HOW IS SUCCESS IN EXPERT WORK DEFINED AND MEASURED?

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Abstract

An abundance of research corroborates the fact, that today's management in organisations has to deal with an increasing number of highly educated and highly skilled workers whose major task consists in solving problems rather than in executing predefined tasks. These workers are called 'experts'. However, the question how success in expert work is defined and measured remains.

In order to answer this question, the author has carried out a research in five different organisations which are commonly regarded as 'knowledge-intensive organisations': a consulting company, a software development company, a product development company, a hospital and a university.

The outcome of this research consists in two basic findings: With regard to the definition of success, productivity in a classic economical sense is not regarded as a success criterion in expert work. In respect of the measurement of success, the assessment of expert work is usually not based on measurable criteria, but rather on a professional display of performance and competence.

The paper proposes a number of explanations for those two findings by referring to further research results and suggests approaches in order to come to a more productivity-minded definition of success as well as to attain a more 'professional' performance assessment of expert work.

Key Words

assessment, expert, knowledge worker, measurement, performance, productivity, professional, success, work

Justification of the question

Nearly all surveys of past decades are pointing to a fundamental structural change in the labour markets of the OECD countries, a change indicated by four correlated findings:

Firstly, there has been, from 1985 onwards, a 10 percentage-points increase in so-called 'derivative services', e.g. consulting, coaching, teaching, researching, developing and management work (Weidig et al. 1999; Dostal & Reinberg 1999; Dostal 2001; Reinberg & Hummel 2002) .

Secondly, the number of occupations of the categories 'manager', 'professional occupation' as well as 'associate professional and technical occupation' has increased by 10 percentage points over the last two decades (UK National Statistics 2000; Baldwin & Beckstead 2003; Beckstead & Gellatly 2004; UK National Statistics 2006; Davenport 2005; US Department of Labor 2006; Brinkley 2006).

Thirdly, the demand for employees with an academic education has increased by 190 percentage points between 1975 and 2004, whereas the demand for employees with a lower educational background is continually decreasing (Weidig et al. 1999; Kleinert et al. 2000; Dostal 2001; Reinberg & Hummel 2002; Reinberg & Hummel 2005; OECD 2006a; OECD 2006b).

Fourthly, Levy & Murnane (2006) noted a disproportional increase in the demand for two skill requirements within the US labour force between 1979 and 1999: 'expert thinking' and 'complex communication'. In contrast to this development, they observed that the demand for manual and routine cognitive skills has been continually decreasing within the same time frame.

These changes can be attributed to two parallel effects (Weidig et al. 1999; OECD 1999; Dostal & Reinberg 1999; Brinkley 2006; Brinkley & Lee 2006; EUROSTAT 2007): on the one hand, to

an economico-structural effect since so-called ‚knowledge-based industries' have equally continually grown over the last decades in respect of their proportion in the gross domestic product as well as in respect of their numbers of employees. On the other hand, to a qualification-centered structural effect, since the demand for highly qualified employees engaged in consulting, coaching, teaching, researching, developing and management work has increased across all economic sectors. Despite the fact that different researchers take different views on the deeper causes of the tendencies delineated above, they agree with one another in that these changes are not to be interpreted as economic fluctuations, but as profound structural changes in the labour markets of the OECD countries (Weidig et al. 1999; Dostal 2001; Reinberg & Hummel 2002; Reinberg & Hummel 2005; Brinkley 2006; Brinkley & Lee 2006).

When applying these macroeconomical tendencies to an organisational level, this implies that today's management has to deal with an increasing number of workers that are highly educated, highly skilled and whose major contribution to the organisation's success consists, above all, in solving problems rather than in executing predefined tasks. The quantitative proportion of this type of workforce in the total labour force within the OECD countries is currently estimated to amount to between 20% and 35%, depending on the kind of tasks and occupations taken into account (Baldwin & Beckstead 2003; Brown & Hesketh 2004; Götzfried 2004; Davenport 2005; Brinkley 2006).

Researchers differ by using different terms for designating said workforce: Some authors call them 'knowledge workers' in reference to a term employed by Fritz Machlup (1962) (e.g. Sumanth, Omachonu & Beruvides 1990; Sveiby 1998; Cortada 1998; Drucker 1999; Horibe 1999; Amar 2002; Newell et al. 2002; Baldwin & Beckstead 2003; Alvesson 2004; Herman 2004; Davenport 2005; Hube 2005; Stam 2007). Others prefer the designation 'brainworkers' (e.g. Gizycki & Ulrici 1988; Handy 1990; Pfiffner & Stadelmann 1999; Malik 2006), 'professionals' (Shapero 1989; Barley & Tolbert 1991; Raelin 1991; Wallace 1995; Pfadenhauer 2003; Mintzberg 2003; Klatzeki & Tacke 2005), 'experts' (Argyris 1991; Sonnentag 1996; Huber 1999; Hron 2000) or – stressing the relatively high income and status of said workforce members - 'gold-collar workers' (Kelley 1990). Despite the fact that these terms are not simply interchangeable, workers which are highly educated, highly skilled and whose major task consists in the solving of problems will be termed 'experts' in the subsequent treatise.

In spite an abundance of research in the field of 'knowledge workers', 'professionals' and 'experts', it is still not clear how success in expert work is defined or measured.

In order to search for an answer to this question one can either refer to theoretical publications trying to investigate the ‚anatomy' of knowledge work (e.g. Sumanth, Omachonu & Beruvides 1990; Pfiffner & Stadelmann 1999; Alvesson 2004; Hermann 2004; Hube 2005). Alternatively one could seek advice from manuals on the practical 'handling' of experts (e.g. Shapero 1989; Sveiby 1998; Horibe 1999; Amar 2002; Newell et al. 2002). Or one could study empirical research that validates or generates particular hypotheses regarding the performance, the motivation, the power of identification or the commitment of engineers, researchers, consultants, physicians or academics in a narrow business segment and generalises the outcome as attributes of 'experts', 'professionals' resp. 'knowledge workers' (e.g. Alvesson 1995; Blackler 1995; Wallace 1995; Hron 2000; Hauber 2002; Balazova 2004; Baldry et al. 2005; Stam 2007).

However, one would not find a profound answer to this question that is grounded in empirical data, as called for by Glaser & Strauss (1967). Therefore, the author carried out an empirical research in order to find answers to this question. The first results of this investigation as well as their interpretation constitute the subject of this paper.

Research design

The subject of the investigation were five different organisations that are commonly regarded as 'expert', 'professional' or 'knowledge-intensive' organisations in previous treatises (Grossmann, Pellert & Gotwald 1997; Sveiby 1998; Pfiffner & Stadelmann 1999; OECD 1999; Amar 2002; Alvesson 2004; Davenport 2005; Brinkley 2006): a consulting company, a software development company, a product development company, a hospital and a university. In these organisations, 42 semi-structured episodic face-to-face-interviews with experts and their managers from three

hierarchical levels were conducted (Flick 1996; Bortz & Döring 2003; Lamnek 2005). One topic of each one-hour interview referred to the question by which indicator individual knowledge work was regarded as success and how was it measured.

The data gathered by means of the interviews have been coded and interpreted with Atlas.ti, Version 5.5.4. The results are presented in an aggregated and concentrated manner without disclosure of the identity of the organisations involved.

Research findings

Definitions and measurements of success in expert work

The first result of our research consists in the fact that in all knowledge-intensive organisations investigated, a number of success indicators including their respective measurement methods can be identified which have been named by experts and their managers independently. Therefore, it can be concluded that these indicators are shared collectively within the respective organisations, that they may be regarded as collectively motivationally directive and, hence, part of the organisational culture (Sackmann 1991; Sackmann 2002).

For the software development company, the predominant success criteria are: adherence to stakeholder milestones and code quality. The latter is operationalised by indicators such as buglessness, transparency, maintainability as well as usability. Said success criteria are measured by the collection and comparison of planned and actual milestones, by static and dynamic software tests and through the collection and analysis of customer feedback.

The product development company, active in an entirely different business segment and subsidiary to another corporate organisation, displayed a corresponding collective understanding of "success". As primary criteria for success at work "adherence to schedules arranged with the customer", "congruence with development budget and planned production costs", "provision and ensuring of the stipulated hardware quality" and a preferably "escalation- and recursionless development process" were named. As before, the success criteria are measured by analysis of planned and actual values with regard to customer milestones, to the development budget and production costs, by analysis of different hardware test records as well as by the number of escalations and recursions during the development process of a circuit board.

For the technology consulting company (which, within a large technology corporation, represents the technical support for the sales department), experts as well as managers mentioned the following success criteria with regard to their work: number of customer projects, revenue on customer projects, rate of demand for specific consultants, sales and customer performance feedback with a view to the consultants requested. The rate of conformance with the success criteria is measured by turnover on customer accounts per consulting assignment, by the number and type of projects per consultant and by verbal customer and sales feedback upon conclusion of each assignment, by mail feedback and customer reference.

For the examined hospital, patient contentment as well as clinical outcome have been concertedly named as primary success criteria by the executive medical director, the clinical directorates as well as the assistant clinical directors and physicians. For the surgical departments, 'clinical outcome' can be established by the number of health complications, e.g. the number of inflammations, in comparison with clinical standards as depicted in professional journals. Patient contentment is being recorded systematically by filled-in feedback forms per patient as well as in the form of patient feedback interviews.

When compared with aforementioned four organisations, the collected university data (provided by the vice-chancellor, the deans and faculty heads and the university professors) displayed a lesser degree of conformity with a view to work success criteria. The following success factors have been named: topicality and international orientation in research and teaching, integration and association of teaching and research into and with the regional community, emergence of research foci, attractiveness of the university to students and other interest groups, quality in research and teaching and the overall reputation with students and within the scientific community. Hence, the indicators with the help of which success is measured are quite disparate: the number of professorships within a specific faculty/deanery, the number and classification of publications, feedback by students and other

interest groups and, similarly, the number of lecture invitations and invitations to science-related events and congresses resp. symposia. Even though overlaps in the success criteria were detectable, the success standards, here, are rather person- than organisation-centered - a finding, previously reported elsewhere (Grossmann 1997; Pellert 1999; Hanft 2000).

The results of our investigation into the five knowledge-intensive organisations lead to the conclusion that the success of knowledge work can be precisely defined and even measured within specific limits. Does this finding support the argument that the definition and measurement of expert work does not differ at all from the management of execution-oriented work?

Particularities in the definition and measurement of success in expert work

According to our findings, this conclusion is not admissible.

With regard to the definition of success in expert work, the particularity emerges if one does not focus on the statements made by the interviewees, but on that which precisely has not been explicitly said: The aspect of productivity. Producitivity in it's original meaning denotes the relation between the amount of output and the amount of input (Pedell, 1985). This aspect has not been named as an accountable success criterion in any one of the organisations examined. This finding can also be corroborated by explicit statements such as: "I am asked: How long is it going to take you to perform this operation? And I always say the same thing: Until it has been concluded… That is not the important thing. The important thing is the outcome of the operation." Or, for the sphere of software engineering: „Well, if I wrote down into it [cf. the development plan]: 'The function has to be completed within three months' and if the colleague is still working on it half a year later, then, evidently, I misjudged the required effort, evidently. Well, that would be such an indicator: Do you achieve what you have planned beforehand or not?" Time-input and capacity-input are rather regarded to be constraints with a view to the attainment of a specific aim than as success criteria in the work process.

The above statement is contradictory to another statement made by all participants in respect of the question of the biggest challenge when directing their own work processes: the difficulty of coming to terms with the enormous amount and variability of tasks to be executed within a restricted amount of time. One can, therefore, state that 'productivity' in knowledge-intensive firms is an issue of importance without being broached as such and without being named as a success criterion for expert work.

In respect of the measurement of success it has to be pointed out, that in all organisations examined, management-by-objectives is in place, and, within this context, the question of performance assessment has to be answered by the respective executives. At this level, it can be noted that executives do not, as a rule, base their assessments of the individual expert on the success criteria outlined above, but rather on criteria such as: degree of competence and professional behaviour the individual expert displays in meetings and conferences, responsiveness when confronted with special requests and special assignments, degree of commitment of the individual worker in special tasks as well as the reputation the expert has achieved with customers and colleagues. Primary criteria for the assessment of the individual expert are, thus, not so much above-mentioned measurable success criteria as rather the display of competence and performance by the individual expert him-/herself or reports thereof by third parties. This finding again has been supported by interview statements such as: "We are lucky, here, since we work locally proximated, here, in one, two buildings, and, thus, …the management can work on signals, here, I believe, ok? And this means that…, I think, one issue is the issue of peer recognition." Or: "A further component consists in …My colleagues do have a target there: 'Do good and make it known'. We are naturally always trying to display our contribution to business. And I undertake continual efforts in those, those [cf. monthly reports] to invite and prompt my colleagues to give a representation of what, what we have achieved." The only remarkable exception to this general approach to performance assessment can be found in the hospital examined, where adherence to professional medical standards constitutes the primary criterion for performance assessment.

According to the research results the particularities in the definition and measurement of success in

expert work – in comparison to execution-oriented work- consist in two aspects:

1. With regard to success definition, productivity in terms of outcome in relation to the invested resp. available time seems to be an issue without being perceived as such.
2. The individual performance of an expert is, in large parts, not assessed according to measurable success criteria, but rather according to the display of performance by the expert or by third-party reports thereof.

Are there any explanations that can illuminate above findings?

Explanations

In order to find an explanation for the first finding mentioned above, i.e. productivity as a cognitive underrepresentation in knowledge-intensive organisations, one could revert to business-specific constraints: Specific businesses such as software or hardware development companies follow a predefined schedule issued by a customer or a project sponsor. Any acceleration of development cycles apart from the critical path does not offer any added value. In other businesses such as medical organisations or consultancy firms, goal conflicts are solved in favour of the quality goal, as a matter of principle. In the university context, as a third example, it is hard to find any relevant meaning of 'productivity' relevant to the academic sphere.

These explanations coincide in large parts with the findings of previous research in knowledge work (Sumanth, Omachonu & Beruvides 1990; Pfiffner & Stadelmann 1999; Hermann 2004; Hube 2005) which proposes, that the performance of knowledge work cannot be adequately operationalised in terms of output-effort-relations, but rather in terms of the contribution of certain measures to attaining a predefined goal. Therefore, successful knowledge work is to be distinguished rather by indicators of effectiveness than by indicators of efficiency.

However, another possibility to explain the lack of producitivity-orientation in expert work according to the interview data consists in that the subject of productivity is always allocated to an abstract economical sphere. It is never broached as a topic of 'time management' or 'priority control'. If the subject of productivity is seen as such, it attains the topicality of a 'top three topic'.

An explanation for the finding that expert performance is usually not assessed according to measurable success criteria lies in the fact that the relation between success criteria measurability and their controllability through the expert worker is an inverse relation: It is true that bugs in the software code, errors in the circuit diagramme layout, missed stakeholder milestones, increases or decreases in the turnover on customer accounts, post-operative complication rates or the number of articles in academic A-journals are measurable – however, their realisation is not exclusively dependent on the efforts undertaken by the individual expert worker. In order to attain these success criteria, further non-manageable variables have to correlate as well: customer requirement levels, customer change rates, quality in personal and institutional customer relations, levels of cooperation at intra-organisational work interfaces, performance delivered by other intra-organisational departments, organisational reputation with the organisation's stakeholders, disposable capacities, unpredictable external complication causes or the extent and quality of personal and organisational social networks. These factors can be influenced, in part, by the expert. They are, nevertheless, not entirely at his/her command nor are they entirely controllable through him/her.

Two additional reasons for the phenomenon that indirect auxiliary indicators rather than direct success criteria are being applied when assessing the performance of expert workers lie - with differing emphasis - in the first place, in the existence of a factual knowledge asymmetry between experts and their managers, and, in the second place, in an intransparency of the expert worker's work as perceived by the manager, since design engineers, consultants, physicians and professors, as a rule, conduct their work in an exceptionally autonomous way when working on tasks or projects.

Managers in knowledge-intensive organisations, therefore, cannot gain but an indirect insight into the performance of their expert workers – an indirect insight imparted by reports handed in by the expert him-/herself, by reports through third parties as well as through further forms of competence representation. The observation that achievements in knowledge-intensive organisations have to be displayed and made visible has been pointed out, yet, only by researchers with a sociological

background, such as Michaela Pfadenhauer (2003) or Mats Alvesson (1995; 2004). At the same time, the question remains to which extent a persuasive display of performance and competence correlates with effected performance and competence.

The question remains what can be done in order to impart the subject of productivity in a mode that is relevant for expert work and in order to implement a more 'professional' way of assessing expert performance?

Consequences

In respect of the framing of the subject of productivity it can be concluded that the modality of addressing the subject seems to determine the degree of attention the subject attracts. An adequate approach – in our opinion – has been brought forward by Fredmund Malik (2006). In his Drucker interpretation "Managing, Performing, Living", he characterises good and suitable management among other things by an orientation by the principle of "concentration on few tasks" and by the usage of tools such as "job design and assignment control", "personal work methodology" and "systematic waste disposal". This approach allocates the subject of productivity to the personal level and asks, on that very level, how the ratio of outcome and expenditure of time can be optimised. In our view, this interpretation of productivity has considerably higher chances to attract attention as a relevant subject in the typesw of organisation here examined.

With regard to performance assessment of expert work, the predominant challenge seems to consist in the detection of relatively valid criteria for the measurement or assessment of the work performance of expert workers. At the hospital examined, we were able to find an approach with a view to the solution of said problem: The surgeons' performance is not primarily assessed in view of complication rates, which may not completely be in their sphere of command, but in view of the compliance of the applied diagnostic, surgical and post-operative measures with current clinical standards. The clinical staff is, therefore, required to have at its command a repertory of applicable and verifiably effective treatment methods. Said professional standards in methods have to be mastered by the clinical personnel as well as selected with professional discernment (Abbott, 1988). To phrase it differently, practically oriented research is required, which verifies method effectiveness and makes its findings public, as well as the systematic training of said methods and of aforementioned professional discernment until mastery thereof has been attained.

We came upon all those elements in the hospital examined: The consolidation of surgical knowledge and capabilities takes place within the context of a six-year long residency during which the doctor-in-training has the opportunity to continually discuss and peruse in detail with an experienced practitioner all diagnoses and surgical treatment regimes prior to surgical interventions, during which he/she undertakes surgical interventions under the supervision of a senior surgeon and receives continual feedback on his/her performance. Innovation in established clinical standards only preliminarily supersedes established standard methods if sufficient scientific evidence has been gathered that the new standard surpasses well-established ones. With the help of this course of action, i.e. a "learning on the job"-principle resp. "accompaniment-principle", in iterative Stepps, an increasing degree of responsibility is transferred onto the expert worker. Aside from the improvement aspect, a generally acknowledged and verifiably effective repertory of diagnostic, surgical and post-operative procedures serves as a basis for performance assessments. For the hospital examined, the performance-enhancing effect of said two measures can be corroborated with the help of "complication rates" which are persistently below the statistically determined average.

We were not able to detect any comparable concept of performance assessment and enhancement in any of the other institutions examined, neither in the software nor in the consulting nor in the hardware nor in the academic environment. The procedures applied in these institutions, which tend to be rather trend-dependent, are generally lacking in verifiable effectiveness and also tend to be little binding, a fact criticised by the research participants. Equally, no comparable concept for the formation of professional judgement and the command of adequate methods can be found anywhere apart from the hospital examined. Human resource development concepts often favour training courses and project assignments that rather resemble "throw-in-at-the-deep-end"-strategies (Berthel & Becker, 2007).

From this perspective, a concept for performance measurement and enhancement in knowledge

work would necessitate the devising of a fixed set of professional, verifiably effective standards, the command and application of which would be systematically trained "on-the-job" for several years. This concept could simultaneously serve as a binding basis for performance assessments in expert work. In the software development firm and the consulting company, initial steps towards such a model were in effect via the institutionalisation of professional career paths and professional certifications, which still lay considerable emphasis on knowledge rather than on accomplishment. It is also true that in this environment the effectiveness of specific methods has, up to the present, not been verified and that their relevance for performance measurements is still not evident. We are of the opinion that the described approach would initiate a professionalisation incentive in expert work in the domains of software and hardware development, consulting and science (research and teaching) – and this, independently of their recognition as actual "professions" in society (vgl. Etzioni, 1969).

With the consequences delineated above, only a rough approach has been outlined in order to solve or - at least - minimise the issues identified in the research. An approach in the wake of which a number of further questions arise which still require clarification.

Further questions

The concept - here propounded - for a further professionalisation of the management of expert work success leaves some central questions unanswered:

1. How can the effectiveness of specific methods and tools be statistically proven?
2. Who is in a position to define the body of knowledge of standardised and verifiably effective procedures and methods: training institutions, interbranch professional interest factions or any single organisation?
3. How can the practical incorporation of said standards into training practice and into performance assessment practice be effected?
4. How can evidence be provided that the command and application of professional methods – not further intervening variables – make a contribution towards the achievement of business goals?

Some of these questions have already been addressed in individual organisations, branches and disciplines: in the form of defined 'bodies of knowledge' whose effectiveness, however, remains to be proved; in the form of research papers on investigations into the effectiveness of single domain-specific and intersectorial procedures whose validity for other organisations and branches remains, nevertheless, still controversial; in the form of organisational practices consolidating binding standards and propagating them with a view to their mastery and application.

It is the task of every organisational unit within knowledge-intensive firms to detect suitable and effective standards, to consolidate them and to incorporate them into an enhancement and assessment programme for expert workers. If this undertaking succeeds, the respective organisation approximates with a high probability that which resource-oriented approaches from the sphere of strategic management call collective and strategic 'capabilities' or 'core competencies' (Wernerfeldt 1984; Prahalad & Hamel 1990; Barney 1991; Grant 1991). At this stage, the question of success on the level of the individual expert worker turns into the question of success on the level of knowledge-intensive organisations and, hence, from an operational to a strategic level.

References

Abbott, A. (1988) The system of professions: an essay on the division of expert labor. Chicago, University of Chicago Press.

Alvesson, M. (1995) Management of knowledge intensive companies. Berlin, De Gruyter.

Alvesson, M. (2004) Knowledge work and knowledge-intensive firms. Oxford, University Press.

Amar, A.D. (2002) Managing knowledge workers: unleashing innovation and productivity. Westport, Quorum.

Argyris, C. (1991): Wenn Experten wieder lernen müssen. Harvard Business Manager, 13 (4), S.95-107.

Balazova, M. (2004) Methode zur Leistungsbewertung und Leistungssteigerung in der Mechatronikentwicklung. Dissertation. Paderborn: Universität Paderborn.

Baldry, C. et al. (2005) Knowledge workers, commitment and occupational community. Paper presented International Labour Process Conference 2005. Glasgow, University of Strathclyde.

Baldwin, J.R. & Beckstead, D. (2003) Knowledge workers in Canada's economy, 1971-2001. Statistics Canada Analytical Paper. Ottawa, Statistics Canada.

Barley, S.R. & Tolbert, P.S. eds. (1991) Research in the sociology of organizations: special issue on professionals in organizations. Research in the sociology of organizations, 8. Greenwich, JAI Press.

Barney, J.B. (1991): Firm resources and sustained competitive advantages. Journal of Management, 17, pp 99-120.

Beckstead, D. & Gellatly, G. (2004) Are Knowledge Workers found only in high-technology industries? Statistics Canada Analytical Paper. Ottawa, Statistics Canada.

Berthel, J. & Becker, F.G. (2007): Personal-Management: Grundzüge für Konzeptionen betrieblicher Personalarbeit. 8. überarb. u. erw. Aufl. Schäffer-Pöschel, Stuttgart.

Blackler, F. (1995) Knowledge, knowledge work and organisations. An overview and interpretation. Organisation Studies, 16 (6), pp.1021-1046.

Bortz, J. & Döring, N. (2003) Forschungsmethoden und Evaluation für Human- und Sozialwissenschaftler. 3. überarb. Aufl. Berlin, Springer.

Brinkley, I. (2006) Defining the knowledge economy: knowledge economy programme report. Research Paper. London, The Work Foundation.

Brinkley, I. & Lee, N. (2006) The knowledge economy in Europe: a report prepared for the 2007 spring council. London, The Work Foundation.

Brown, P. & Hesketh, A. (2004) The mismanagement of talent: employability and jobs in the knowledge economy. Oxford, University Press.

Cortada, J.W. ed. (1998) Rise of the knowledge worker. Resources for the Knowledge-Based Economy. Boston, Butterworth-Heinemann.

Davenport, T.H. (2005) Thinking for a living: how to get better performance and results from knowledge workers. Boston, Harvard Business School Press.

Dostal, W. (2001) Neue Herausforderungen an Qualifikation und Weiterbildung im Zeitalter der Globalisierung. Gutachten im Auftrag der Enquete-Kommission ‚Globalisierung der Weltwirtschaft'. Berlin, Deutscher Bundestag.

Dostal, W. & Reinberg, A. (1999) Arbeitslandschaft 2010. Teil 2: Ungebrochener Trend in die Wissensgesellschaft. IAB-Kurzbericht, Nr.10. Nürnberg, Institut für Arbeitsmarkt- und Berufsforschung.

Drucker, P.F. (1999) Management challenges for the 21st century. New York, Harper.

Etzioni, A. ed. (1969) The semi-professions and their organization: teacher, nurses, social workers. New York, The Free Press.

EUROSTAT (2007) High-technology manufacturing and knowledge-intensive services sector [Internet], Luxembourg, Eurostat. Available from: <http://europa.eu.int/estatref/info/sdds/en/htec/ htec_base.htm> [Accessed 09 January 2007].

Flick, U. (1996) Psychologie des technisierten Alltags: Soziale Konstruktion und Repräsentation technischen Wandels in verschiedenen kulturellen Kontexten. Opladen, Westdeutscher Verlag.

Gizycki, R. & Ulrici, W. (1988) The brainworkers: typology, training, background and work situation. A report from the FAST-Programme of the Commission of the European Communities. München, Oldenbourg.

Glaser, B. & Strauss, A. (2007) The discovery of grounded theory: strategies for qualitative research. (first 1967) 2nd Paperback ed. New Brunswick, Aldine Transaction.

Götzfried, A. (2004) Who are Europe's highly qualified human resources and where do they all work? Statistics in focus. Science and technology 11(2004). Luxembourg: Eurostat.

Grant, R.M. (1991) The resource-based theory of competitive advantage: implications for strategy formulation. California Management Review, 33 (3), pp 114-135.

Gossmann, R., Pellert, A. & Gotwald, V. (1997) Krankenhaus, Schule, Universität: Charakteristika

und Optimierungspotentiale. In: Grossmann, R. Hrsg. Besser Billiger Mehr: Zur Reform der Expertenorganisation Krankenhaus, Schule, Universität. Wien, Springer, S 24-35.

Handy, C. (1990) The age of unreason. Boston, Harvard Business School Press.

Hanft, A. Hsg. (2000) Hochschulen managen?: Zur Reformierbarkeit der Hochschulen nach Managementprinzipien. Neuwied, Luchterhand.

Hauber, R. (2002) Performance Measurement in der Forschung und Entwicklung: Konzeption und Methodik. Wiesbaden, Deutscher Universitäts Verlag.

Herman, S. (2004) Produktive Wissensarbeit: Eine Herausforderung. In: Hermann, S. Hrsg Ressourcen strategisch nutzen: Wissen als Basis für den Dienstleistungserfolg. Stuttgart, Fraunhofer IRB-Verlag; S 207-228.

Horibe, F. (1999) Managing knowledge workers: new skills and attitudes to unlock the intellectual capital in your organization. Toronto, John Wiley.

Hron, J. (2000) Motivationale Aspekte von beruflicher Expertise: Welche Ziele und Motive spornen Experten im Rahmen ihrer Arbeit an? München, Utz.

Hube, G. (2005) Beitrag zur Beschreibung und Analyse von Wissensarbeit. Dissertation, Institut für Arbeitswissenschaft und Technologiemanagement der Universität Stuttgart.

Huber, B. (1999) Experts in organizations. Paper presented at the 1999 Academy of Business & Administrative Sciences (ABAS) International Conference, Barcelona, (Spain), July 12-14. Zürich, Institute for Research in Business Administration of the University of Zurich.

Kelley, R.E. (1990) Managing the new workforce, in: Machine Design, 62 (9), pp. 109-113.

Klatezki, T. & Tacke, V. Hsg. (2005) Organisation und Profession. Wiesbaden, VS Verlag für Sozialwissenschaften.

Kleinert, J. et al. (2000) Globalisierung, Strukturwandel und Beschäftigung. Tübingen, Mohr Siebeck.

Lamnek, S. (2005) Qualitative Sozialforschung: Lehrbuch. 4. vollst. überarb. Aufl. Weinheim, Beltz.

Levy, F. & Murnane, R.J. (2006) How computerized work and globalization shape human skill demands. MIT IPC Working Paper 05-006 [Internet], Boston, Massachusetts Institute of Technology. Available from: <http://web.mit.edu/ ipc/publications/pdf/05-006.pdf> [Accessed 09 January 2007].

Machlup, F. (1962) The production and distribution of knowledge in the United States. Princeton, University Press.

Malik, F. (2006) Führen, leisten, leben: Wirksames Management für eine neue Zeit. Komplett überarb. Neuaufl. Frankfurt, Campus.

Mieg, H.A. & Pfadenhauer, M. Hsg. (2003) Professionelle Leistung – Professional Performance: Positionen der Professionssoziologie. Konstanz, UVK Verlagsgesellschaft

Mintzberg, H. (2003) The professional organization. In: Mintzberg H. et al. eds. The strategy process: concepts, contexts, cases. 4. ed. Upper Saddle River, Prentice Hall, pp.372-382.

Newell, S. et al. (2002) Managing knowledge work. Houndmills, Palgrave Macmillan.

OECD (1999) The knowledge-based economy: a set of facts and figures. Paris, Organisation for Economic Co-operation and Development.

OECD (2006a) OECD employment outlook. 2006 edition: boosting jobs and incomes. Paris, Organisation for Economic Co-operation and Development.

OECD (2006b) Education at a glance. OECD indicators 2006. Indicator A8: labour force participation by level of educational attainment [Internet]. Paris, Organisation for Economic Co-operation and Development. Accessible at: <http://www.oecd.org/document/6/0,2340,en_2649_34515_37344774_1_1_1_1,00.html> [Accessed 07 January 2007].

Pedell, K.L. (1985) Analyse und Planung von Produktivitätsveränderungen. Zeitschrift für betriebswirtschaftliche Forschung, 37 (12), S 1078-1097.

Pellert, A. (1999) Die Universität als Organisation: Die Kunst, Experten zu managen. Studien zu Politik und Verwaltung 67. Wien, Böhlau.

Pfadenhauer, M. (2003) Professionalität: Eine wissenssoziologische Rekonstruktion institutionalisierter Kompetenzdarstellungskompetenz. Opladen, Leske und Budrich.

Pfiffner, M. & Stadelmann, P. (1999) Wissen wirksam machen: Wie Kopfarbeiter produktiv werden. 2. unveränd. Aufl., Bern, Haupt.

Prahalad, C.K. & Hamel, G. (1990) The core competence of the corporation. Harvard Business Review, 68 (3), May-June, 1990, pp 79-93.

Raelin, J. A. (1991) The clash of cultures: managers managing professionals. Boston, Harvard Business School Press.

Reinberg A. & Hummel, M. (2002) Zur langfristigen Entwicklung des qualifika-tionsspezifischen Arbeitskräfteangebots und –bedarfs in Deutschland: Empiri-sche Befunde und aktuelle Projektionsergebnisse. Mitteilungen aus der Arbeitsmarkt- und Berufsforschung, 35 (4), S. 580-600.

Reinberg. A. & Hummel, M. (2005) Höhere Bildung schützt auch in der Krise vor Arbeitslosigkeit. IAB-Kurzbericht Nr.9. Nürnberg, Institut für Arbeitsmarkt- und Berufsforschung.

Sackmann, S.A. (1991) Cultural knowledge in organizations: exploring the collective mind. Newsbury Park, Sage.

Sackmann, S.A. (2002) Unternehmenskultur: Erkennen – Entwickeln – Verändern. Neuwied, Luchterhand.

Shapero, A. (1989) Managing professional people: understanding creative performance. New York, Free Press.

Sonnentag S. (1996) Experten in der Software-Entwicklung: Untersuchung hervorragender Leistungen im Kontext intellektueller Teamarbeit. Habilitationsschrift, Fachbereich Psychologie der Justus-Liebig-Universität Gießen.

Stam, C. (2007) Knowledge productivity: designing and testing a method to diagnose knowledge productivity and plan for enhancement. Ph.D. thesis, Universiteit Twente.

Sumanth, D.J., Omachonu, V.K. & Beruvides, M. G. (1990) A review of the state-of-the-art research on white collar / knowledge-worker productivity. International Journal of Technology Management, 5 (3), pp 337-355.

Sveiby, K.E. (1998) Wissenskapital – das unentdeckte Vermögen: Immaterielle Unternehmenswerte aufspüren, messen und steigern. Landsberg, Moderne Industrie.

UK National Statistics (2000) Standard occupational classification 2000 (SOC 2000): summary of structure [Internet]. London, UK National Statistics. Available at <www.statistics.gov.uk/methods_quality/ns_sec/downloads/SOC2000.doc> [Accessed 09 January 2007].

UK National Statistics (2006) All in employment by socio-economic classification (NS-SEC) (Not seasonally adjusted) [Internet]. London, UK National Statistics. Accessible at: <http://www.statistics.gov.uk/STATBASE/ ssdataset.asp?vlnk=7919> [Accessed 20 August 2008].

US Department of Labor (2006) Occupational outlook handbook [Internet]. Washington, Bureau of Labor. Accessible at: <http://www.bls.gov/ oco/home.htm> [Accessed 09 January 2007].

Wallace, J.E. (1995) Organizational and professional commitment in professional and nonprofessional organizations. Administrative Science Quarterly, 40 (2), pp. 228 - 255.

Weidig, I. et al. (1999) Arbeitslandschaft 2010 nach Tätigkeiten und Tätigkeitsniveau. Beiträge zur Arbeitsmarkt- und Berufsforschung Nr. 227. Nürnberg, Institut für Arbeitsmarkt- und Berufsforschung.

Wernerfeldt, B. (1984): A resource-based view of the firm. Strategic Management Journal, 5, pp 171-180.