

## PRINCIPLES OF A UNIVERSAL INFORMATION SYSTEM IN OCCUPATIONAL MEDICINE

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### ABSTRACT

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An information system designed to answer three major questions is described. The questions are: which kind of information should an information system contain, which information technologies can the system use and which technologies suit the system best?

The advantages of the system are compared with other information systems.

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A universal information system in occupational medicine should contain nine different kinds of information:

1. Literature records
2. Original presentations
3. Laws, prescriptions and norms
4. Statistical data
5. Addresses
6. Expert records
7. Current research records
8. Internal texts
9. Audiovisual media

In 1973 "IDIS" (Institute für Dokumentation und Information über Sozialmedizin und öffentliches Gesundheitswesen) was instructed to build up such a universal information system by a European Community Commission.

The principles of the system have already been described<sup>1,3</sup>. The Commission financed the step-by-step set-up of this system:

1. The literature records have been collected for the "IDIS" electronic data processing (EDP) system, and are now available in a record pool of 33 000 titles in occupational medicine.
2. The problems of assembling original literature have been mainly solved and analysed in respect to copyright.
3. Fundamental principles have been developed for assembling and modifying laws, prescriptions and norms.

4. Data documentation will be developed following the example of a data pool for noxious substances. Proposals have been worked out<sup>1</sup>.
5. and 6. A system of addresses and expert records has been worked out and is described elsewhere<sup>3</sup>.
7. Current research records are used already in practice.
8. Analyses of internal texts are not yet done, but no unsurmountable difficulties are expected in their development.

Techniques and organisation of producing, recording and disseminating audiovisual media are developed in general and can be demonstrated on models.

For the compilation of the above input information, the information technology offers three methods: the conventional method, the EDP-method and the combined conventional and electronic method.

The conventional method uses occupational medicine periodicals, printed current research documentation, a collection of prescriptions in folders, special print-outs for titles of papers (original literature), a tear-sheet-collection of laws, a catalogue of toxic substances, a directory, a special collection of teaching appliances, etc. The costs are relatively low but the results are neither handy nor well arranged.

The electronic data processing (EDP) method, operating with terminals, ensures clarity and practicability, but is very expensive. The yearly costs for one-hour daily use within a medium distance of 200 km from the central operating computer would amount to 15 000 DM for the terminal rent, 10 000 DM for telecommunication and 7 000 DM for the computer rent, totalling 32 000 DM.

A combined conventional and electronic method has been developed in our institute and published under the name "IDIS - MICRODOC"<sup>2</sup>. "IDIS" is the abbreviation for "Institut für Dokumentation und Information über Sozialmedizin und öffentliches Gesundheitswesen" and "MICRODOC" stands for **M**icrofiche **I**nformation system with **C**omputer compatibility and **R**otating **O**bjects (register) for the **D**ocumentation of visual (**O**ptic) and acoustic data in **C**oordination. This information system uses the microfiche as a storage medium.

A microfiche is a film slide, the size of a postcard which is used for recording all visual data either in black and white or in colour, for instance: journal articles, dissertations (grey literature), laws, prescriptions, etc., tables, statistics, standardisations, toxicological data, addresses of experts, photos, different forms of registers, etc. It assembles all these data scaled down with a dissemination factor of 1:42. This extreme dissemination allows to fix 200 standard pages on one slide. A copy of a microfiche costs about 0.16 DM which is more than 20-time less than the respective costs for papercopies, print-outs, mailing, etc. The microfiche as a storage medium allows for the first time to realize in practice complete presentation of all kinds of information which could be important for the researcher and practitioner in occupational medicine.

Only the microfiche medium is capable of storing and presenting information in the way that the researcher and the practitioner have access to them at their workplace.

"Computer compatibility" means preparation of all texts and data for computer composing and processing. The preparation follows the rules for information processing, so that the data pool can be integrated into all existing documentation and information processing and delivering systems. This is indispensable if we want to avoid double work and to guarantee the operating of a rotating register of objects.

A register of objects is a well-known register of data only confined to special issues for instance a literature register, a law register, address register, statistics register etc. The quality of the rotating register greatly increases the rate of publications retrieval. This can be demonstrated by means of an example. A journal article is titled: "Epidemiologie des gleichzeitigen Vorkommens von Lungenfibrose und Bronchialcarcinom bei Gießereiarbeitern in Abhängigkeit von Lebensalter und von der Expositionszeit." This article, at least in its title, contains 6 aspects, which could appear in the register under the following 6 keywords: Epidemiologie, Lungenfibrose, Bronchialcarcinom, Gießerei, Lebensalter, Exposition. In a register of the usual shape this article could be found either under "Lungenfibrose" or under "Bronchialcarcinom" or "Gießerei" etc. If it is classified under "Lungenfibrose" the problem could never be found under any other keyword, because it only has this one place in the register. This can be avoided if the microfiche is combined with electronic data processing. The computer rotates the list of keywords so that each keyword appears once in its alphabetical place and is accompanied by all the others for a better definition. Microfiches contain these comprehensive registers in such an extreme grade of scaling down, that they all the same remain handy. A register for about 10 000 articles would not fill more than 7 microfiches, which is equivalent to about 2 sheets of typing paper.

Documentation of coordinated visual and acoustic information describes the aim, which is not to document visual facts alone, but also all auditive forms. All auditive materials are stored on tape. These two storage forms can be linked so that it is possible to present them synchronously.

Before deciding which of the three information technologies can best serve the occupational health practitioner it must first be stated which qualities such technology must have. There are 9 that could be comprised in 3 groups.

The respective technology should grant completeness of titles, completeness of texts and easy access to them. Further it must be handy, cheap and immediately retrievable. Also it must suit the system in respect to data processing, audiovisual media and information and documentation.

The first two issues need no additional explanation, but the third does. Suiting data processing means that all information in the system was transmitted to a level at which they can be computer processed. Suiting audiovisual media means that besides visual information auditive information, e.g. picture shown with soundtrack, lecture programme, etc. can be stored, recalled and reproduced. Suiting the information and documentation means that the system fits into a special information and documentation system, which is supported by the government of the Federal Republic of Germany and comprises 16 departments

of information subjects. The organisation and coordination of data must be adapted to this system.

If we analyse these three forms of presentation the following will show up as presented in Table 1. The conventional method is not complete because it cannot deliver audiovisual information. Texts like articles, laws, prescriptions etc. can be stored and reproduced unabridged, and storage could be made fully accessible in principle, yet a suitable register is seldom found.

TABLE 1  
Comparison of three kinds of information technologies.

|                  | Conventional | EDP terminal | IDIS MICRODOC |
|------------------|--------------|--------------|---------------|
| Complete sample  | (+)          | -            | +             |
| Complete texts   | +            | -            | +             |
| Easy access      | (+)          | +            | +             |
| Handy            | -            | -            | +             |
| Cheap            | (+)          | -            | +             |
| Immediate recall | (+)          | (-)          | +             |
| Suitable to EDP  | -            | +            | +             |
| Suitable to AV   | -            | -            | +             |
| Suitable to ID   | -            | +            | +             |

Difficulties in searching for legislative, physiological, toxicological data, etc. are well known because of the great number of various law collections, standard compendiums, title references, handbooks, copy storage of original texts, etc.

In contrast to a pure EDP system it is still cheap, but it is expensive compared with the IDIS-MICRODOC system. Costs of materials amount already to a factor of 1:15. It is not always accessible, because the concerned occupational health practitioner can hardly have all records at hand to sustain his decisions. Often he has to turn to other persons and institutions for the necessary records. This system is suitable neither to EDP nor to AV, nor to ID.

The second, the EDP-terminal system is not complete for it can only reproduce such information as can be presented on the screen. It cannot deliver complete texts. It can however give a first rate access to the material, if this has been decomposed by suitable documentation techniques. Yet how can it help the user if he knows that there is information available which he needs, but has no opportunity to obtain or only with difficulties? Also it is not cheap; regarding all expenses (e.g. rents, reductions, telecommunications, EDP costs) it costs 10 times as much as the conventional method. Only on rare occasions will an immediate access be possible, because hardly a practitioner will own a terminal or will own it in the near future. The system is of course fully suitable to EDP as by itself it represents the core of data processing techniques, but it does not suit the AV-information, as it cannot be presented on the terminal screen. The

method suits the ID-systems, the general scope of the programme of the Government of the Federal Republic of Germany. These programmes are based on the kind of information which can be processed on terminals.

The profile of the combined conventional-electronic method that is used by IDIS-MICRODOC is complete in every respect because it assembles, stores and reproduces all visual and auditive materials and therefore fulfills also the second condition, to present complete original texts. A highly efficient register enables the user to find each stored information with minimum effort. It is handy, because all needed information can be presented in one device. The storage medium is very cheap. About 15 printed/typed pages can be stored on microfiche at the cost of one page in paper copy. All information is immediately accessible by means of the reading device, which can be positioned directly near the workplace.

The system suits all EDP, AV and ID conditions and is therefore of universal use not only for practitioners but also in the context of related information systems. IDIS-MICRODOC stands for an EDP-compatible storage medium of highest capacity, at lowest expense, for visual and auditive information of all kinds, and fulfills all conditions of an efficient information system for the purpose of occupational medicine.

#### REFERENCES

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