	41	53%	47%
23	86	6	57	29	66%	34%
24	90	2	50	40	56%	44%
25	83	9	58	25	70%	30%
26	84	8	38	46	45%	55%
27	86	6	56	30	65%	35%
28	84	8	48	36	57%	43%

n – number of non-missing responses

NA – number of missing responses (omitted in analysis)

Figure 6.1.: Results Visualised in the Conceptual Model



6.4. Influence of Moderators

The second hypothesis H2 stated that there are no significant differences in the perceptions of respondent groups determined by certification status, personnel responsibility and attitude towards certification.

[Bender *et al.* \(2002\)](#) suggest the Wilcoxon rank sum test to determine whether or not two independent samples of ordinal data are significantly different from each other. The Likert-type response categories are discrete values ranging from 1 to 4 and can be regarded as ordinal.

Another approach for analysing Likert-type data is to regard the response categories as nominal values and apply the chi-square test of [Northern Iowa \(2006\)](#); [Romano *et al.* \(2006\)](#). When the present data are collapsed to two groups, it accommodates the chi square test which relies on few cells with low frequencies. Furthermore, the resulting contingency tables are clearer [Saunders *et al.* \(2003, p. 357\)](#). As the author is not familiar with the tests, both tests will be employed in order to gain confidence in the results.

Regarding the moderator ‘personnel responsibility’, only one statement with a barely significant difference of agreement is found: item 8 [$\chi^2 = 4.8429; p = 0.0278$]. The contingency tables and the results from both significance tests are presented in table [D.2](#) in appendix [D](#). The frequencies given in that table show, that from the group of respondents with personnel responsibility there are more who disagree with the statement ‘high skills increase the market value of a professional’. This result is not regarded as important.

Similarly, only four statements (5, 12, 13, 27) with significant differences can be found for the moderator ‘certification status’. The corresponding detailed results are presented in table [D.1](#) in appendix [D](#), but will also be summarised later. At this point it can be confirmed that the Wilcoxon rank sum test and the chi-square test yield very similar results, which also make sense when compared to the numbers in the contingency tables.

The findings for the influence of the third moderator ‘general attitude towards IT certification’ are very surprising. Table [6.4](#) lists the statistical results. Except for the before mentioned statements which are only indirectly linked with certification and one obviously unclear statement, all statements are found to be perceived significantly different by the two groups. Specifically, among respondents with a negative attitude significantly less agree with the statements.

This was not expected. After all, an ideal certification programme was thought to please the demands of most respondents, as the common points of criticism were eliminated.

6.5. A Second Glance

Given the strong influence of the moderator ‘general attitude towards IT certification’, the responses of both resulting groups shall now be examined separately. It is hoped that this yields more specific insights about the agreement on the model of certification value. The tables [D.3](#) and [D.4](#) in appendix [D](#) summarise the collapsed frequencies and percentages of agreement for respondents with positive or negative attitude respectively.

In order to allow a more convenient comparison, the columns with the percentages of agreeing respondents of both groups and of the overall sample (table [6.3](#)) are rearranged in table [6.5](#). Additionally, all other relevant results are integrated. The frequency of missing responses per statement, the significant influences of the three moderating variables, the certification components with their respective users and the catchwords of the individual questionnaire statement are all combined in this table.

The threshold of 70% shall be used as criterion for general agreement like it was done for the analysis of the overall sample. In the column of the positive attitude group all items below this threshold and for the negative attitude group all items reaching or surpassing the threshold are highlighted.

6.5.1. Positive Attitude Group

Indeed, the data of the positive attitude group comes close to the expected results outlined by the two hypotheses. Except for controversial or unclear use situations, the respondents largely confirm the statement. The specific results can be used to discuss and refine the model.

The analysis regarding the two remaining moderators ‘personnel responsibility’ and ‘certification status’ requires particular attention. After the segmentation of the sample, the frequencies of some response categories might be too low for the employed tests. Their results differ considerably in numbers, but not in their determination of significance. An inspection of the data confirms the tests’ results (table [D.5](#) and [D.6](#) in appendix [D](#)). So, no significant influence of the moderators can be determined.

Table 6.4.: Moderator – Attitude Towards Certification

Item	Positive Attitude		Negative Attitude		χ^2	p	Wp	
	agree	disagree	agree	disagree				
1	31	1	22	32	24.4526	0.0000	0.0000	*
2	18	13	9	48	14.9439	0.0001	0.0000	*
3	34	0	53	5	1.6491	0.1991	0.7152	
4	27	3	16	34	23.0932	0.0000	0.0000	*
5	25	7	39	14	0.0444	0.8331	0.8848	
6	31	1	43	11	3.6444	0.0563	0.0731	
7	30	2	46	8	0.7220	0.3955	0.7847	
8	31	3	32	25	10.6827	0.0011	0.0001	*
9	29	5	26	31	12.4137	0.0004	0.0002	*
10	27	5	31	22	5.0314	0.0249	0.0061	*
11	23	6	28	24	4.1423	0.0418	0.0018	*
12	18	9	16	36	7.9349	0.0049	0.0012	*
13	26	5	13	43	27.2820	0.0000	0.0000	*
14	14	11	24	28	0.3201	0.5715	0.1352	
15	25	5	22	33	13.0448	0.0003	0.0000	*
16	27	3	33	20	6.0372	0.0140	0.0000	*
17	28	3	29	23	9.2326	0.0024	0.0005	*
18	31	3	37	16	4.3580	0.0368	0.1536	
19	13	18	8	48	6.8893	0.0087	0.0012	*
20	28	5	28	25	7.8231	0.0052	0.0011	*
21	17	14	13	44	7.7990	0.0052	0.0002	*
22	23	7	23	34	8.9967	0.0027	0.0003	*
23	25	5	32	24	4.8809	0.0272	0.0013	*
24	30	3	20	37	24.1633	0.0000	0.0000	*
25	20	9	38	16	0.0139	0.9062	0.9118	
26	20	9	18	37	8.6558	0.0033	0.0003	*
27	26	5	30	25	6.2704	0.0123	0.0014	*
28	23	10	25	26	2.7045	0.1001	0.0463	*

p – p-value for χ^2 ; Wp – p-value for Wilcoxon rank sum test
 * – statistically significant difference in responses; probability of $H_0 < 0.05$
 H_0 : the probability distributions of the two samples are equal

Table 6.5.: Integrated Results

Item	NA	Agreeing responses			Mod.		Statement
		overall	pos.A.	neg.A.	A	C P	
Certification criteria – Personal value							
1	6	62%	97%	41%	+		minimal skills
2	4	31%	58%	16%	+		high skills
3	0	95%	100%	91%			high skills → market value
Certification criteria – Organisational value							
4	12	54%	90%	32%	+		personnel development
5	7	75%	78%	74%	–		high skills → productivity
6	6	86%	97%	80%			high skills → level of service
7	6	88%	94%	85%	–		high skills → market value
Certification tests / test simulations – Personal value							
8	1	69%	91%	56%	+		milestones for learning
9	1	60%	85%	46%	+		self-assessment
10	7	68%	84%	58%	+		increase confidence
11	11	63%	79%	54%	+		identify gaps
Certification tests / test simulations – Organisational value							
12	13	43%	67%	31%	++		training outcome
13	5	45%	84%	23%	++		assure skill levels
14	15	49%	56%	46%			identify training demand
Certificates – Personal value (external)							
15	7	55%	83%	40%	+		credibility
16	9	72%	90%	62%	+		differentiation
17	9	69%	90%	56%	+		documented devel. path
18	5	78%	91%	70%			→ commitment to profession
19	5	24%	42%	14%	+		fulfil job requirement
Certificates – Organisational value							
20	6	65%	85%	53%	+		selection criteria
21	4	34%	55%	23%	+		efficient recruitment
Certificates – Organisational value (external)							
22	5	53%	77%	40%	+		credibility of staff skills
23	6	66%	83%	57%	+		differentiation
24	2	56%	91%	35%	+		documented skill standards
25	9	70%	69%	70%			→ commitment to staff devel.
26	8	45%	69%	33%	+		fulfil requirements
Certificates – Client value							
27	6	65%	84%	55%	++		selection criteria
28	8	57%	70%	49%	+		efficient selection

NA – number of missing responses (omitted in analysis)

pos.A. – positive Attitude; neg.A. – negative Attitude

Mod. – Moderators: A – positive Attitude; C – Certificant; P – Personnel Responsibility

+/- – moderator positively/negatively affects agreement to statement

6.5.2. Negative Attitude Group

The data of the negative attitude group reflects a general disagreement with all statements which are directly related to the certification components. This adds another dimension to the proposed model of certification value. The results will be discussed in the next chapter—along with the qualitative findings of the feedback through the mailing list.

The statistical limitations regarding the analysis of the moderating variable apply here, as well. The results also indicate that there is no significant influence of the moderators (table D.7 and D.8 in appendix D).

6.5.3. Detailed Summaries of Responses

The frequencies and percentages of the responses with intact response categories (non-collapsed) can be found in appendix D. Tables D.9, D.10, D.11, D.12, D.13, D.14 and D.15 list these summaries for the overall sample and for both groups created by each moderator.

7. Discussion

The results of the previous chapter are now discussed based on table 6.5 which integrates the most important findings. Those are supplemented by qualitative data extracted from the electronic group discussions, which had been triggered by the invitation to participate in the online survey.

As the proposed model already integrates the findings and the author's critique of the reviewed previous research, the discussion of the present empirical findings mainly focus on the model itself. Only in cases of exceptional findings they are related to the literature in detail.

7.1. Non-Directive Group Interview

Within 17 days after the start of the survey, 41 electronic messages from 22 individual participants have been collected. Except for two personal e-mails to the author, all messages appeared on the electronic mailing lists on which the invitation letter had been posted. The author only participated in the discussion in order to clarify questions about the research and the questionnaire.

The group interaction led the discussion to several themes, ranging from the common points of certification criticism to selection procedures and to the value of formal qualifications in general. Due to time constraints the qualitative analysis process is limited to a mere categorisation and description of main themes and arguments. The specific findings are presented within the discussion below.

Within the time of the electronic discussion, two announcements for three IT job positions appeared on the mailing lists. One indicated that a specific certification would be seen as a bonus. The other listed a specific certification in the requirements for two jobs, but didn't clearly indicate if it could be substituted by experience.

7.2. Assessment of the Proposed Model

The proposed conceptual model of certification value explained in chapter 4 aims to clearly differentiate between use situations and to make each use situation comprehensible. Assuming an ideal certification programme it was expected that the respondents generally agree to most use situation with the exception of some more controversial ones. As found in the last chapter this is only true for the positive attitude group. First, the model shall be assessed based on the responses of this group and on the available qualitative data. Thereafter, the attitude towards certification and its impact on the responses will be examined.

7.2.1. Respondent Groups Formed by Moderators

The three moderators were included in order to verify that the characteristics of certification programmes and the presented use situations are clear to all different respondent groups. Presumably, due to a lack of similar clarity, previous research found conflicting evidence from groups of HR professionals, line managers, IT professionals and certifi-cants. The hypothesis of the present research that there are no significant differences in their perceptions could only be confirmed for two moderators: Responses of individuals who are certified or who participate in personnel decisions don't differ from those without these attributes. The attitude towards certification in general proved to play a much more important role than expected.

While previous research ([Bartlett et al. 2005](#); [Cegielski 2004](#)) compared the perceptions of paired IT and HR professionals concerning the influence of certification on recruitment, the present research focused on IT professionals with and without personnel responsibility. It was anticipated that many IT professionals participate in selection decisions with respect to IT related positions. This has been confirmed by the responses. In many firms they might even be the primary decision makers. It is interesting that they perceive certification like their colleagues without personnel responsibility rather than like HR managers who tend to believe in the value of certification ([Anderson et al. 2005a](#); [Bartlett et al. 2005](#); [Cegielski 2004](#)). This makes it even more important to examine the perception of certification value from perspectives other than that of HR managers.

[Bartlett et al. \(2005\)](#) found that certification status influenced the perceived value of certification in selection processes. They offered as potential explanations, that certifi-

cants try to justify their certification efforts or that they attribute their success partly to certification. Such influence couldn't be found in the present research. First of all, the statements referred to an ideal certification, of course. However, there also seems to be no clearly significant relation between certification status and attitude towards certification. Table 6.2 shows that even among certified respondents a clear majority indicates a negative attitude. This attitude might have been caused by the experience of getting certified and its (lack of) consequences. Or they had to get certified despite the negative attitude they already had before.

7.2.2. Perceptions of Real Certification Programmes

In the literature review low relevance and validity of certification programmes were identified as the primary reasons for a negative attitude. For the study's framework this was considered as a major distraction from the use situations to be examined. So it focused on an ideal certification, instead. The expected criticism has been confirmed by the qualitative responses from the mailing list discussion.

Five participants are not convinced of certification at all. They emphasise that certification doesn't assess real and relevant skills, but that it is all about memorising exams and teaching to the test. This results in pseudo-qualifications which can be attained by individuals who don't even possess a computer. One participant presents a definition of certification from a humorous glossary of IT terminology. It defines certification as a business model which compresses hot air to paper and trades it in for currency. A sixth participant confirms this focus on profit, as he reports from his experiences as trainer and examiner how he had to pass all candidates despite their lack of skills. so they would get their value for their money. Two others explicitly blame vendor certificates to be inadequate as qualification and no proof for skills at all. They are much too easy, as they are actually a marketing instrument of vendors to create product champions.

Among all those participants four concede that there are a few technical certification programmes which can be relied on. A multi-certified participant acknowledges the misuse of certification, but he points out that he sees no alternative way of professional development and qualification in the IT field. This obviously practical dilemma stresses the need for more research in this field.

7.2.3. The Value of Certification Criteria

While 97% of the respondents from the positive attitude group agree with the statement that certification criteria help with the systematic development of minimally required skills, only 58% agree that this is feasible for high skills.

Sections 3.2.2 and 3.2.3 of the literature review exemplify the confusion about skill level and adequate compensation. The respective part of the model acknowledges that the skills obtained through certification don't necessarily lead to superior work or justify premium pay. It depends on the context if a specific set of skills is regarded as minimally required or high.

The link from highly skilled staff to higher productivity, level of service and market value of rendered services is generally accepted. But the ability of certification criteria to help develop such high skills is controversial. This might be caused by an ambiguity of the term 'high skills', which hasn't been considered during the design phase of the questionnaire. In the model high skills are contrasted to minimally required skills. In the questionnaire high skills might be regarded by some as higher level skills such as creativity.

Some messages of the group discussion contain hints that this was the case indeed. One message suggests that job skills comprise more than just the knowledge how to do a job. A comparison with a cook's skill to add some seasoning suggests that the profession is seen more as an art. Three participants point out that any formal qualification lack the needed expressiveness to determine high skills. A new IT qualification of the German chambers of industry and commerce is given as example where structures from other fields are tried to be forced onto the IT field without success.

The agreement on the organisational value of certification criteria for the development of personnel is high (90%), but twelve respondents of the overall sample indicate that they can't assess the statement. This might indicate that this use of certification criteria is not very common. The reviewed previous research and literature on organisational use of IT certification doesn't touch this use, but it was extracted from the section on standardisation of job tasks and skills (section 2.2.3).

The idea of standardised skills in general is also discussed in the group messages. The IT Infrastructure Library (ITIL) guideline, a global standard for IT service management (ITIL 2007b), and the corresponding international standard ISO/IEC 20000 (ITIL

2007a) are currently implemented in the companies of some participants. The main arguments follow those of the discourse about unique organisational competences in management strategy. One participant stresses that the conformance to the prescribed processes limits potential organisational competences and innovations. Two others argue that ITIL is just a collection of best practises with a focus on measurable metrics, which can be useful but can also be misused.

ITIL also includes certification components for employees, which covers the individual's knowledge about service management processes. As it seems to be a hot topic in organisations, some respondents might also have referred the survey to this particular certification. Two participants suggest to make an explicit distinction between ITIL and normal skills certifications. Actually, the survey explicitly focused on technology and product skills certifications, but it should have been emphasised more.

7.2.4. The Value of Certification Tests

Positive attitude respondents generally agree on the personal value of certification tests and test simulation. Tests serve as milestones for the learning process and are suitable for self-assessment of skills. Passed tests increase the confidence in own skills and test simulations can help identify gaps. The term 'test simulation' might have been unclear, as both statements using the term yielded over ten 'unclear / don't know' responses. The term refers to publicly available tests for self-assessment which are not conducted in a proctored environment and whose results are not attested.

On the organisational side, the use of tests is more controversial. As an ideal certification programme is assumed, the quality of tests shouldn't be the cause. Instead, reactions to tests in general as outlined in section 3.4.3 might be the reason. The notion of tests within the organisation is generally unpleasant, as the test outcome might threaten the employee's position and disturb the familiar system of rights and responsibilities (Colardyn and Bjørnåvold 2005, p. 41).

So, 67% of the respondents indicate, that certification tests are suitable for the assessment of informal learning and organisational training outcome. It is unclear why 12 respondents of the overall sample can't assess this statement. Only 56% agree to the statement, that test simulations help identify organisational training demand. However, 84% believe that tests help assure organisational skill levels. This doesn't fit with the

assumption of a general refusal of tests in the organisational context. Maybe, the latter statement is mainly referred to minimal skills.

The messages from the group discussion merely cover test in organisational context, but one comment illustrates the difficulty to assess skills. According to that, IT experience and skills are often revealed by the results of complex and long-term tasks, such as by the product's robustness, flexibility or ease of maintenance. This is beyond the capabilities of a limited test. Instead an innovative software project or a solved professional task should be presented. Given this argument, it is understandable, that for the organisational assessment of such skills the actual work is regarded rather than the outcome of a test.

The organisational use of certification tests might be limited to the encouragement of employees to assess themselves. Any organisational use of the test results as appraisal is disputable, though. So, only positive outcomes of certification tests should be considered. Two participants report that their companies financially support participation in training and certification. In one case professional development is even the employees' personal responsibility. Any qualification which is generally recognised is in the interest of employer and employee.

7.2.5. The Value of Certificates for Individuals and Organisations

The respondents of the positive attitude group confirm most of the statements related to the use of certificates. Certificates increase credibility, allow differentiation from competitors, document the professional development path and thus signal a commitment to the profession. Those externally directed use situations can be used by organisations as supplementary criteria for selection decisions.

In section 3.4.3 it was decided that the general use of certificates as job requirements is not feasible due to the voluntary nature of certification. Therefore, the model considers only a very specific use situation. It is stated that in an abundant labour market companies can use certificates as job requirement in order to optimise selection process efficiency, i.e. such companies could impose the costs for the selection test on the candidate due to their powerful position. Despite these constraints this use situation remains controversial. Only 55% agree to it and only 42% agree to the corresponding statement that the individual uses certificates to fulfil job requirements.

A discussion among the participants about the costs of certification reveals one possible reason. One member of this discussion worries about the burden for the job incumbents. He imagines that students and career changers are financially supported by the government and become certified after years of training but without experience, whereas job incumbents would struggle to finance the certification tests—particularly in the case of an extensive tests of an ideal certification. This argument has been countered by others who get financial support from their employer, but it remains valid considering the breadth of IT technologies and the wealth of corresponding available IT certification programmes. To get all potentially required certifications would be an impossible endeavour. The strength of certification to cover specific, immediately applicable technologies is also a weakness as it limits the possibility to require a certain programme. Certification costs and their adverse impact on applicants along with online skills tests as a potential solution were briefly covered in section 3.4.3.

7.2.6. Discussion of Certificates as Selection Criterion

The major points of criticism mentioned in the related section of the literature review also surfaced in the group discussion. Certification is seen as alibi for HR managers who can excuse wrong decisions with the fact that the required credential was present, or as a straw at which HR managers without IT skills can clutch. By some respondents HR managers are not trusted to understand the voluntary nature of certification and its implication that one can't conclude from a missing certificate to missing skills. One participant even gives an anecdotal evidence for such misuse of certificates. Despite being a security expert his application was rejected. From unofficial sources he learnt that the reasons were the lack of a certificate and of a certain catchword in the application. After staff members had enforced an interview, he was rejected due to over-qualification, even though the company claimed to be innovative and leading-edge. Consequently, he asks now: “who certifies the recruiters?”

Another participant presents statistical findings of his company's recruiters. They found no relation between the attained number of certifications and success in interviews, but a strong correlation between certifications listed in the curriculum vitae and the speed of applicant rejection. Such statements show that many applicants get certified in order to make up for missing experience. Based on observations like this, some HR managers might infer from the presence of certificates that the applicant has no experience. But

as outlined in section 3.2.2 this is obviously as inadequate as any conclusions from the lack of a certificate.

Extreme opinions deny the value of any formal training or qualification for selection decisions. Others report that their company regards an academic degree as an indicator, that the individual can complete a demanding task. They agree that such a degree has much higher requirements than a certification test. One participant remarks that any qualification shows that an applicant can understand instructions and jump through hoops in order to get the promised reward. He ironically adds that this is an important characteristic for many companies.

Telephone interviews and peer recommendations are discussed as alternatives to certifications, but drawbacks of such approaches are identified as well: Recommendation is limited by the trust chain it depends on and by interpersonal problems. And one participant questions if telephone interviews for pre-screening conducted by HR personnel are better than completely outsourcing the test to a certification body. It is recognised by another participant how certification aims to improve things, but he can't see if it works.

There are more similar positive views of certification and qualifications in general. For instance, certification is seen as a formal criterion among others like school qualifications and academic degrees. Two participants report that they trust HR managers to be aware of the individual value of relevant IT certifications and to be able to distinguish between them. Furthermore, a selection decision is usually based on an interview, recommendations, project portfolios and finally a probationary period, so considering certificates doesn't hurt the process. One participant emphasises that there are demanding certifications which he found to be a good predictor of skills for both experienced applicants and beginners. Another accepts certification as substitute for experience in the case of entry-level applicants from university.

Relativising the extreme positions, a participant clarifies that the respective job position determines the combination of selection criteria and their weights. An effective way to assess these criteria usually involves a tradeoff between costs, carefulness and speed. A certification can be one criterion with a certain weight in this mix if it is a predictor of the needed skills. With hundreds of applicants he also sees prescreening as an effective measure.

Section 3.4 presented [Litecky et al.'s \(2004\)](#) model of information systems hiring with its

filtration stage based on technical skills. Several responses suggest that in the present German IT labour market specific technical skills are not always that relevant. One large internet service provider is mentioned whose strategy is to hire IT professionals with certain basic skills and train all required skills on top of those. This approach is obviously not focused on the need for immediately applicable skills which certifications promise. Several reports about IT departments which mainly require an academic degree in science affirm this. But the one giving the example also concedes that it would be optimal to recruit candidates who are already equipped with specifically needed skills. The described practise might be the reaction to a labour market shortage.

This discussion reflects the controversial use of certification as requirement, the more accepted use as one criterion among others, but also some lack of acknowledgement of formal qualification. From the elements of the hiring mix identified by [Anderson *et al.* \(2005b\)](#), only experience seems to be recognised univocally by the participants, whereas education and certification is disputable.

7.2.7. The Value of Certificates for Organisations and Clients

According to the proposed model of certification value, the use situations of certificates for individuals and organisations is almost congruent with that of organisations and clients. Consequently, the corresponding statements in the questionnaire are essentially the same. Based on the quantitative results the use among organisations and clients seems to be more agreeable, though. 70% of the positive attitude group's respondents agree that clients can demand certificates as requirement for placing an order and 69% agree that organisations use certificates to fulfil such requirements.

Instead of a heated debate as in the previous section, the discussion only yielded some practical examples for such a use. Two participants report that their employers pay for the certification of their staff, as clients or vendors require them. And one participant states that certifications become part of a person specification for a job if authorities or vendors require it.

The individuals might see mainly the organisations carry the burden of dealing with the certification demands of the client, i.e. employees expect that time and expenses for training and certification are provided by their organisations. It is notable that such requirements can affect the individual eventually. For instance, organisations could

try to recruit employees who already possess the certificates required by the client, as demonstrated by the example above.

7.3. Attitude Towards Certification

The strong influence of attitude towards certification on the acceptance of an ideal certification programme is unexpected. It was anticipated that any potential negative attitude was mainly based on the deficiencies of actual certification programmes and that the consideration of an ideal certification programme would allow an unaffected assessment of individual use situations. However, respondents from the negative attitude group tend to disagree significantly more often to all certification related statements than those of the positive attitude group.

Even item 1, which states that certification criteria help with the systematic development of minimally required skills, is accepted by only 41%. Given the assumption that the ideal programme's certification criteria are clearly proven to be relevant for a job role, this statement was expected to receive univocal agreement. After all, the availability of additional resources for skill development doesn't come with any risks or inconveniences. Such publicly available criteria can be seen as a collection of best practises or as a curriculum for self-study. Their use is not linked to the need to take a test or attain a certificate.

On the other hand, all statements which are not directly related to certification are accepted. For instance, 85% agree to item 7, which states that highly skilled employees increase the market value of the offered service.

Negative views of actual certification programmes as summarised in section 7.2.2 have been foreseen. But they can't explain the quantitative responses from the negative attitude members. The reactions in the electronic discussions help reveal some potential reasons.

First of all, there seems to be a strong aversion to the concept of certification in general. By some participants certification is seen as just a management fashion adopted from the American culture without questioning if it really fits in the German system. One participant explicitly states that the German vocational education and training system doesn't require additional private-sector solutions.

The reactions to the survey also reflect such negative attitudes. As the survey assumes an ideal certification and proposes various use situations, some certification averse participants were obviously annoyed about the survey itself. Two participants criticised that the questionnaire was much too positive about certification and full of suggestive statements. Another one worried that the result of a general agreement to the value of an ideal certification programme could be misused to endorse the use of actual certification in organisations.

Two survey respondents report that they discontinued the questionnaire for these reasons. The author assured that the results wouldn't be published without this important context, of course, and explained that only completed questionnaires could be analysed. Thereupon both respondents reported that they had completed the questionnaire for the sake of the research project. Such feedback leaves the impression that some respondents were eager to participate in the survey, but were annoyed when they realised that they couldn't communicate their main concerns via the questionnaire's response categories.

Another reason for the weak acceptance of the proposed use situations might be the refusal of the given assumptions. One participant states that he can't imagine an ideal certification programme. Another indicates that he can imagine one, but that he doesn't believe in it, as the process would be too costly and time-consuming and adequate assessors wouldn't be available. He suggests a feasibility study of a ideal certification programme which should also be recognised by those who are to be certified.

One collected message suggests that the idea of an ideal certification programme wasn't clear to all. The provided definitions and explanations might have been skipped or mistaken. A discussion about the German term 'Kompetenz' which has been used as translation for 'skills' showed how ambiguous those essential concepts are.

Finally, the attitude against tests and the preference for real experience and real projects as covered in prior sections surely contributed to the general disagreement to the value of certification within the negative attitude group.

Besides all the critique there have also been some positive remarks. One participant indicates that he is quite content with the questionnaire. Presumably, he is a member of the positive attitude group. Furthermore, the participants agreed that the result of the research project shall be published as an article in the magazine for association members.

7.4. Main Issues Revealed by the Research and its Limitations

The perceptions of the positive attitude group showed which use situations are particularly controversial even in the case of an ideal certification programme. In accordance with the findings in the literature, requiring applicants to get certified was found to be difficult due to probable aversive reactions. For the same reasons, the organisational use of certification tests might be felt to be inadequate. The value of certification to develop skills beyond the minimally required ones couldn't be confirmed, as the term 'high skills' might have been mistaken by the respondents for higher level skills such as creativity. All other use situations of the model were generally accepted by the group, which consisted of only 34 respondents, though.

However, none of those confirmed use situations can be generalised to a recommended use in organisations. First, the perceptions are based on an ideal certification programme and an actual programme might be accepted much less. Furthermore, the survey respondents are self-selected from a purposive sample of IT professionals, which is certainly not representative of other populations of IT professionals. Perception-based research is vulnerable to limitations anyway. Finally, the majority of respondents belonged to the negative attitude group, which tended to refuse the use of certification in general.

For most members of the negative attitude group the deficiencies of current certification programmes were not the only reason for their adverseness. Therefore, the theoretical framework based on an ideal certification programme as outline in section 5.4 proved to be not adequate for them. The electronic group discussions revealed various reasons for their position against the concept of certification. It also demonstrated how IT professionals can become emotional over the topic IT skills certification.

The chosen group of experienced IT professionals was certainly more critical than a group of individuals who have just entered the job market. The unique German vocational education and training system might also influence how certification is perceived. In other countries or cultures, where initial vocational education is not regulated by the state but delivered by private-sector training, IT certification might be more accepted. Nevertheless, it can be argued that the critical views captured by the present study might be valuable for all certification-related works, as such views need to be anticipated in order to manage certification use in a generally accepted way.

8. Conclusions and Critical Reflection

The aim of this research was to examine the value of IT skills certification in selection processes and professional development. For this purpose, certification's characteristics, potential use situations and value destroyers have been systematically examined using previous research and related literature. Surprisingly, the amount of available research was very limited despite the practical relevance of certification in today's IT field. This affirmed the commitment to this research project, as the need for further research was even more pressing.

The author realised, though, that a less rigorously researched field is difficult to grasp. Consequently, the scope of the consulted literature might have been too broad. Even some parts of the literature review might not be directly related to the research question, but they were found to be important for the understanding of certification as concept. Most articles dealing with issues of educational measurement have been dropped for the benefit of this work's focus on managerial matters.

Founded on the critique of the available literature, a model of certification value was elaborated. The visual representation of the interdependencies between individuals, organisations and clients and their received value in the respective use situation was deemed to be already a valuable preliminary result. While the author acknowledges that the model might be too simplistic or even plainly wrong in some respect, it might be a start which makes further discussions about certification value easier. In this regard a large part of the research aim had already been met.

An empirical study needed to be conducted in order to test the proposed model and to produce authoritative findings. For its planning, a number of important decisions had to be taken. However, the time-constraints of a part-time student research project almost dictated the research design to be a cross-sectional survey based on perceptions of IT professionals. The decision to refer in the survey to an ideal certification programme

proved to be an effective way to focus on issues other than the often discussed deficiencies of certification.

The resulting research framework and the corresponding questionnaire were only briefly discussed and pilot-tested with a small group of IT professionals. At this point a much more intense discussion with a panel of IT professionals would have been more appropriate to prepare the survey. This could have anticipated some of the later found issues and both framework and questionnaire could have been refined accordingly. Nevertheless, the framework yielded interesting findings, so it is still found to be appropriate for the purpose of testing the model. Specifically, the strong influence of the moderator ‘attitude towards certification’ on the acceptance of the proposed use situations revealed a dimension which had been overlooked before.

The qualitative data captured from the electronic group discussions were regarded as sufficient to triangulate the quantitative data collected by the online-questionnaire. Using the web-based data collection method was found to be much more efficient and less error-prone than paper-based questionnaires. Some technical difficulties with the survey service came as a surprise, but there was only a minor or even no impact on the survey results. If applicable, this will also be the method of choice for future projects.

Several weaknesses of the newly created questionnaire were revealed during the analysis of the data. Ambiguous words caused confusion among some respondents, the provided definitions and explanations were only browsed by some others, and among the proposed statements some were unclear. As the assumption of an ideal certification was essential for the survey, the corresponding explanations were critical. The consultation of literature specialised in questionnaire design would have been helpful. As the questionnaire was created in German, the translation introduced another level of potential ambiguity, despite the carefully defined terms in the literature review. It might have been better, if a concrete close-to-ideal certification programme had been presented as example. Then, the questionnaire wouldn’t have depended on abstract definitions and the use situations would have been more concrete.

Despite these weaknesses, the statistical analysis of the quantitative data provided expressive findings. Based on the responses of the positive attitude group most of the proposed model’s elements could be confirmed. The particularly controversial use situations involved certification as job requirement or the organisational use of certification tests both of which had also been identified as such in the literature review.

The qualitative data from the electronic discussions revealed that the deficiencies of current certification programmes are not the only reason for the respondents' adverse-ness to certification. It's the concept of certification in general which is being refused for various reasons. Before, the author was sure to have succeeded in minimising bias and personal value judgements, but from this point on he gradually realised that his own view of certification has limited the research framework. First, he couldn't understand why some respondents didn't recognise the obvious value of certification in certain use situations. And then, he had difficulties to accept an adverseness to certification as concept. After all, a certification is just a more specialised vocational qualification. However, some respondents also questioned the relevance of other vocational qualifications or even qualifications in general.

8.1. Future Research

Such strong feelings against certification need to be acknowledged by further research and by practitioners in organisations. In the literature review it was shown that certification is already used in organisations and might even grow in relevance, as initial vocational education no longer suffice. There are many who can afford to be against certification, but there are also many who rely on it. One participant of the electronic discussion, for instance, didn't see any alternative to certification unless one has the time and money to go back to university.

It might be promising to enquire the possibilities how organisations could consider both groups with positive and negative attitude towards certification. A goal should be that the use of certification is accepted by all those who are expected to get certified. Codes of conduct and ethics or guidelines for organisations could make the use of certification more transparent and comprehensible for applicants and employees. It would be interesting how this would affect the acceptance of certification.

Further research on the individual certification components might also be necessary. What is the value of standardised IT skills? Could costly skills test be replaced by inexpensive online tests, given that recruiters can demand a proctored retest? Is an ideal certification programme feasible? Maybe certification just needs a different name and a focus on the less controversial certification criteria to increase its acceptance among IT professionals?

As an obvious next step, though, the model and questionnaire of the present study could be refined and replicated. Examining the organisational use situations of certification in their real life context using a longitudinal study might also be feasible given enough time and resources.

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A. Questionnaire - German Original

Befragung zum Nutzen von IT-Personalertifizierungen

1. Wichtige Informationen zur Befragung

Vielen Dank für Ihre Bereitschaft zur Teilnahme an dieser Online-Befragung.

Das Ausfüllen des Fragebogens wird ca. 8 Minuten Ihrer Zeit in Anspruch nehmen. Dies wird für Sie hoffentlich durch die im Mai auf dieser Mailingliste bereitgestellten Ergebnisse der Studie wettgemacht.

Hintergrund der Studie

Auf europäischer und nationaler Ebene begegnet man den Herausforderungen des lebensbegleitenden Lernens mit der Forderung nach transparenten, durchlässigen und kompetenzorientierten Qualifikationen [1]. In der schnelllebigen IT-Welt hat Weiterbildung einen besonders hohen Stellenwert. Eine hier gebräuchliche Form der Qualifikation sind Produkt- oder Technologie-spezifische IT-Zertifizierungen. Die Diskussion um deren Nutzen vermengt üblicherweise die unterschiedliche Qualität der am Markt befindlichen Zertifizierungsprogramme und die vielfältigen Einsatzmöglichkeiten. Infolgedessen gelten IT-Zertifizierungen als eher umstritten. Die weitgehende Anerkennung des Konzeptes SZertifizierung ist jedoch wesentlich für dessen Rolle als Hilfsmittel zur Personalentwicklung und in Auswahlverfahren.

Im Rahmen einer Studie sollen nun verschiedene Nutzungsmöglichkeiten aus Sicht der Beteiligten und losgelöst von konkreten Zertifizierungsprogrammen und deren Unzulänglichkeiten untersucht werden. Die Ergebnisse der Studie können als Orientierungshilfe im betrieblichen und persönlichen Einsatz von IT-Zertifizierungen dienen. Weiterhin eignen sich die identifizierten potenziellen Stärken als Grundlage für die Erarbeitung von Anforderungen an konkrete Zertifizierungsprogramme.

Die Studie ist Teil einer Masterarbeit für den Studiengang Management der University of Glamorgan Business School. Sie verfolgt keinerlei kommerzielle Interessen, sondern möchte ausschließlich zur Grundlagenforschung beitragen.

Datenschutz

Die gesammelten Daten werden streng vertraulich behandelt. Die vom Umfragesystem protokollierten IP-Adressen werden vor der Auswertung gelöscht. Die Auswertung erfolgt somit auf vollständig anonymisierten Daten. Ergebnisse werden nur in kumulierter Form veröffentlicht.

Kontaktinformationen

Noch offen gebliebene Fragen zum Hintergrund der Studie beantworte ich gerne per E-Mail: (E-Mail Adresse)

[1]

Auf dem Weg zu einem Nationalen Qualifikationsrahmen

<URL:<http://www.bibb.de/de/25722.htm>>

2. Generelle Einstellung gegenüber IT-Zertifizierung

Meine generelle Einstellung gegenüber IT-Zertifizierung aufgrund von mir bekannten Zertifizierungsprogrammen ist:

(Auswahlliste)

„eher positiv“ „eher negativ“

3. Definitionen und Erläuterungen

Die untenstehenden Definitionen und Erläuterungen sollen ein gemeinsames Verständnis des untersuchten Konzepts „Zertifizierung“ sicherstellen.

Zertifizierung ist der freiwillige Prozess, bei dem eine regierungsunabhängige Stelle einer Person einen Leistungsnachweis (Zertifikat) ausstellt, nachdem deren Fachkompetenzen anhand von frei verfügbaren, vorbestimmten und standardisierten Kriterien geprüft wurden. **Fachkompetenzen** sind hierbei ausdrücklich tätigkeitsorientiert und gehen wesentlich über bloßes Wissen hinaus.

In dieser Befragung soll der Nutzen idealer IT-Zertifizierungsprogramme untersucht werden.

Als ideal gilt hierbei, wenn der Nachweis für

- die Relevanz der Zertifizierungskriterien für einen Aufgabenbereich,
- die Zuverlässigkeit und Gültigkeit der Durchführung und Bewertung der Zertifizierungsprüfung, und

- die Unbefangenheit der Zertifizierungsstelle

Ihren Ansprüchen und derer internationaler Standards [1] gerecht wird.

Die nachfolgenden Fragen beziehen sich auf den aus Ihrer Sicht empfundenen Nutzen der verschiedenen Zertifizierungskomponenten (Kriterien, Prüfung, Zertifikat) für die jeweiligen Nutznießer (Person, Betrieb, Kunde).

[1]

z.B. ISO/IEC 17024

[URL:http://www.love-it-plus.de/service/glossar/#c317](http://www.love-it-plus.de/service/glossar/#c317)

4. Der Nutzen von IT-Zertifizierungskriterien und standardisierten Kompetenzen

Im Mittelpunkt steht der Nutzen von IT-Zertifizierungskriterien und standardisierten Kompetenzen.

Gegeben ist ein ideales IT-Zertifizierungsprogramm.

Zu welchem Grad stimmen Sie der jeweiligen Aussage zu?

(pro Aussage stehen 5 Antwortkategorien zur Auswahl: „stimme stark zu“, „stimme zu“, „lehne ab“, „lehne stark ab“; etwas abgesetzt: „unklar / weiß nicht“)

Persönlicher Nutzen:

- 1** Zertifizierungskriterien helfen beim systematischen Erwerb von Kompetenzen, um Mindestanforderungen zu entsprechen.
- 2** Zertifizierungskriterien helfen bei der systematischen Entwicklung von hohen Kompetenzen.
- 3** Hohe Kompetenzen erhöhen den Marktwert einer Fachkraft.

Betrieblicher Nutzen:

- 4** Zertifizierungskriterien und deren standardisierte Tätigkeitsbeschreibungen unterstützen die betriebliche Personalentwicklung.
- 5** Mitarbeiter mit hohen Kompetenzen sind produktiver.
- 6** Mitarbeiter mit hohen Kompetenzen leisten qualitativ bessere Arbeit.
- 7** Hohe Kompetenzen des Personals erhöhen den Marktwert der angebotenen Dienstleistung.

5. Der Nutzen von IT-Zertifizierungsprüfungen

Im Mittelpunkt steht der Nutzen von IT-Zertifizierungsprüfungen.

Gegeben ist ein ideales IT-Zertifizierungsprogramm.

Zu welchem Grad stimmen Sie der jeweiligen Aussage zu?

Persönlicher Nutzen:

- 8** Zertifizierungsprüfungen eignen sich als Meilenstein bei Lernprozessen.
- 9** Zertifizierungsprüfungen eignen sich für die Kontrolle der eigenen Kompetenzen.
- 10** Bestandene Zertifizierungsprüfungen steigern das Vertrauen in die eigenen Kompetenzen.
- 11** Prüfungssimulationen zeigen Kompetenz-Lücken auf.

Betrieblicher Nutzen:

- 12** Zertifizierungsprüfungen eignen sich für die betriebliche Kontrolle von informellen Lernprozessen und betrieblicher Weiterbildung.
- 13** Zertifizierungsprüfungen helfen bei der Sicherstellung betrieblicher Kompetenzstandards.
- 14** Prüfungssimulationen helfen bei der Bedarfsermittlung von betrieblichen Weiterbildungsmaßnahmen.

6. Der Nutzen von IT-Zertifikaten für Person und Betrieb

Im Mittelpunkt steht der Nutzen von IT-Zertifikaten für Person und Betrieb.

Gegeben ist ein ideales IT-Zertifizierungsprogramm.

Zu welchem Grad stimmen Sie der jeweiligen Aussage zu?

Persönlicher Nutzen:

- 15** Zertifikate erhöhen die Glaubwürdigkeit der individuellen Fachkompetenz.
- 16** Zertifikate ermöglichen eine Abgrenzung gegenüber Mitbewerbern.
- 17** Zertifikate dokumentieren den Weg der beruflichen Weiterbildung.
- 18** Kontinuierliche Weiterbildung signalisiert ein hohes berufliches Engagement.
- 19** Zertifikate dienen zur Erfüllung von Mindestvoraussetzungen für eine Arbeitsstelle.

Betrieblicher Nutzen:

- 20** Zertifikate dienen als ergänzende Kriterien in der betrieblichen Personalauswahl.

- 21** Bei Fachkräfteüberschuss können Betriebe Zertifikate als Mindestvoraussetzung für eine Bewerbung fordern und damit Personalbeschaffungsprozesse optimieren.

7. Der Nutzen von IT-Zertifikaten für Betrieb und Kunde

Im Mittelpunkt steht der Nutzen von IT-Zertifikaten für Betrieb und Kunde.

Gegeben ist ein ideales IT-Zertifizierungsprogramm.

Zu welchem Grad stimmen Sie der jeweiligen Aussage zu?

Betrieblicher Nutzen:

- 22** Zertifikate erhöhen die Glaubwürdigkeit der Personal-Fachkompetenz.
- 23** Zertifikate ermöglichen eine Abgrenzung gegenüber Mitbewerbern.
- 24** Zertifikate dokumentieren betriebliche Kompetenzstandards.
- 25** Hohe betriebliche Kompetenzstandards signalisieren eine engagierte Personalentwicklung.
- 26** Zertifikate dienen zur Erfüllung von Mindestvoraussetzungen für eine Auftragserteilung.

Kundennutzen:

- 27** Zertifikate dienen als ergänzende Kriterien in der Auswahl eines Dienstleisters.
- 28** Kunden können Zertifikate als Mindestvoraussetzung für eine Auftragserteilung fordern.

8. Angaben zur Person

Alter: „unter 20“ „20-29“ „30-39“ „40-49“ „50-60“ „über 60“

Geschlecht: „männlich“ „weiblich“

Berufserfahrung im IT-Bereich in Jahren: „weniger als 5“ „5-9“ „10-20“ „mehr als 20“

Firmengröße (Anzahl Vollzeit-Angestellter): „weniger als 10“ „10-99“ „100-499“ „500-999“ „1000-10000“ „mehr als 10000“

Beteiligt an Personalentscheidungen: „ja“ „nein“

Anzahl erworbener IT-Zertifizierungen: „keine“ „1“ „2“ „3 oder mehr“

9. Vielen Dank

Vielen Dank für Ihre Zeit und Ihre Bereitschaft dieses Forschungsprojekt zu unterstützen.

Das Gesamtergebnis der Studie wird im Mai 2007 über die Mailingliste zugänglich gemacht werden.

B. Questionnaire - Translated

Survey about the Value of IT Skills Certification

1. Important Information about the Survey

Thank you very much for your participation in this online-survey.

The questionnaire should take you about 8 minutes to complete. Hopefully, you will see the resulting study as a reward for your efforts. It will be provided through you mailing list in May.

Background on the study

On the European and national level the challenges of life-long learning are encountered by the demand for transparent, permeable and skill oriented qualifications [1]. In the fast-paced IT field professional development is of particular importance. One commonly used type of qualification are product- and technology-specific IT certifications. The discussion about their value usually blends the variable quality of actual certification programmes and their manifold use situations. Consequently, IT certifications are seen as quite controversial. However, a large degree of recognition of the concept “certification” is essential for its role as instrument for professional development and selection procedures.

A study shall now examine the different use possibilities from the perspective of the concerned parties without being influenced by concrete certification programmes and their deficiencies. The results of the study can serve as guidance for the organisational and personal use of IT certifications. Furthermore, the identified potential strengths are suited as foundation for requirements concerning concrete certification programmes.

The study is part of a master thesis for a management degree at the University of Glamorgan Business School. It doesn't pursue any commercial interests, but wants to contribute to fundamental research, exclusively.

Data Privacy

The collected data will be treated in the strictest of confidence. The IP addresses recorded by the survey system will be deleted prior to their analysis. The analysis will be conducted on completely anonymised data. Only aggregated data will be published.

Contact Information

I look forward to answer any further open questions about the background of the study via E-Mail: (e-mail address)

[1]

On the way to a national qualification framework

<URL:<http://www.bibb.de/de/25722.htm>>

2. General Attitude towards IT Certification

Based on the certification programmes I know, my general attitude towards IT certification is:

(list box)

“rather positive” “rather negative”

3. Definitions and explanations

The definitions and explanations below shall ensure a shared understanding of the examined concept “certification”.

Certification is the voluntary process by which a non-governmental entity awards a record of achievement (certificate) to an individual whose job skills have been tested against a set of publicly available, predetermined, and standardised criteria. Hereby, **job skills** are explicitly task-oriented and go beyond mere knowledge.

In this survey the value of ideal IT certification programmes shall be examined.

Ideal means, that the evidence for

- the relevance of certification criteria for a job role,
- the reliability and validity of test use and interpretation, and
- the impartiality of the certification body

meets the demands of you and those of international standards [1].

The following items refer to your perspective of the value of various certification components (criteria, test, certificate) for the respective users (individual, organisation, client).

[1]

z.B. ISO/IEC 17024

<URL:<http://www.love-it-plus.de/service/glossar/#c317>>

4. The Value of IT Certification Criteria and Standardised Competences

The focal points are the value of IT certification criteria and standardised competences. Provided is an ideal IT certification programme.

To what extent do you agree with the statement?

(5 response categories per statement are available: “strongly agree”, “agree”, “disagree”, “strongly disagree”; separated slightly: “unclear / don’t know”)

Personal Value:

- 1** Certification criteria help with the systematic development of minimally required skills
- 2** Certification criteria help with the systematic development of high skills
- 3** High skills increase the market value of a professional.

Organisational Value:

- 4** Certification criteria and their standardised job task descriptions support the personnel development in organisations.
- 5** Highly skilled employees are more productive.
- 6** Highly skilled employees provide a higher level of service.
- 7** Highly skilled employees increase the market value of the offered service.

5. The Value of IT Certification Tests

The focal point is the value of IT certification tests.

Provided is an ideal IT certification programme.

To what extent do you agree with the statement?

Personal Value:

8 Certification tests are suitable as milestones for learning processes.

9 Certification tests are suitable for the self-assessment of skills.

10 Passed certification tests increase the confidence in own skills.

11 Test simulations help identify gaps.

Organisational Value:

12 Certification tests are suitable for the assessment of informal learning and organisational training outcome.

13 Certification tests help assure organisational skill levels.

14 Test simulations help identify organisational training demand.

6. The Value of IT Certificates for Individual and Organisation

The focal point is the value of IT certificates for individual and organisation.

Provided is an ideal IT certification programme.

To what extent do you agree with the statement?

Personal Value:

15 Certificates increase the credibility of an individual's skills.

16 Certificates allow differentiation from competitors.

17 Certificates document the path of professional development.

18 Continuing professional development signals a high commitment to profession.

19 Certificates fulfil job requirements.

Organisational Value:

20 Certificates serve as supplementary criteria for selection decisions.

21 In an abundant labour market companies can use certificates as job requirement in order to optimise selection process efficiency.

7. The Value of IT Certificates for Organisation and Client

The focal point is the value of IT certificates for organisation and client.

Provided is an ideal IT certification programme.

To what extent do you agree with the statement?

Organisational Value:

22 Certificates increase the credibility of staff skills.

23 Certificates allow differentiation from competitors.

24 Certificates document organisational skill standards.

25 High organisational skill standards signal high commitment to staff development.

26 Certificates fulfil requirements for an order.

Client Value:

27 Certificates serve as supplementary criteria for selection of a service provider.

28 Clients can demand certificates as requirement for placing an order.

8. Demographics

Age group: "under 20" "20-29" "30-39" "40-49" "50-60" "over 60"

Gender: "male" "female"

Professional IT experience in years: "less than 5" "5-9" "10-20" "more than 20"

Company size (number of full-time employees): "less than 10" "10-99" "100-499" "500-999" "1000-10000" "more than 10000"

Participate in personnel decisions: "yes" "no"

Number of held IT certifications: "none" "1" "2" "3 or more"

9. Thank You Very Much

Thank you very much for your time and your support of this research project.

The completed study will be made available through the mailing list in May 2007.

C. GNU R Commands Used for Statistical Analysis

The statistical computing language and environment GNU R Version 2.3.1 and its basic-statistics GUI (graphical user interface) Rcmdr Version 1.1 were used for all statistical analysis work.

```
library(Hmisc);
# car needs to be loaded after Hmisc
library(car);
library(Rcmdr);

d <- read.table("data.csv", header=TRUE, sep="," ,
  na.strings="NA", dec=".", strip.white=TRUE);

# collapse number of certificates to moderator Certified and
# convert to factor
d$Certified <- recode(d$certificates, 'c(1) = "no";
  c(2,3,4) = "yes";', as.factor.result=TRUE);

# convert other moderators to factor
d$Attitude <- factor(d$Attitude, levels=c(1:2),
  labels=c('positive', 'negative'));
d$HrResp <- factor(d$HrResp, levels=c(1:2),
  labels=c('yes', 'no'));

# convert demographic items to factor
d$certificates <- factor(d$certificates, levels=c(1:4),
  labels=c('none', 'one', 'two', 'three+'));
d$age <- factor(d$age, levels=c(1:6),
  labels=c('under20', '20-29', '30-39', '40-49', '50-60', 'over 60'));
d$gender <- factor(d$gender, levels=c(1:2),
  labels=c('male', 'female'));
d$experience <- factor(d$experience, levels=c(1:4),
  labels=c('less than 5', '5-9', '10-20', 'more than 20'));
```

C. GNU R Commands Used for Statistical Analysis

```
d$compsize <- factor(d$compsize, levels=c(1:6),
  labels=c('less than 10','10-99','100-499','500-999',
  '1000-10000','more than 10000'));

# create copy with model items converted to factor
df <- d;
for (i in 1:28) df[[i]] <- factor(df[[i]], levels=c(1,2,3,4),
  labels=c('strongly agree','agree','disagree',
  'strongly disagree'));

# create copy with model items collapsed to binary factor
dc <- d;
for (i in 1:28) dc[[i]] <- recode(dc[[i]], 'c(1,2) = "agree";
  c(3,4) = "disagree"; ', as.factor.result=TRUE);

# summarise demographic data
describe(d[29:36])

# summarise collapsed model items
describe(dc[1:28])

# summarise collapsed model considering attitude
describe(dc[dc$Attitude=="positive" , 1:28])
describe(dc[dc$Attitude=="negative" , 1:28])

# summarise detailed model items
describe(df[1:28])

# summarise detailed model items considering moderators
describe(df[df$Attitude=="positive" , 1:28])
describe(df[df$Attitude=="negative" , 1:28])
describe(df[df$Certified=="yes" , 1:28])
describe(df[df$Certified=="no" , 1:28])
describe(df[df$HrResp=="yes" , 1:28])
describe(df[df$HrResp=="no" , 1:28])

# check relation of demographic data
describe(dc[dc$Attitude=="positive" , 29:36])
describe(dc[dc$Attitude=="negative" , 29:36])

# Pearson's Chi-squared test with Yates' continuity correction
# for item 1 and moderator Attitude
.Table <- xtabs(~Attitude+dc[[1]], data=dc)
.Table
```

C. GNU R Commands Used for Statistical Analysis

```
.Test <- chisq.test(.Table, correct = TRUE)
.Test
remove(.Test)
remove(.Table)

# Wilcoxon rank sum test with continuity correction
# for item 1 and moderator Attitude
wilcox.test(d[[1]] ~ Attitude, alternative="two.sided", data=d)
```

D. Detailed Statistics

Table D.1.: Moderator – Certification Status

Item	Certificants		Non-Certificants		χ^2	p	Wp	
	agree	disagree	agree	disagree				
1	43	20	10	13	3.3886	0.0657	0.0833	
2	19	42	8	19	0.0117	0.9138	0.5357	
3	62	3	25	2	0.0011	0.9737	0.8847	
4	34	23	9	14	2.0114	0.1561	0.1980	
5	41	19	23	2	4.1175	0.0424	0.0045	*
6	49	11	25	1	2.0790	0.1493	0.1644	
7	50	9	26	1	1.4122	0.2347	0.0583	
8	47	18	16	10	0.5688	0.4508	0.3174	
9	40	24	15	12	0.1476	0.7008	0.5283	
10	45	16	13	11	2.2164	0.1366	0.0868	
11	35	22	16	8	0.0384	0.8446	0.7885	
12	30	26	4	19	7.2922	0.0069	0.0069	*
13	33	29	6	19	5.0279	0.0249	0.0239	*
14	29	25	9	14	0.8495	0.3567	0.2711	
15	37	23	10	15	2.5321	0.1116	0.1835	
16	44	13	16	10	1.4728	0.2249	0.1488	
17	41	17	16	9	0.1190	0.7302	0.2751	
18	48	15	20	4	0.1853	0.6669	0.1427	
19	15	46	6	20	0.0150	0.9024	0.6182	
20	43	20	13	10	0.5698	0.4503	0.2394	
21	24	38	6	20	1.3574	0.2440	0.0976	
22	34	27	12	14	0.3424	0.5584	0.9152	
23	43	18	14	11	1.0809	0.2985	0.1713	
24	37	27	13	13	0.1954	0.6585	0.8864	
25	38	20	20	5	1.1208	0.2897	0.2620	
26	27	31	11	15	0.0154	0.9012	0.5990	
27	45	17	11	13	4.3355	0.0373	0.0337	*
28	38	24	10	12	1.0790	0.2989	0.1127	

p – p-value for χ^2 ; Wp – p-value for Wilcoxon rank sum test

* – statistically significant difference in responses; probability of $H_0 < 0.05$
 H_0 : the probability distributions of the two samples are equal

Table D.2.: Moderator – Personnel Responsibility

Item	Personnel Resp.		No Personnel Resp.		χ^2	p	Wp
	agree	disagree	agree	disagree			
1	26	16	27	17	0.0290	0.8648	0.6026
2	15	31	12	30	0.0320	0.8581	0.9611
3	42	5	45	0	3.2040	0.0735	0.6003
4	21	21	22	16	0.2330	0.6293	0.4708
5	33	9	31	12	0.1944	0.6593	0.4074
6	38	5	36	7	0.0968	0.7556	0.7468
7	36	9	40	1	4.8429	0.0278	0.0298 *
8	31	16	32	12	0.2228	0.6370	0.6887
9	29	17	26	19	0.0895	0.7648	1.0000
10	29	15	29	12	0.0596	0.8072	0.5547
11	28	15	23	15	0.0386	0.8443	0.7319
12	15	24	19	21	0.3410	0.5593	0.8086
13	21	25	18	23	0.0027	0.9584	0.5367
14	20	19	18	20	0.0133	0.9080	0.9420
15	25	18	22	20	0.0997	0.7522	0.8386
16	30	13	30	10	0.0823	0.7743	0.9877
17	27	15	30	11	0.4043	0.5249	0.9270
18	34	11	34	8	0.1219	0.7270	0.9600
19	13	30	8	36	1.1293	0.2879	0.2997
20	26	20	30	10	2.4541	0.1172	0.1202
21	14	31	16	27	0.1431	0.7052	0.7310
22	24	22	22	19	0.0059	0.9389	0.9480
23	29	16	28	13	0.0221	0.8818	0.6236
24	24	23	26	17	0.4681	0.4938	0.2432
25	30	12	28	13	0.0052	0.9425	0.6883
26	19	24	19	22	0.0004	0.9833	0.8637
27	26	19	30	11	1.6115	0.2043	0.2215
28	24	18	24	18	0.0486	0.8255	0.7925

p – p-value for χ^2 ; Wp – p-value for Wilcoxon rank sum test

* – statistically significant difference in responses; probability of $H_0 < 0.05$

H_0 : the probability distributions of the two samples are equal

Table D.3.: Collapsed Results of Positive Attitude Group

Item	n	NA	Frequency		Percentage	
			agree	disagree	agree	disagree
1	32	2	31	1	97%	3%
2	31	3	18	13	58%	42%
3	34	0	34	0	100%	0%
4	30	4	27	3	90%	10%
5	32	2	25	7	78%	22%
6	32	2	31	1	97%	3%
7	32	2	30	2	94%	6%
8	34	0	31	3	91%	9%
9	34	0	29	5	85%	15%
10	32	2	27	5	84%	16%
11	29	5	23	6	79%	21%
12	27	7	18	9	67%	33%
13	31	3	26	5	84%	16%
14	25	9	14	11	56%	44%
15	30	4	25	5	83%	17%
16	30	4	27	3	90%	10%
17	31	3	28	3	90%	10%
18	34	0	31	3	91%	9%
19	31	3	13	18	42%	58%
20	33	1	28	5	85%	15%
21	31	3	17	14	55%	45%
22	30	4	23	7	77%	23%
23	30	4	25	5	83%	17%
24	33	1	30	3	91%	9%
25	29	5	20	9	69%	31%
26	29	5	20	9	69%	31%
27	31	3	26	5	84%	16%
28	33	1	23	10	70%	30%

Table D.4.: Collapsed Results of Negative Attitude Group

Item	n	NA	Frequency		Percentage	
			agree	disagree	agree	disagree
1	54	4	22	32	41%	59%
2	57	1	9	48	16%	84%
3	58	0	53	5	91%	9%
4	50	8	16	34	32%	68%
5	53	5	39	14	74%	26%
6	54	4	43	11	80%	20%
7	54	4	46	8	85%	15%
8	57	1	32	25	56%	44%
9	57	1	26	31	46%	54%
10	53	5	31	22	58%	42%
11	52	6	28	24	54%	46%
12	52	6	16	36	31%	69%
13	56	2	13	43	23%	77%
14	52	6	24	28	46%	54%
15	55	3	22	33	40%	60%
16	53	5	33	20	62%	38%
17	52	6	29	23	56%	44%
18	53	5	37	16	70%	30%
19	56	2	8	48	14%	86%
20	53	5	28	25	53%	47%
21	57	1	13	44	23%	77%
22	57	1	23	34	40%	60%
23	56	2	32	24	57%	43%
24	57	1	20	37	35%	65%
25	54	4	38	16	70%	30%
26	55	3	18	37	33%	67%
27	55	3	30	25	55%	45%
28	51	7	25	26	49%	51%

Table D.5.: Positive Attitude Group: Moderator – Certification Status

Item	Certificants		Non-Certificants		χ^2	p	Wp	
	agree	disagree	agree	disagree				
1	27	0	4	1	0.9252	0.3361	0.4929	
2	13	12	5	1	0.8763	0.3492	0.3052	
3	28	0	6	0	14.2353	0.0001	0.5814	*
4	23	2	4	1	0.0000	1.0000	0.3035	
5	19	7	6	0	0.7924	0.3734	0.0351	*
6	25	1	6	0	0.6617	0.4160	0.2148	
7	24	2	6	0	0.0547	0.8150	0.0701	
8	25	3	6	0	0.0022	0.9628	0.4421	
9	23	5	6	0	0.2359	0.6272	0.5863	
10	21	5	6	0	0.2978	0.5853	0.6952	
11	19	6	4	0	0.1897	0.6632	0.8083	
12	16	7	2	2	0.0367	0.8481	0.4430	
13	23	4	3	1	0.0447	0.8325	0.6075	
14	12	10	2	1	0.0498	0.8234	0.8123	
15	21	4	4	1	0.1920	0.6613	0.9176	
16	22	2	5	1	0.0231	0.8790	0.8373	
17	23	2	5	1	0.0154	0.9013	0.5237	
18	25	3	6	0	0.0022	0.9628	0.8581	
19	10	15	3	3	0.0004	0.9881	0.5881	
20	24	4	4	1	0.1216	0.7273	1.0000	
21	15	11	2	3	0.0564	0.8123	0.2730	
22	18	7	5	0	0.5963	0.4400	0.2288	
23	21	4	4	1	0.1920	0.6613	0.8204	
24	25	3	5	0	0.0059	0.9388	0.0839	
25	16	8	4	1	0.0030	0.9562	0.3475	
26	16	7	4	2	0.1287	0.7198	0.8205	
27	22	3	4	2	0.4328	0.5106	0.1813	
28	21	7	2	3	1.0825	0.2981	0.0522	

p – p-value for χ^2 ; Wp – p-value for Wilcoxon rank sum test

* – contradicting results of statistical significance tests due to low frequencies

Table D.6.: Positive Attitude Group: Moderator – Personnel Responsibility

Item	Personnel Resp.		No Personnel Resp.		χ^2	p	Wp	
	agree	disagree	agree	disagree				
1	14	0	17	1	0.0164	0.8981	0.1615	
2	10	5	8	8	0.3313	0.5649	0.3559	
3	16	0	18	0	0.1176	0.7316	0.0389	*
4	14	0	13	3	1.2054	0.2723	0.2001	
5	11	4	14	3	0.0351	0.8513	0.7913	
6	15	0	16	1	0.0040	0.9493	0.8630	
7	14	2	16	0	0.5333	0.4652	0.0388	*
8	15	1	16	2	0.0114	0.9149	0.2605	
9	16	0	13	5	3.2315	0.0722	0.2505	
10	12	3	15	2	0.0232	0.8788	0.6616	
11	12	2	11	4	0.1323	0.7160	0.5823	
12	6	4	12	5	0.0199	0.8880	0.8820	
13	14	1	12	4	0.8070	0.3690	0.1078	
14	7	3	7	8	0.5479	0.4592	0.3951	
15	13	1	12	4	0.6696	0.4132	0.1101	
16	14	1	13	2	0.0000	1.0000	0.3982	
17	14	0	14	3	1.0889	0.2967	0.0454	*
18	14	2	17	1	0.0114	0.9149	1.0000	
19	8	5	5	13	2.2829	0.1308	0.0950	
20	13	2	15	3	0.0491	0.8246	0.5465	
21	9	5	8	9	0.3559	0.5508	0.1472	
22	13	2	10	5	0.7453	0.3880	0.1392	
23	12	3	13	2	0.0000	1.0000	0.7534	
24	15	1	15	2	0.0030	0.9560	0.3565	
25	11	2	9	7	1.5338	0.2155	0.0469	*
26	10	3	10	6	0.1861	0.6662	0.3031	
27	12	2	14	3	0.0564	0.8123	0.3409	
28	11	4	12	6	0.0012	0.9724	0.4087	

p – p-value for χ^2 ; Wp – p-value for Wilcoxon rank sum test

* – contradicting results of statistical significance tests due to low frequencies

Table D.7.: Negative Attitude Group: Moderator – Certification Status

Item	Certificants		Non-Certificants		χ^2	p	Wp	
	agree	disagree	agree	disagree				
1	16	20	6	12	0.2397	0.6244	0.8820	
2	6	30	3	18	0.0192	0.8897	0.8574	
3	34	3	19	2	0.0913	0.7626	0.8361	
4	11	21	5	13	0.0270	0.8696	0.6269	
5	22	12	17	2	2.6780	0.1017	0.0374	*
6	24	10	19	1	3.2438	0.0717	0.1545	
7	26	7	20	1	1.6027	0.2055	0.2142	
8	22	15	10	10	0.1658	0.6838	0.5193	
9	17	19	9	12	0.0019	0.9653	0.9127	
10	24	11	7	11	3.1776	0.0747	0.0794	
11	16	16	12	8	0.1746	0.6760	0.4705	
12	14	19	2	17	4.3593	0.0368	0.0689	*
13	10	25	3	18	0.8081	0.3687	0.3569	
14	17	15	7	13	0.9794	0.3224	0.4024	
15	16	19	6	14	0.7366	0.3907	0.6724	
16	22	11	11	9	0.3103	0.5775	0.5132	
17	18	15	11	8	0.0031	0.9555	0.9668	
18	23	12	14	4	0.3482	0.5551	0.0726	
19	5	31	3	17	0.0810	0.7759	0.6237	
20	19	16	9	9	0.0000	0.9956	0.6347	
21	9	27	4	17	0.0359	0.8498	0.7038	
22	16	20	7	14	0.2970	0.5858	0.7929	
23	22	14	10	10	0.2738	0.6008	0.5621	
24	12	24	8	13	0.0057	0.9397	0.3336	
25	22	12	16	4	0.7744	0.3789	0.4483	
26	11	24	7	13	0.0004	0.9783	0.8392	
27	23	14	7	11	1.7900	0.1809	0.2362	
28	17	17	8	9	0.0098	0.9211	0.8874	

p – p-value for χ^2 ; Wp – p-value for Wilcoxon rank sum test

* – contradicting results of statistical significance tests due to low frequencies

Table D.8.: Negative Attitude Group: Moderator – Personnel Responsibility

Item	Personnel Resp.		No Personnel Resp.		χ^2	p	Wp
	agree	disagree	agree	disagree			
1	12	16	10	16	0.0026	0.9590	0.5562
2	5	26	4	22	0.0829	0.7734	0.7476
3	26	5	27	0	2.9381	0.0865	0.4406
4	7	21	9	13	0.7951	0.3726	0.2315
5	22	5	17	9	1.0346	0.3091	0.4288
6	23	5	20	6	0.0190	0.8904	0.6264
7	22	7	24	1	2.8662	0.0905	0.2319
8	16	15	16	10	0.2345	0.6282	0.3804
9	13	17	13	14	0.0096	0.9218	0.4019
10	17	12	14	10	0.0670	0.7957	0.8366
11	16	13	12	11	0.0042	0.9485	0.9444
12	9	20	7	16	0.0655	0.7980	0.5273
13	7	24	6	19	0.0374	0.8467	0.6007
14	13	16	11	12	0.0042	0.9485	0.8807
15	12	17	10	16	0.0030	0.9560	0.6041
16	16	12	17	8	0.2811	0.5960	0.5525
17	13	15	16	8	1.4038	0.2361	0.2956
18	20	9	17	7	0.0234	0.8783	0.8880
19	5	25	3	23	0.0269	0.8697	0.4683
20	13	18	15	7	2.5819	0.1081	0.0855
21	5	26	8	18	0.9904	0.3197	0.4359
22	11	20	12	14	0.2990	0.5845	0.3664
23	17	13	15	11	0.0374	0.8467	0.7841
24	9	22	11	15	0.5889	0.4428	0.0842
25	19	10	19	6	0.2941	0.5876	0.3925
26	9	21	9	16	0.0337	0.8543	0.8796
27	14	17	16	8	1.7305	0.1884	0.1224
28	13	14	12	12	0.0221	0.8819	0.9590

Table D.9.: Frequency and Percentage – Overall Sample

Item	n	NA	Frequency				Percentage			
			s.ag.	ag.	dis.	s.dis.	s.ag.	ag.	dis.	s.dis.
1	86	6	6	47	22	11	7%	55%	26%	13%
2	88	4	1	26	34	27	1%	30%	39%	31%
3	92	0	41	46	3	2	45%	50%	3%	2%
4	80	12	2	41	27	10	2%	51%	34%	12%
5	85	7	28	36	16	5	33%	42%	19%	6%
6	86	6	31	43	7	5	36%	50%	8%	6%
7	86	6	31	45	9	1	36%	52%	10%	1%
8	91	1	5	58	22	6	5%	64%	24%	7%
9	91	1	3	52	30	6	3%	57%	33%	7%
10	85	7	11	47	22	5	13%	55%	26%	6%
11	81	11	11	40	22	8	14%	49%	27%	10%
12	79	13	2	32	37	8	3%	41%	47%	10%
13	87	5	1	38	37	11	1%	44%	43%	13%
14	77	15	1	37	30	9	1%	48%	39%	12%
15	85	7	4	43	31	7	5%	51%	36%	8%
16	83	9	11	49	18	5	13%	59%	22%	6%
17	83	9	10	47	20	6	12%	57%	24%	7%
18	87	5	29	39	11	8	33%	45%	13%	9%
19	87	5	5	16	44	22	6%	18%	51%	25%
20	86	6	8	48	21	9	9%	56%	24%	10%
21	88	4	5	25	35	23	6%	28%	40%	26%
22	87	5	5	41	34	7	6%	47%	39%	8%
23	86	6	7	50	18	11	8%	58%	21%	13%
24	90	2	2	48	28	12	2%	53%	31%	13%
25	83	9	6	52	17	8	7%	63%	20%	10%
26	84	8	3	35	28	18	4%	42%	33%	21%
27	86	6	2	54	20	10	2%	63%	23%	12%
28	84	8	3	45	27	9	4%	54%	32%	11%

Table D.10.: Frequency and Percentage – Positive Attitude

Item	n	NA	Frequency				Percentage			
			s.ag.	ag.	dis.	s.dis.	s.ag.	ag.	dis.	s.dis.
1	32	2	6	25	0	1	19%	78%	0%	3%
2	31	3	0	18	10	3	0%	58%	32%	10%
3	34	0	15	19	0	0	44%	56%	0%	0%
4	30	4	2	25	2	1	7%	83%	7%	3%
5	32	2	10	15	6	1	31%	47%	19%	3%
6	32	2	14	17	0	1	44%	53%	0%	3%
7	32	2	11	19	2	0	34%	59%	6%	0%
8	34	0	4	27	3	0	12%	79%	9%	0%
9	34	0	2	27	4	1	6%	79%	12%	3%
10	32	2	7	20	4	1	22%	62%	12%	3%
11	29	5	8	15	6	0	28%	52%	21%	0%
12	27	7	1	17	9	0	4%	63%	33%	0%
13	31	3	1	25	4	1	3%	81%	13%	3%
14	25	9	1	13	11	0	4%	52%	44%	0%
15	30	4	4	21	5	0	13%	70%	17%	0%
16	30	4	10	17	3	0	33%	57%	10%	0%
17	31	3	7	21	2	1	23%	68%	6%	3%
18	34	0	12	19	2	1	35%	56%	6%	3%
19	31	3	3	10	15	3	10%	32%	48%	10%
20	33	1	5	23	5	0	15%	70%	15%	0%
21	31	3	4	13	12	2	13%	42%	39%	6%
22	30	4	4	19	7	0	13%	63%	23%	0%
23	30	4	6	19	4	1	20%	63%	13%	3%
24	33	1	1	29	3	0	3%	88%	9%	0%
25	29	5	2	18	8	1	7%	62%	28%	3%
26	29	5	1	19	9	0	3%	66%	31%	0%
27	31	3	2	24	5	0	6%	77%	16%	0%
28	33	1	2	21	8	2	6%	64%	24%	6%

Table D.11.: Frequency and Percentage – Negative Attitude

Item	n	NA	Frequency				Percentage			
			s.ag.	ag.	dis.	s.dis.	s.ag.	ag.	dis.	s.dis.
1	54	4	0	22	22	10	0%	41%	41%	19%
2	57	1	1	8	24	24	2%	14%	42%	42%
3	58	0	26	27	3	2	45%	47%	5%	3%
4	50	8	0	16	25	9	0%	32%	50%	18%
5	53	5	18	21	10	4	34%	40%	19%	8%
6	54	4	17	26	7	4	31%	48%	13%	7%
7	54	4	20	26	7	1	37%	48%	13%	2%
8	57	1	1	31	19	6	2%	54%	33%	11%
9	57	1	1	25	26	5	2%	44%	46%	9%
10	53	5	4	27	18	4	8%	51%	34%	8%
11	52	6	3	25	16	8	6%	48%	31%	15%
12	52	6	1	15	28	8	2%	29%	54%	15%
13	56	2	0	13	33	10	0%	23%	59%	18%
14	52	6	0	24	19	9	0%	46%	37%	17%
15	55	3	0	22	26	7	0%	40%	47%	13%
16	53	5	1	32	15	5	2%	60%	28%	9%
17	52	6	3	26	18	5	6%	50%	35%	10%
18	53	5	17	20	9	7	32%	38%	17%	13%
19	56	2	2	6	29	19	4%	11%	52%	34%
20	53	5	3	25	16	9	6%	47%	30%	17%
21	57	1	1	12	23	21	2%	21%	40%	37%
22	57	1	1	22	27	7	2%	39%	47%	12%
23	56	2	1	31	14	10	2%	55%	25%	18%
24	57	1	1	19	25	12	2%	33%	44%	21%
25	54	4	4	34	9	7	7%	63%	17%	13%
26	55	3	2	16	19	18	4%	29%	35%	33%
27	55	3	0	30	15	10	0%	55%	27%	18%
28	51	7	1	24	19	7	2%	47%	37%	14%

Table D.12.: Frequency and Percentage – Certificants

Item	n	NA	Frequency				Percentage			
			s.ag.	ag.	dis.	s.dis.	s.ag.	ag.	dis.	s.dis.
1	63	2	5	38	12	8	8%	60%	19%	13%
2	61	4	1	18	25	17	2%	30%	41%	28%
3	65	0	29	33	2	1	45%	51%	3%	2%
4	57	8	2	32	15	8	4%	56%	26%	14%
5	60	5	15	26	14	5	25%	43%	23%	8%
6	60	5	20	29	6	5	33%	48%	10%	8%
7	59	6	18	32	8	1	31%	54%	14%	2%
8	65	0	4	43	14	4	6%	66%	22%	6%
9	64	1	3	37	19	5	5%	58%	30%	8%
10	61	4	10	35	11	5	16%	57%	18%	8%
11	57	8	10	25	16	6	18%	44%	28%	11%
12	56	9	2	28	21	5	4%	50%	38%	9%
13	62	3	1	32	22	7	2%	52%	35%	11%
14	54	11	1	28	19	6	2%	52%	35%	11%
15	60	5	3	34	17	6	5%	57%	28%	10%
16	57	8	9	35	9	4	16%	61%	16%	7%
17	58	7	9	32	13	4	16%	55%	22%	7%
18	63	2	18	30	8	7	29%	48%	13%	11%
19	61	4	3	12	32	14	5%	20%	52%	23%
20	63	2	7	36	14	6	11%	57%	22%	10%
21	62	3	5	19	24	14	8%	31%	39%	23%
22	61	4	3	31	20	7	5%	51%	33%	11%
23	61	4	6	37	11	7	10%	61%	18%	11%
24	64	1	1	36	17	10	2%	56%	27%	16%
25	58	7	4	34	14	6	7%	59%	24%	10%
26	58	7	3	24	19	12	5%	41%	33%	21%
27	62	3	2	43	10	7	3%	69%	16%	11%
28	62	3	3	35	19	5	5%	56%	31%	8%

Table D.13.: Frequency and Percentage – Non-Certificants

Item	n	NA	Frequency				Percentage			
			s.ag.	ag.	dis.	s.dis.	s.ag.	ag.	dis.	s.dis.
1	23	4	1	9	10	3	4%	39%	43%	13%
2	27	0	0	8	9	10	0%	30%	33%	37%
3	27	0	12	13	1	1	44%	48%	4%	4%
4	23	4	0	9	12	2	0%	39%	52%	9%
5	25	2	13	10	2	0	52%	40%	8%	0%
6	26	1	11	14	1	0	42%	54%	4%	0%
7	27	0	13	13	1	0	48%	48%	4%	0%
8	26	1	1	15	8	2	4%	58%	31%	8%
9	27	0	0	15	11	1	0%	56%	41%	4%
10	24	3	1	12	11	0	4%	50%	46%	0%
11	24	3	1	15	6	2	4%	62%	25%	8%
12	23	4	0	4	16	3	0%	17%	70%	13%
13	25	2	0	6	15	4	0%	24%	60%	16%
14	23	4	0	9	11	3	0%	39%	48%	13%
15	25	2	1	9	14	1	4%	36%	56%	4%
16	26	1	2	14	9	1	8%	54%	35%	4%
17	25	2	1	15	7	2	4%	60%	28%	8%
18	24	3	11	9	3	1	46%	38%	12%	4%
19	26	1	2	4	12	8	8%	15%	46%	31%
20	23	4	1	12	7	3	4%	52%	30%	13%
21	26	1	0	6	11	9	0%	23%	42%	35%
22	26	1	2	10	14	0	8%	38%	54%	0%
23	25	2	1	13	7	4	4%	52%	28%	16%
24	26	1	1	12	11	2	4%	46%	42%	8%
25	25	2	2	18	3	2	8%	72%	12%	8%
26	26	1	0	11	9	6	0%	42%	35%	23%
27	24	3	0	11	10	3	0%	46%	42%	12%
28	22	5	0	10	8	4	0%	45%	36%	18%

Table D.14.: Frequency and Percentage – Personnel Responsibility

Item	n	NA	Frequency				Percentage			
			s.ag.	ag.	dis.	s.dis.	s.ag.	ag.	dis.	s.dis.
1	42	5	4	22	12	4	10%	52%	29%	10%
2	46	1	1	14	16	15	2%	30%	35%	33%
3	47	0	21	21	3	2	45%	45%	6%	4%
4	42	5	1	20	15	6	2%	48%	36%	14%
5	42	5	16	17	5	4	38%	40%	12%	10%
6	43	4	16	22	1	4	37%	51%	2%	9%
7	45	2	13	23	8	1	29%	51%	18%	2%
8	47	0	4	27	11	5	9%	57%	23%	11%
9	46	1	1	28	12	5	2%	61%	26%	11%
10	44	3	5	24	12	3	11%	55%	27%	7%
11	43	4	5	23	8	7	12%	53%	19%	16%
12	39	8	2	13	21	3	5%	33%	54%	8%
13	46	1	1	20	21	4	2%	43%	46%	9%
14	39	8	0	20	14	5	0%	51%	36%	13%
15	43	4	3	22	12	6	7%	51%	28%	14%
16	43	4	7	23	10	3	16%	53%	23%	7%
17	42	5	8	19	11	4	19%	45%	26%	10%
18	45	2	16	18	7	4	36%	40%	16%	9%
19	43	4	3	10	20	10	7%	23%	47%	23%
20	46	1	4	22	14	6	9%	48%	30%	13%
21	45	2	5	9	18	13	11%	20%	40%	29%
22	46	1	4	20	17	5	9%	43%	37%	11%
23	45	2	4	25	8	8	9%	56%	18%	18%
24	47	0	2	22	13	10	4%	47%	28%	21%
25	42	5	4	26	7	5	10%	62%	17%	12%
26	43	4	3	16	15	9	7%	37%	35%	21%
27	45	2	2	24	12	7	4%	53%	27%	16%
28	42	5	3	21	13	5	7%	50%	31%	12%

Table D.15.: Frequency and Percentage – No Personnel Responsibility

Item	n	NA	Frequency				Percentage			
			s.ag.	ag.	dis.	s.dis.	s.ag.	ag.	dis.	s.dis.
1	44	1	2	25	10	7	5%	57%	23%	16%
2	42	3	0	12	18	12	0%	29%	43%	29%
3	45	0	20	25	0	0	44%	56%	0%	0%
4	38	7	1	21	12	4	3%	55%	32%	11%
5	43	2	12	19	11	1	28%	44%	26%	2%
6	43	2	15	21	6	1	35%	49%	14%	2%
7	41	4	18	22	1	0	44%	54%	2%	0%
8	44	1	1	31	11	1	2%	70%	25%	2%
9	45	0	2	24	18	1	4%	53%	40%	2%
10	41	4	6	23	10	2	15%	56%	24%	5%
11	38	7	6	17	14	1	16%	45%	37%	3%
12	40	5	0	19	16	5	0%	48%	40%	12%
13	41	4	0	18	16	7	0%	44%	39%	17%
14	38	7	1	17	16	4	3%	45%	42%	11%
15	42	3	1	21	19	1	2%	50%	45%	2%
16	40	5	4	26	8	2	10%	65%	20%	5%
17	41	4	2	28	9	2	5%	68%	22%	5%
18	42	3	13	21	4	4	31%	50%	10%	10%
19	44	1	2	6	24	12	5%	14%	55%	27%
20	40	5	4	26	7	3	10%	65%	18%	8%
21	43	2	0	16	17	10	0%	37%	40%	23%
22	41	4	1	21	17	2	2%	51%	41%	5%
23	41	4	3	25	10	3	7%	61%	24%	7%
24	43	2	0	26	15	2	0%	60%	35%	5%
25	41	4	2	26	10	3	5%	63%	24%	7%
26	41	4	0	19	13	9	0%	46%	32%	22%
27	41	4	0	30	8	3	0%	73%	20%	7%
28	42	3	0	24	14	4	0%	57%	33%	10%