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A MANUAL FOR HUMANIZED OFFICE INFORMATION SYSTEMS DESIGN

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ABSTRACT:
Designing humanized and efficient systems for office information systems requires broad ergonomic knowledge from both system developers, users and their representatives.

For quick and easy access to this broad spectrum of knowledge a manual on human factors guidelines would be helpful.

An example of such manual which is based on a task oriented approach and proposes a human centred, evolutionary and cooperative way of system development is presented in this paper.

1. INTRODUCTION

The "A manual for humanized office information systems design" (original title: "EDV im Büro - Handbuch zur menschengerechten Gestaltung", see /Tjoa 1990/) described in this paper is a result of the research project "Office information systems design guidelines" which is developed at the University of Vienna. This research project was funded by the Austrian Federal Ministry of Science and Research and the Austrian Trade Unions.

2. SCOPE

The increasing use of office information systems in business and administration (see /Frese 89/, /Bullinger 88/, /Friedrich 87/, /Katz 87/, /Congress U.S. 85/, /Baethge 86/, /Berger 84/) actualizes more and more the problem of the *acceptance* of these systems *by the user*. The acceptance problem has been identified as a *key stone for the successful implementation* of these systems (see /Müller-Böling 86/, /Hirschheim 86/, /Picot 85/).

Improved acceptance cannot be reached by hardware ergonomic precautions only. In addition, design guidelines for software and tasks are a necessity (see /Nullmeier 88/).

A new working area is emerging for EDP-specialists, users, work council members and managers with a need of high qualification. Adequate instruments for these persons which can serve as a help to solve these new problems and challenges (see /Ackermann 88/). The proposal manual is one kind of such an instrument.

3. AIM, AUDIENCE AND SCOPE OF THE MANUAL

The **aim** of the manual is to make available a tool for both *efficient and humanized design* of office information systems from its beginning in the planning and organization to its installation and maintenance phase.

Primary **audiences** of the manual are on the one hand *system developers* (e.g. EDP-specialists, work organizators) and on the other hand *users and their representatives* (i.e. work council members). The audience in general is not restricted to this group. This manual could also serve as a reference for students and all persons interested in the ergonomic design of office information systems.

The **scope of the manual** is the *administrative area of offices* of different business branches, where computer aided tasks are considered.

4. BASIC DESIGN PRINCIPLES; STRUCTURE AND CONTENT OF THE MANUAL

4.1 Basic design principles

4.1.1 The task oriented approach

Figure 1 shows the four main elements of the work system (i.e. the office) considered in this manual. They should be taken into account in the establishment of office information systems.

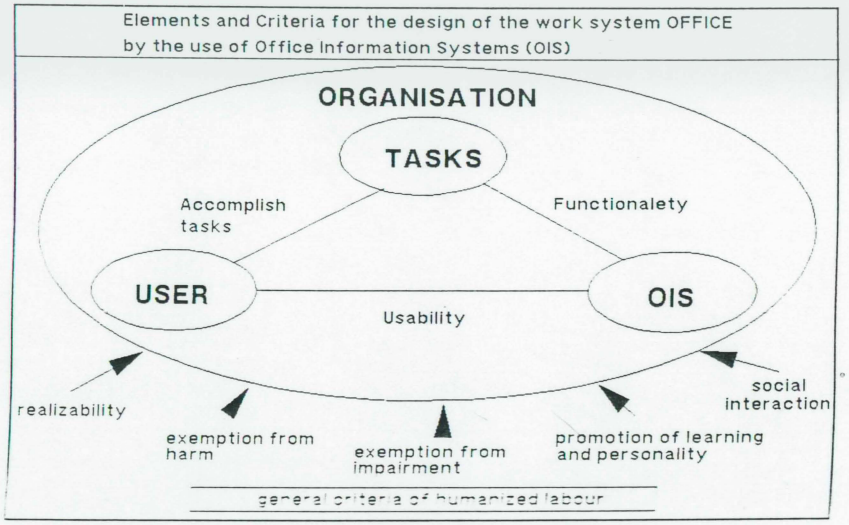

Figure 1

The approach used in this manual is **task oriented**, i.e. the office-tasks and the workers performing these tasks build the centre of our considerations and design criteria. The reason for this approach is that tasks play the key role for efficiency and social implications for office workers (see /Dunckel 89/, /Hacker 87/).

This view point leads to a design concept of an office information system which balances organization, tasks *and* workers. This means that ergonomic, business and EDP-technical criteria are considered with equal weight. This is the only way to achieve the goal 'creating humanized labour'.
Dependencies and conflicts exists between these criteria. We will show that these criteria do not a-priori exclude simultaneous optimization.

Figure 1 shows the general criteria of work psychology and organization psychology for creating humanized labour. These criteria are detailed and related with concrete guidelines to make the manual practicable.

4.1.2 The design procedure

Figure 2 shows the approach chosen in this manual to proceed design of office information systems (design-levels, design direction, and design margin).

The use of a task oriented approach leads to a **human centred** (anthropo-centred) way of proceeding (see /Nullmeier 88/, /Baitsch 89/, /Hacker 87/, /Kubicek 86/). This implies a design direction in which first the distribution of tasks between the involved workers is performed (Human-human function allocation). In the next step the working-procedures (tasks) are designed (design of working-procedures). As late as in the next step the allocation of tasks between workers (users) and the office information system (Human-Computer function allocation) is performed. The actual design of the office information system (i.e. Software on the tool, dialogue, input-output level of the IFIP-model and hardware) and the design of the workplace and the working environment is done after the organizational design is performed.

An **evolutionary** way of proceeding is proposed. The necessity of such an approach is stressed by an expert-questionaire /Aschersleben 89/. After the introduction of an office information system the evolutionary way of proceeding implies repetition of all development phases (development cycle). New and modified requirements resp. detected errors within and after the development process lead to a redo of previous design-phases. This means that principles and guidelines are valid for the whole life-time of the office information system. Different kinds of *prototyping* are proposed to support this way of proceeding (see /Baitsch 89/, /Spitta 89/, /Hoppe 88/, /Pomberger 88/, /Mehl 88/).

To satisfy different user interests and requirements a **cooperative** way of proceeding is thought to be fundamental (see /Koslowski 87/, /Peschke 86/, /Mambrey 85/, /Mehl 87/). The whole design process can be understood as a *learning process* for all persons involved in the system development. This allows the users of the system to participate actively by the help of their knowledge and experience.

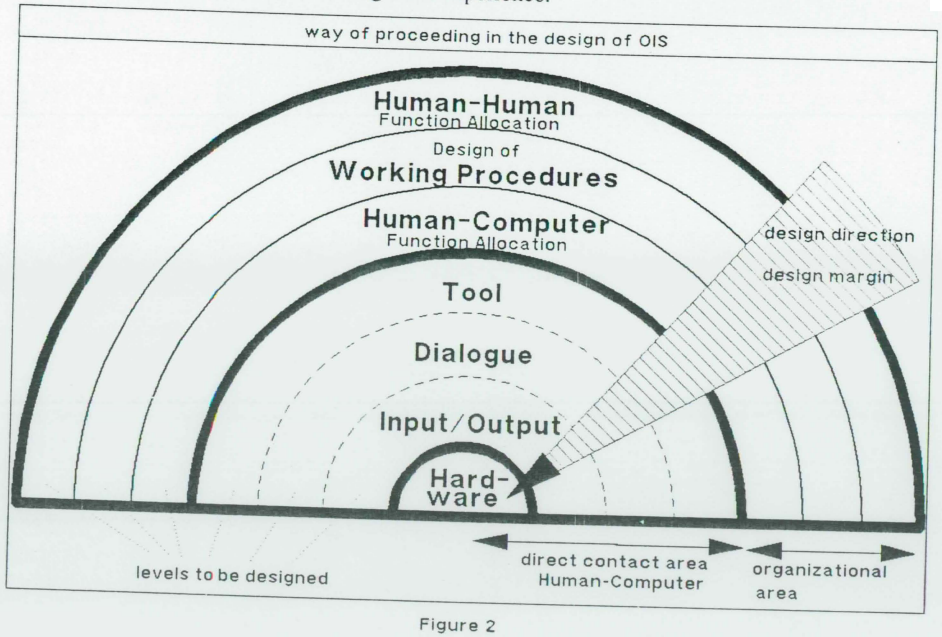

Figure 2

4.2 Structure and Contents of the Manual

In a brief **introduction** the main aspects of humanized design of office information systems (i.e. approach, way of proceeding, influencing factors, juridical aspects, etc.) are described.

The **use of the manual** is facilitated by a proceeding model (see Figure 3) and a graphic overview (as a kind of a graphical table of contents). Different entry points makes it possible to handle the manual (i.e. depend on the current state of the design process resp. audience). This means that a goal oriented access to different chapters of the manual is made possible.

In the following **practical guidance for a humanized design of office information systems** the phases of the proceeding model are described in detail. The proceeding model starts with the idea to introduce an office information system (phase 1) and terminates with the use of the system including the maintenance (phase 8). This proceeding model can be thought of as a framework in which both "classical" and "modern" models of system development can be embedded.

Design activities necessary for *each phase* and considered *ergonomic guidelines* are described in detail. Great emphasis is given to the description of the qualification requirements and the necessary qualifying guidelines.

The set of **guidelines for humanized design** are summarized in an own chapter. This set forms a kind of "*ergonomic check-list*" for all persons involved in the design process. The guidelines can be assigned to the following design-areas:

- Organization and task design [1]
- Software design [2]
- Hardware and workplace design [3]

The end of this chapter is dedicated to references on existing standards and design guidelines.

Since for the audience one or several topics of the manual could be a novelty the last chapter of the manual deals with **fundamentals** to the following aspects:

- Ergonomic design and evaluation criteria
- Description of typical office information system functions
- Methods and tools for the design of office information systems
- Qualification

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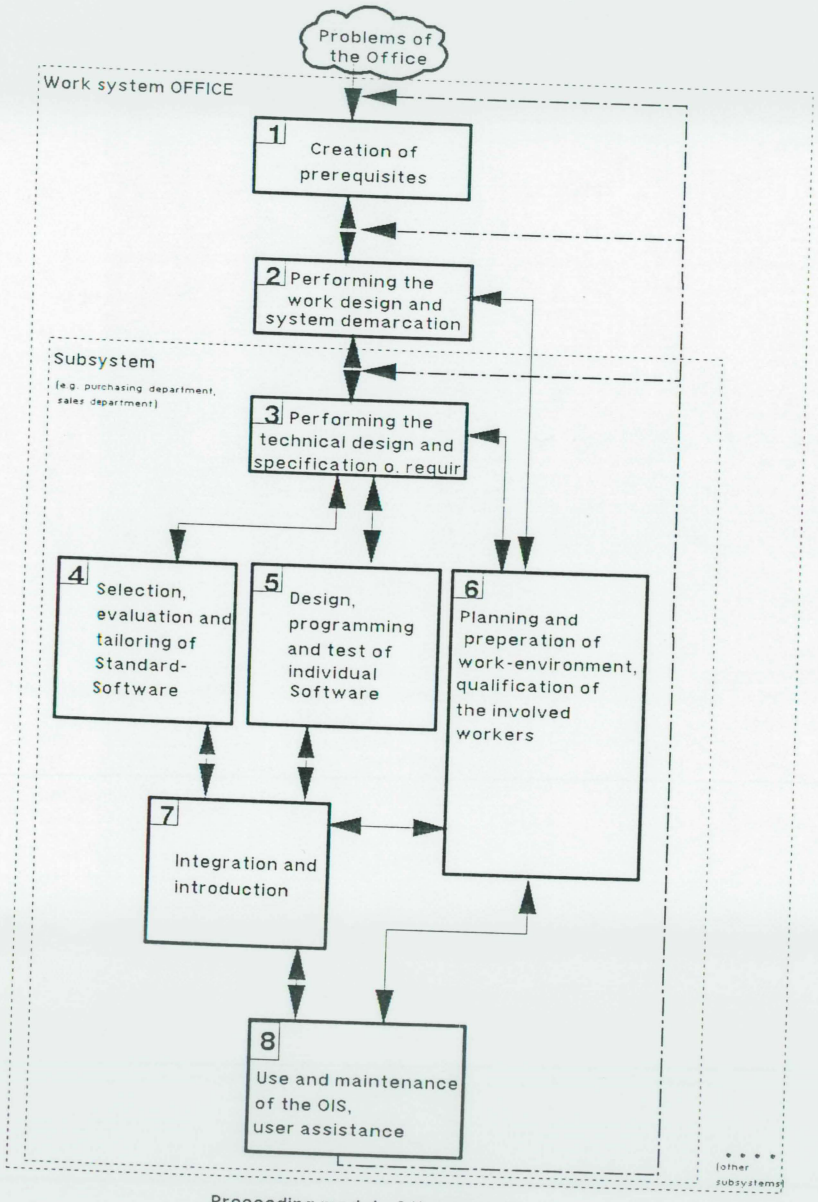
[1] see /Baitsch 89/, /Frese 89/, /Dunckel 89/, /Hacker 89/, /Hacker 87a/, /Rudolph 87/, /Rödinger 86/, /Krüger 88/, /Hartmann 88/, /Ulich 88/, /Dohr 88/, /Kiesmüller 87/, /Spinas 83/

[2] see /Baitsch 89/, /Frese 89/, /DIN 66234 Teile 3/5/8/, /VDI 5005/, /Oppermann 88/, /Lang 88/, /Oetinger 88/, /Heeg 88/, /Smith 86/, /Galitz 85/, /Shneiderman 87/, /Staufer 87/

[3] see /Grandjean 87/, /Helander 87/, /Frieling 87/, /Weinert 87/, /Gewerkschaft der Privatangestellten 87/, /TUC 85/, /TCO 86/, /Spinas 83/.



Proceeding model of the manual

Figure 3

5. METHODOLOGY OF THE CONCEPTION OF THE MANUAL

As shown in Figure 4 the methodological approach can be grouped into two project phases. This approach fits with the requirement of practical use of the manual.

In the **first phase** (begin of the project: June 1988) a brochure (see /Gewerkschaft der Privatangestellten 88/) was written, which was the basis for subsequent lectures, tutorials, and workshops. Audience of these events were user groups, their representatives, computer manufacturers and EDP-specialists.

The definition of the requirements for the manual (e.g. main emphasis, understandability, etc.) was essentially guided by the experience gained in these meetings.

In the **second phase** a scientific report was written (finished in November 1989) which builds the basis of the manual. The manual was written within a tight cooperation with the Austrian Trade Unions (Committee of Automation and Work Design) (Publishing date: Mid 1990).

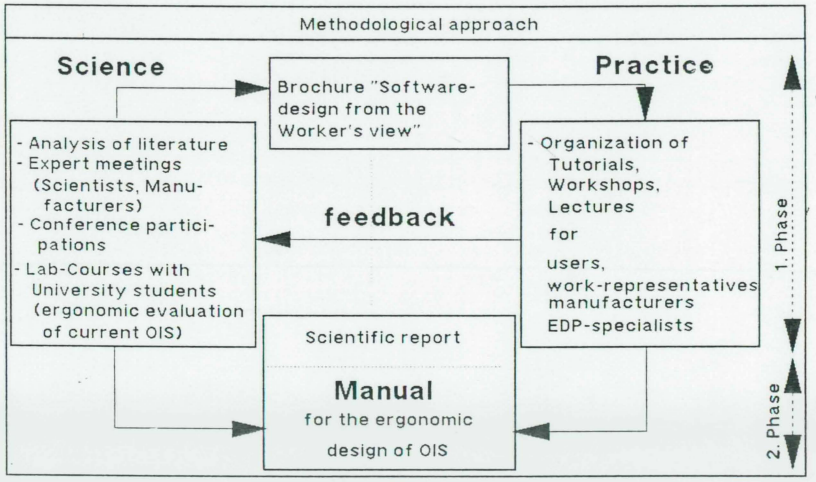


Figure 4

6. FUTURE WORK

In another research project an evaluation procedure of office information systems will be developed. This project will introduce an integrative evaluation approach. This work will be done in cooperation with GMD-Bonn (Gesellschaft für Mathematik und Datenverarbeitung - Research group: Human-Machine-Communication). The software evaluation guide EVADIS will be the basis of this future work. Our integrative evaluation procedure will perform a new instrument for EDP-specialists and work representatives to control the realization of ergonomic guidelines.

7. REFERENCES

Ackermann 1988 Ackermann D.: Empirie des Softwareentwurfs: Richtlinien und Methoden, in: **Balzert 1988**, S. 253-276

Aschersleben 1989 Aschersleben G., u.a.: Der Prozeß der Software-Gestaltung - Eine Bestandsaufnahme in Wissenschaft und Industrie, in: Maaß S, Oberquelle H. (Hrsg.): Software-Ergonomie '89, Aufgabenorientierte Systemgestaltung und Funktionalität, Teubner-Verlag, Stuttgart, 1989, S.244-253

Baethge 1986 Baethge M., Oberbeck H.: Zukunft der Angestellten, Campus, Frankfurt, 1986

Baitsch 1989 Baitsch C., Katz C., Spinas P., Ulich E.: Computerunterstützte Büroarbeit, ZDF-Verlag, Zürich, 1989

Balzert 1988 Balzert H., u.a. (Hrsg.): Einführung in die Software-Ergonomie, De Gruyter, Berlin, 1988

Berger 1984 Berger U.: Wachstum und Rationalisierung der industriellen Dienstleistungsarbeit, Campus, Frankfurt, 1984

Bullinger 1988 Bullinger H.-J. (Hrsg.): Information Technology for Organisational Systems - Concepts for increased Competitivness, (Proceedings of the First European Conference on Information Technology for Organisational Systems - EURINFO'88, Athens, Greece, 16.-20.5.'88), North-Holland, Amsterdam, 1988

Congress U.S. 1985 Congress of the U.S.: Automation of America's Offices 1985-2000, U.S. Government Printing Office, Washington D.C., 1985

DIN 66234/3 1981 DIN 66234 Teil 3: Bildschirmarbeitsplätze, Gruppierung und Formatierung von Daten, März 1981

DIN 66234/5 1981 DIN 66234 Teil 5: Bildschirmarbeitsplätze, Codierung von Information, Berlin, März 1981,

DIN 66234/8 1988 DIN 66234 Teil 8: Bildschirmarbeitsplätze, Grundsätze der Dialoggestaltung, Februar 1988

Dohr 1988 Dohr W., u.a. (Hrsg.): Datenschutzgesetz, Manz Verlag, Wien, 1988

Dunckel 1989 Dunckel H.: Arbeitspsychologische Kriterien zur Beurteilung und Gestaltung von Arbeitsaufgaben im Zusammenhang mit EDV-Systemen, in: Maaß S., Oberquelle H.(Hrsg.): Software-Ergonomie '89, Aufgabenorientierte Systemgestaltung und Funktionalität, Teubner-Verlag, Stuttgart, 1989, S.69-79

Floyd 1987 Floyd Ch.: STEPS - eine Orientierung der Softwaretechnik auf sozialverträgliche Technikgestaltung, in: Informatik Forum 2/1987, S.40-45

Frese 1989 Frese M., Brodbeck F.: Computer in Büro und Verwaltung, Springer-Verlag, Berlin, 1989

Friedrich 1987 Friedrich J., u.a..: Zukunft der Bildschirmarbeit, Bundesanstalt für Arbeitsschutz, Fb. 506, Dortmund, 1987

Frieling 1987 Frieling E., u.a.: Gestaltung von CAD- Arbeitsplätzen und ihrer Umgebung, Bundesanstalt für Arbeitsschutz FB 503, Bonn, 1987

Galitz 1985 Galitz W.: Handbook of Screen Format Design, North-Holland, Amsterdam, 1985

Gewerkschaft der Privatangestellten 1987 Gewerkschaft der Privatangestellten (Hrsg.): Richtlinien zur Gestaltung von Bildschirmarbeit, ÖGB-Verlag, Wien, 1987 (2.Auflage)

Gewerkschaft der Privatangestellten 1988 Gewerkschaft der Privatangestellten (Hrsg.): Softwaregestaltung aus Arbeitnehmersicht, ÖGB-Verlag, Wien, 1988

Grandjean 1987 Grandjean E.: Ergonomics in Computerized Offices, Taylor & Francis, 1987

Hacker 1984 Hacker W.: Psychologische Bewertung von Arbeitsgestaltungsmaßnahmen - Ziele und Bewertungsmaßstäbe, Springer-Verlag, Berlin, 1984 (2.Auflage)

Hacker 1987 Hacker W.: Software-Gestaltung als Arbeitsgestaltung, in: Fähnrich K. (Hrsg.): Software-Ergonomie, Oldenbourg, München, 1987, S.29-42

Hacker 1987a Hacker W.: Software-Ergonomie: Gestalten rechnergestützter geistiger Arbeit?!, in: Schönpflug W., Wittstock M. (Hrsg.): Software-Ergonomie '87, Nützen Informationssysteme dem Benutzer, Stuttgart, 1987, S. 31-54

Hacker 1989 Hacker W., u.a.: Hilfsmittel für die kooperative Aufgabenanalyse - Eine Voraussetzung aufgabenorientierter Systemgestaltung, in: Maaß S., Oberquelle H. (Hrsg.): Software-Ergonomie '89, Aufgabenorientierte Systemgestaltung und Funktionalität, Teubner-Verlag, Stuttgart, 1989, S. 89-99

Hartmann 1988 Hartmann C.: Planungs- und Gestaltungshilfen für integrierte Techniken in Büro und Verwaltung, Bundesanstalt für Arbeitsschutz, Dortmund, 1988

Heeg 1988 Heeg F.: Empirische Software-Ergonomie, Springer Verlag, Berlin, 1988

Helander 1987 Helander M.G.: Design of Visual Displays, in: **Salvendy 1987**, S. 507-548

Hirschheim 1986 Hirschheim R.: Understanding the Office: A Social-Analytic Perspective, in: ACM Transaction on Office Systems, October 1986, S. 331-344

Hoppe 1988 Hoppe H.: Werkzeuge für die Prototypenentwicklung von Benutzerschnittstellen, in: **Balzert 1988**, S. 277-298

Katz 1987 Katz C., u.a.: Arbeit im Büro von Morgen, Verlag des Schweizerischen Kaufmännischen Verbandes, Zürich, 1987

Kiesmüller 1987 Kiesmüller T., u.a.: Arbeitsstrukturierung in typischen Bürobereichen eines Industriebetriebes (ASTEX), Bundesanstalt für Arbeitsschutz Fb 512, Bonn, 1987

Koslowski 1987 Koslowski K.: Unterstützung von partizipativer Systementwicklung durch Methoden des Software Engineering, GMD Arbeitspapier 242, Bonn, 1987

Krüger 1988 Krüger D., Nagel A.: Mischarbeit im Büro- u. Verwaltungsbereich beim Einsatz neuer Technologien, Bundesanstalt für Arbeitsschutz, Dortmund, 1988 (2.Auflage)

Kubicek 1986 Kubicek H, Rolf A.: Mikropolis, VSA-Verlag, Hamburg, 1986 (2.Auflage)

Lang 1988 Lang J., Peters H.: Erhebung ergonomischer Anforderungen an Software, die überprüfbar und arbeitswissenschaftlich abgesichert sind, TÜV Bayern, München, 1988

Mambrey 1985 Mambrey P., Oppermann R.: Benutzerbeteiligung bei der Systementwicklung, Einschätzung der Möglichkeiten durch Experten, in: Angewandte Informatik, März 1985, S. 111-119

Mehl 1987 Mehl W., Reisin F., u.a..: Skandinavische Ansätze zur kooperativen Gestaltung (Institutsbericht), Berlin, 1987

Mehl 1988 Mehl W., Reisin F., u.a.: Prototyping als Technik im Kontext partizipativer Systementwicklung (Institutsbericht), Berlin, 24.Juni 1988

Müller-Böling 1986 Müller-Böling: Akzeptanzfaktoren der Bürokommunikation, Oldenbourg, Wien-München, 1986

Nullmeier 1988 Nullmeier E., Rödiger K.-H.: Dialogsysteme in der Arbeitswelt, Bibliographisches Institut, Angewandte Informatik, Mannheim, 1988

Österle 1988 Österle H.: Anleitung zu einer praxisorientierten Software-Entwicklungsumgebung, Band 1 und Band 2, AIT, Halbergmoos, 1988

Oetinger 1988 Oetinger R.: Benutzergerechte Software-Entwicklung, Springer Verlag, Berlin, 1988

Oppermann 1988 Oppermann R., u.a.: Evaluation von Dialogsystemen, Der softwareergonomische Leitfaden EVADIS, Walter de Gruyter, Berlin, 1988

Peschke 1986 Peschke H.: Betroffenenorientierte Systementwicklung, Peter Lang, Frankfurt, 1986

Picot 1985 Picot A., Reichwald R.: Bürokommunikation, CW-Publikation, 1985, (2.Auflage)

Pomberger 1988 Pomberger G.: Integration von Prototyping in Software-Entwicklungsumgebungen, in: **Österle 1988**, S. 101-116

Rödiger 1986 Rödiger K.-H.: Verfahren zur Ermittlung von Regulationserfordernisse in der Arbeitstätigkeit im Büro (VERA/B), Berlin, 1986

Rudolph 1987 Rudolph E., Schönfelder E., Hacker W.: Tätigkeitsbewertungssystem - Geistige Arbeit (TBS-GA), Berlin (DDR), 1987 (im Vertrieb von Hogrefe-Verlag Göttingen)

Salvendy 1987 Salvendy G. (Hrsg.): Handbook of Human Factors, John Wiley & Sons, New York, 1987

Shneiderman 1987 Shneiderman B.: Designing the User Interface: Strategies for Effective Human-Computer Interaction, Addison-Wesley Publ., USA, 1987

Smith 1986 Smith S. L., Mosier J. N.: Guidelines for Designing User Interface Software, MITRE, Bedford, Mass., 1986

Spinas 1983 Spinas P., Troy N., Ulich E.: Leitfaden zur Einführung und Gestaltung von Arbeit mit Bildschirmsystemen, CW-Publikationen, Zürich, 1983

Spitta 1989 Spitta T.: Software Engineering und Prototyping, Springer, Berlin, 1989

Staufer 1987 Staufer M.: Piktogramme für Computer, Reihe: Mensch Computer Kommunikation Band 2, Walter de Gruyter, Berlin, 1987

TCO 1986 TCO: Der Bildschirmprüfer, TCO, Informgruppe, 1986

Tjoa 1990 Tjoa A Min, Kolm P., Koch M., Reiterer H., Gärtner J.: EDV im Büro - Handbuch zur menschengerechten Gestaltung, Oldenbourg, Wien, 1990

TUC 1985 TUC: TUC Guidelines on VDUS, TUC, London, 1985

Ulich 1988 Ulich E.: Arbeits- und organisationspsychologische Aspekte, in: **Balzert 1988**, S. S. 49-66

VDI 5005 Verein Deutscher Ingenieure.: VDI-Richtlinien, Bürokommunikation, Software-Ergonomie in der Bürokommunikation, VDI 5005 (Entwurf), Beuth, Düsseldorf, November 1988

Weinert 1987 Weinert R.: Menschengerechte Arbeitsgestaltung im Büro, ÖTV, Stuttgart, 3. 1987