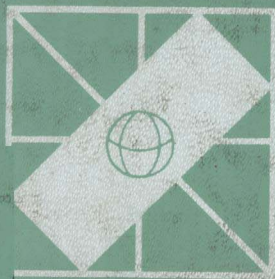# post-secondary and vocational education in data processing

tomorrow's needs for computing education and training

edited by

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POST-SECONDARY AND VOCATIONAL EDUCATION IN DATA PROCESSING

Tomorrow's Needs for Computing Education and Training

edited by

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PREFACE

This publication is an account of the proceedings of the IFIP Working Conference on "Post Secondary and Vocational Training" held in Amsterdam from 17th - 20th April, 1979.

The Conference was organised by the IFIP Working Group 3.4 and brought together specialists in computing, education and training from many countries. The Conference concentrated on the provision of specialist education and training for those who have left secondary school. It emphasised tomorrow's needs for computing education and training relative to commerce, industry and administration.

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Part I

INTRODUCTION

The motivation and structure of the conference are explained in this introduction.

THE STRUCTURE OF THE CONFERENCE

H.L.W. JACKSON

The International Federation for Information Processing (IFIP) has, as one of its
important objectives, the fostering and participating in international activities
in computer education. Its Technical Committee 3 (TC 3 - Education) has a Work-
ing Group 3.4 (WG 3.4) for Post-Secondary Education and Technical Training. This
Working Group realised the particular need for information concerning post-
secondary and vocational education in data processing. With this objective in
view the Working Group organised a Conference which was held in Amsterdam from
17th - 20th April, 1979.

The Conference brought together specialists in computing, education and training
from sixteen countries. It concentrated on the provision of specialist education
and training for those persons who have left secondary school. Current practices
were reviewed and the needs of the future explored. These future needs considered
the momentous changes in industrial and social organisation which will be brought
about by the use of micro-processors.

This account of the proceedings is divided into five parts, of which this intro-
ducation forms Part I. Part II surveys the present situation in a number of
countries with particular emphasis on the vocational aspect concerned with the
production of data processing personnel. Part III is an amalgam of the present
position in existing training systems within both governmental and company
educational centres. Projects are outlined which indicate new programmes of
education and further education in the field of data processing. The impact of
new technologies on existing courses and the consequent adaptation is discussed.
This part is completed by the report of a discussion session on courses and
qualifications. Part IV covers todays needs for practical training and data
processing experience and propounds new ideas to deal with this ever increasing
problem. New ways are put forward by which the relationship between practical
experience and formal data processing education can be achieved. It examines the
roles and relationships which ought to exist between "users" and computer people.
Learning processes, the objectives of vocational courses and the problems
encountered by those responsible for designing and organising such courses are
expounded. This part is rounded off by an account of the discussion concerning
the training of people for tomorrow's needs. Part V reports on the final dis-
cussion period which considered the impact of the micro-processor revolution on
informatics education and training. The provision of practical elements and their
evaluation in academic courses was included together with the consideration of
the levels of qualifications required in a career structure in informatics.

The apparent success of this Working Conference has motivated WG 3.4 to suggest
that there is a need to work on up-dating the knowledge of teaching staff in
post-secondary education in order to face the rapidly changing technology,
particularly in respect of micro-processors and distributed computing.

Part II

PRESENT SITUATION

This part presents the existing situation for computing education and training in various countries.

TWO APPROACHES TO VOCATIONAL EDUCATION
IN INFORMATICS IN THE NETHERLANDS

G. J. Groenenboom

INTRODUCTION

In the IFIP guide to concepts and terms in data processing (1) "Informatics"
is defined as those aspects of science and technology specifically applicable
to Data Processing and particularly to automatic data processing. Data
Processing then is "the execution of a number of operations (partially ordered
in time) upon data, for example handling, merging, sorting, computing". This
approach to Informatics and Data Processing has been criticized and I think with
reason. I shall return to this subject later on.

In the Netherlands there is no consensus of opinion about the meaning of the term
"Informatics". F.F. Land (2) states: "the Europeans have given wide acceptance
to the term Informatics, but even in Europe the definitions of Informatics range
from Computer Science to something akin to a new discipline. The split between
Computer Science and the new discipline is not universally accepted. They accept
a good deal of the argument for changes in the curriculum but consider that most
of the new material is derived from the concept of Computer Science."

Something about this difference in conception about the discipline of Informatics
we find in the two curricula for vocational education in Informatic (on a
post-secondary level) available in the Netherlands:

1. Informatics (H I O), offered in colleges for science and engineering studies
    (H T O).
2. Management Informatics (B I O), offered in colleges for business and
    management studies (H E A O).

These courses are offered by independent departments.

H I O (Informatics)

Originally the H I O was intended to provide software experts. Compelled by
necessity after the vanishing of a computer industry in the Netherlands, the
H I O started the education of information systems designers. In the H I O
Informatics and Computer Science are synonymous terms. Objects of study are the
computer and computer applications. There is a special relationship between
Informatics and Mathematics. The approach is rather mechanistic and formal.
The curriculum is growing with the needs. These needs originate from better
knowledge, developments in hardware and software, etc. We could call this the
evolutionary or bottom-up approach towards the discipline. A disadvantage could
be the inability to integrate the subjects of the discipline as closely as might
be desirable.

B I O (Management Informatics)

Information and information systems are objects of study in the B I O.
Originally the B I O was intended to train application software experts. Today
the B I O provides information system designers and information analysts.

An information system is part of an organisation consisting of men with their methods and machines. An information system has to meet information needs. Information needs originate from activities called "directed change" . Informatics could be: "Informatics encompasses the design, the construction, the evaluation, the use and maintenance of information processing systems including hardware, software, organisational and human aspects as well as the complex of their industrial, commercial, administrative, social and political impact". (3)

In the B I O Informatics is much more than training in Data Processing. You cannot separate data processing from information processing. I do not like the word data processing in the title of this working conference; information processing could be better. We should like to see information on three levels:

  - syntactic level (the level of structuring)
  - semantic level (the level of meaning)
  - pragmatic level (the level of intention and response)

In Data Processing we usually forget the pragmatic level. For this level we need knowledge from the social sciences. The design of information systems should start from an understanding of human characteristics. Management Informatics then is the discipline with information systems as the object of study, with particular stress on their role in the organisation.

FURTHER COMPARISON OF H I O AND B I O

	H I O	B I O
admission	secondary school (with Mathematics and English)	secondary school (with Mathematics and Economics)
total course duration	4 years	4 years
practical training	10 months (in the third or fourth year)	9 months (in the fourth year)
subject taught	(% of total time)	(% of total time)
1. Mathematics	25%	20%
2. Economics, Business and Management Sciences	15%	20%
3. Computer Science	35%	20%
4. Information Systems	17%	20%
5. Social Sciences	---	12%
6. Other subjects	8%	8%

REMARKS

  - Mathematics comprises subjects such as Statistics, Operations Research and Simulation.

  - Computer Science comprises subjects such as programming (software engineering), COBOL, ALGOL, SIMULA, computer organisation, data communication, file organisation and compiler construction (the latter in the H I O).

  - Information Systems comprises subjects such as systems analysis and

design, methods and techniques, data bases, systems theory, systems approach and administrative organisation (the latter only in the B I O).

- The Social Sciences comprises subjects such as Sociology, Psychology and Group Dynamics.
- Other subjects are for instance natural languages (English, French and German) and Law Studies.

REFERENCES:

1. IFIP Guide to concepts and terms in data processing,
    ed J H Gould 1971, North-Holland, Amsterdam.

2. F F Land, Efforts in education in Universities for large information systems; Education and large information systems,
    ed R A Buckingham, North-Holland, Amsterdam

3. IBI-Unesco Conference on "Strategic and Policies for Informatics 1978".
    Main working Document.

FURTHER INFORMATION ARISING FROM THE DISCUSSION

- The H I O started in 1972 and currently has about 400 students. The B I O started in 1973, with currently about 200 students.
- The four year study program comprises 32 lectures a week in the first year, 28 in the second and 24 in the third year, whereas in the fourth year students attend classes only for one day a week for 7 lectures.
- The demand for students from these courses by the industry is much larger than can currently be supplied.
- The drop-out rate is about fifty percent.

EDP PERSONNEL TRAINING
IN   ISRAEL
- STATE OF AFFAIRS -

D. Millin

The Rapid development of computer installations in
Israel, as opposed to a shortage of human resources,
requires the adoption of a comprehensive national
training policy in the EDP field.

General outlines and standards for the training of
computer manpower were recently elaborated and will
enable institutions to provide coordinated programmes,
thus allowing the country to cope with this issue.

INTRODUCTION

Israel, as a country with relatively few human resources and a rapid development
of computer installations, has adopted a national training policy, which is
carried out under the supervision of national institutions.

By and large, this training is either subsidized to a certain extent or fully
paid by the government.

The rationale behind this concept is that only non-profit institutions can take
into consideration the overall manpower needs in the computer field in the
country.

Beyond that, there is a national salary policy, based on contracts between
government and the trade unions. This collective contracts system is upheld by
all the national institutions and by most of the large private companies.

Given the present contracts, computer manpower is divided into three main
categories, for each of which there exists a special salary scale, divided as
follows:

1. General staff: coders, punch machine staff, operators, etc.;
2. Specialized technical staff: programmers, designers, analysts, etc.;
3. Academic staff: engineers, project managers, etc.

It is important that a national policy should be accepted only as long as the
employers have enough possibilities to provide reasonable rewards for those whom
the institution wants to promote. Essentially, therefore, a system of payments
should be carried out according to the need for professional personnel, which
provides enough motivation for all the required tasks.

On the other hand, there should be a close correlation between the salaries and
the number of hours spent by a person in his training. A clearly defined curri-
culum which will help to produce properly trained computer professionals and one
might save time and money for this kind of training by preparing a curriculum
according to the task analysis and the expected needs.