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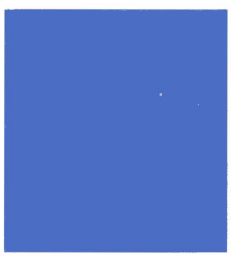

NEW INFORMATION TECHNOLOGY IN EDUCATION

THE NETHERLANDS

Commission of the European Communities

Document

Cataloguing data can be found at the end of this publication.

Luxembourg: Office for Official Publications of the European Communities, 1992

ISBN 92-826-4779-X

Printed in Luxembourg

Commission of European Communities

New Information Technology in Education

The Netherlands

Document

New Information Technology in Education

in the Netherlands

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February 1992

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PREFACE

This is the Dutch contribution to the European Community initiative once again in 1992 to publish 'Member State reports on NIT in Education'.

Ever since 1982, government in the Netherlands has been taking active steps to introduce information technology, later called the New Technologies, into education.
This Member State report provides a broad overview of activities since that date and identifies the results.

We have written the report for policy-makers and others interested in the policy aspects of the introduction of NIT.
In order not to obscure the main lines of policy, there is no exhaustive coverage of details and exceptions to the rule. Readers interested in further information can obtain it from the Netherlands Ministry of Education and Science.

Compiling the Member State report meant once again reviewing the achievements of the last ten years, achievements in which each of us were involved in our own particular way. From this retrospective standpoint, it is possible to draw an ever-increasing number of interesting conclusions and we hope that these will inspire colleagues in the EC to create opportunities which have elsewhere been missed and to avoid mistakes we made in the past.

The Hague, February 1992.

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1. BACKGROUND TO THE DUTCH EDUCATION SYSTEM

1.1 A distinctive feature of Dutch education: freedom of education

The Dutch Constitution establishes the principle of freedom of education. Freedom of education means that groups of private individuals have the right to establish schools on the basis of their own particular philosophy of life or their own views of society and/or education, and that these schools are then funded by government. This produces a wide variety of types of schools.
All schools qualify for government subsidy provided they meet the quality criteria laid down in various statutes and regulations, and provided they are likely to meet the minimum standard for student numbers.

There are two main categories of schools: publicly-run and privately-run. Publicly-run schools are controlled by the municipalities. Privately-run institutions fall into three groups, viz. roman catholic, protestant and non-denominational private schools (the last of which are not based on any system of religious belief, but do have a private school board). There are also schools run in accordance with islamic (1991: 20) and hindu (1991: 3) principles.
The Constitution places all the schools on an equal financial footing. This means that government expenditure on publicly-run education has to be matched in relation to privately-run education.
At present there are almost twice as many private as public schools, and a total of around 6300 school boards. The municipalities are the competent authority with regard to publicly-run education.

Educational freedom is limited by the Compulsory Education Act, which makes it compulsory for children up to the age of 16 years to attend an educational institution meeting the statutory requirements and measuring up to the standards of quality set by the Ministry of Education and Science. These standards relate to the subjects or areas of the curriculum compulsory under statute for the various types of schools and to the examination requirements or attainment targets.

Despite the large number of school boards, there is a considerable degree of uniformity. Regulations with regard to subject combinations, timetabling of lessons and examination syllabuses guarantees degree of standardization in the intake and output of the various types of schools.
It is true that quality differences do occur, but these do not prejudice the general validity of the final qualifications.

1.2 Funding

Education is funded by the Ministry of Education and Science. The 1992 budget (excluding student grants and loans) totals 27 billion guilders, equivalent to 5.8% of the net national income. The Education budget accounts for approx. 13% of total government expenditure. The money comes from tax revenue and to a limited extent from revenue from tuition fees charged by schools, evening class institutions, universities and polytechnics.
Beyond the school-leaving age (above 16 years) those in education are asked to contribute to the costs of tuition.
Student financing schemes are supposed to ensure that these financial contributions do not limit access to education. For pupils up to the age of 18 there is a study costs allowance calculated on the basis of parental income, while students aged between 18 and 30 have a right to a student grant. This consists of a gift, in the form of the basic grant for all students (NLG 600 per month for students living away from home), and an additional opportunity, dependent on parental income, to take out a loan or apply for a scholarship. In 1992 some 4.3 billion guilders was spent on student grants, equivalent to 0.9% of the net national income.

The government resources are distributed throughout the education system on the basis of funding conditions. There are separate rules for the funding of staff, capital costs (costs of new buildings) and operating costs. Decisive factors are the number of pupils, the average length of time spent in education, group-size and the level of staff salaries.

There are two funding formulas: a declaration-based model and a norm-based system. In the declaration-based model, actual costs are reimbursed on the basis of declarations made in accordance with various rules.

In the norm-based system, schools have greater freedom to spend their money as they see fit and government control over the legitimacy of expenditure is less detailed.

In recent years, for an increasing number of school sectors the government has gone over to the norm-based system. This is already established within higher education and senior secondary vocational education and over the next few years it is to be brought in for general secondary and primary schools.

All schools can ask parents to make voluntary contributions towards extra facilities, festivities etc.
Institutions of higher education and senior secondary vocational establishments can recruit income from third parties by means of contract education: courses provided at the request of third parties. In addition to this, higher education also can carry out research under contract to third parties.

The Netherlands also has a substantial sector of education which is not funded by government: company training courses, face-to-face and correspondence courses, etc. This kind of education is funded entirely by the participants, their employers or their parents.

1.3 Legislation and regulation

Education in the Netherlands is heavily controlled by statute, based ultimately on section 23 of the Constitution (dating from 1848), which lays down the freedom to provide education. The principle of financial equality between publicly and privately-run education has been an established fact since 1921.
It is particularly the financial and organizational aspects of the Dutch education system that are established by statute.

Full-time school attendance is compulsory for a period of twelve years - from the age of five up to the end of the sixteenth year. After that, there is a further period of two years in which part-time attendance (one or two days a week) is obligatory. The Netherlands has a high level of participation in non-compulsory post-secondary education.

Central government controls the education system by means of legislation and regulation while administration and management are organized on a decentralized (municipal) basis. The main central government responsibilities with regard to educational policy are: organization (ensuring adequate facilities for education properly spread around the country), funding, supervision, examining, and promoting innovations.

The provinces play only a modest role with regard to education. Their duties are chiefly supervisory with regard to ensuring the availability of sufficient public provision at primary and secondary level and judicial, in terms of settling appeals against decisions by municipal authorities. The provinces also have a role in the area of adult education.
The municipalities are the competent authorities with regard to publicly-run education and are also charged with innumerable executive duties, such as supervising compliance with the Compulsory Education Act and reimbursing the costs of facilities for publicly and privately-run schools.

1.4 Policy-making

External advisory bodies *advise* the Minister of Education and Science with regard to policy-making. There is one permanent advisory body, the Education Council, established by statute in 1919. This Council has 80 members and can advise the Minister at his request or on its own initiative. The Council's role is mainly supervisory with regard to the maintenance of financial equality between publicly and privately-run institutions, the coordination of educational policy and regulations, and the preservation of educational freedom.
The Advisory Council for Education (ARO) advises the Minister with regard to policy proposals affecting the curriculum.

The Minister of Education and Science *consults* on proposed new policies with various consultative bodies composed of representatives of the schools and institutions, parents, staff and students. These groups are represented during consultations by four umbrella organizations (of which one is for publicly-run education and three for education organized on the basis of ideological persuasion: one roman catholic, one protestant and one private non-denominational.

Consultation precedes discussion of policy proposals in *parliament*. Parliament ratifies the main lines of policy proposals, by statute or otherwise.

As a consequence of the freedom of education, the Netherlands has no national *curriculum*. The substance of education is controlled only through the examination requirements and attainment targets.

Based on these, commercial educational publishers compile methods and textbooks. The individual schools or teachers then decide which of these methods to use, always having a choice between the products of several publishers.
Broadly speaking, there are three motives for modifying the curriculum:

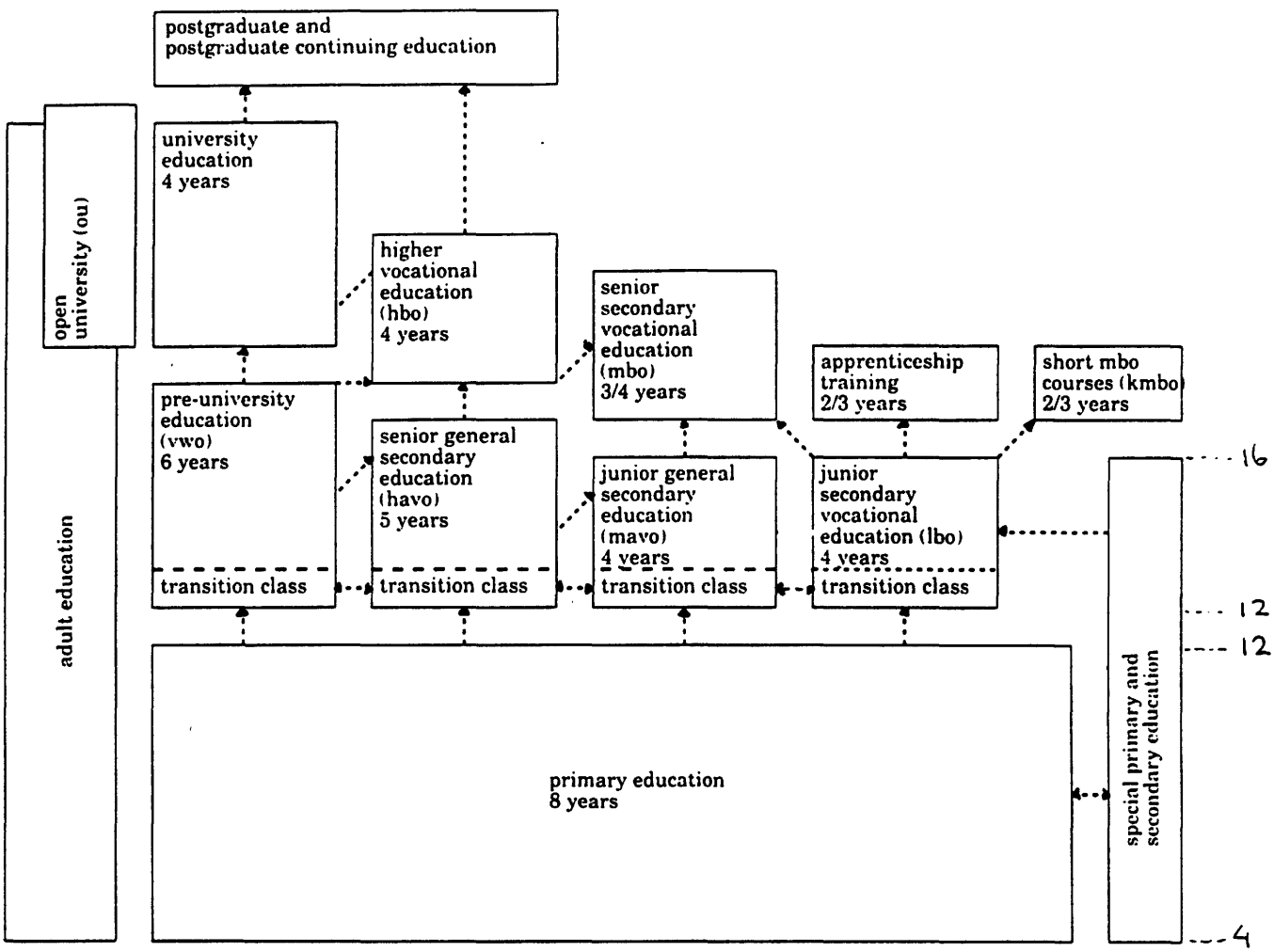
- changing needs of society;
- new ideas in education and/or teaching;
- changes in the structure of the education system.

The government subsidizes the design of new curricula via development projects carried out by the National Institute for Curriculum Development or by one of the national educational support centres (of which there are three, organized on an ideological basis: one roman catholic, one protestant and one non-denominational).
Since no curricula are prescribed by government, the products of these government-subsidized institutions can be no more than examples. Development projects of this kind prompt educational publishers to modify their products.

Policy *implementation* is carried out by the schools themselves. They do this to some extent on the basis of duties laid down in legislation or via funding regulations, and to some extent voluntarily on the basis of developments within society.
Implementation is based on learning materials manufactured by educational publishers and teaching materials originating in development projects. In addition, teachers also produce their own materials.

Figure 1

The Dutch education system today



Source: Netherlands, Ministry of Education and Science

1.5 Types of education

In the Netherlands, the following types of schools are distinguished:

Primary education:

- primary schools (from 4 to 12 years, compulsory from the age of five);
- special education (remedial education for children aged from 3 to 18 years).

General secondary education:

- junior general secondary education (mavo);
- senior general secondary education (havo);
- pre-university education (vwo);
- secondary special education.

Vocational education:

- junior secondary vocational education (lbo);
- senior secondary vocational education (mbo);
- apprenticeship system (part-time).

Higher education (from age 18) consists of:

- higher vocational education (hbo);
- university education and Open University (wo).

Adult education:

- secondary general adult education (vavo);
- adult basic education;
- vocational education.

Figure 1 illustrates the structure of the education system; a brief description of the different types of education follows below.
This Member State report disregards higher education.

Primary education

The Primary Education Act came into operation in 1985. The introduction of the new-style primary school brought the integration of the old-style nursery and elementary schools. This new-style primary education offers children aged between 4 and 12 years of age an uninterrupted period of development geared to the progress of the individual child.

For children with handicaps or with learning or developmental difficulties and therefore unable to attend mainstream schools, there are schools providing special education.

General secondary education

Within secondary education, a distinction is drawn between general and vocational education. 1968 saw the introduction of the Secondary Education Act, the key features of which are: improved coordination; opportunities for horizontal and vertical transfers between the different types of schools; and a combined first year, the transition class, bridging both between elementary and secondary schooling and between the different kinds of schools within secondary education. Two kinds of transition class eventually emerged: one for general secondary and one for vocational education.

Since the introduction of the Secondary Education Act, the debate on the structure of secondary education has moved on. The most recent proposal is that concerning Basic Education, a basic curriculum for all pupils aged between 12 and 15 and embracing the first three years of secondary education. Draft legislation on this has now been approved by the Lower Chamber and is currently (February 1992) before the Upper Chamber.

The proposals for Basic Education focus on objectives such as the postponement of selection decisions, encouraging personal development and offering a more broadly based education. The curriculum is to be taught at two different levels. The Basic Education Bill assumes that these objectives can be achieved without any statutory change in the existing structure. The four different types of secondary school (lbo, mavo, havo and vwo) will therefore continue to exist. Following the period of Basic Education, pupils will be able to opt to complete their secondary education at any of these types of school.

Vocational education

Within vocational education, there are a number of variants[1]:

- junior secondary vocational education lasts four years. It constitutes general pre-vocational education and is not intended as terminal education. The first two years are intended primarily for general subjects, while years three and four are more vocationally-oriented. There are lbo schools providing courses in technical subjects, commercial fields and agriculture, as well as in the personal and social services and health care;
- senior secondary vocational education is vocationally-oriented and trains students for middle management jobs in industry, the service sector, health care and government. It lasts three to four years and includes the same sectors as lbo;
- the apprenticeship system is a form of vocational training involving one or two days a week of classroom education plus on-the-job training, for which the trainee is paid, on the remaining days of the week;
- short senior secondary vocational (kmbo) courses are intended for pupils leaving lbo and mavo and failing to find their way into mainstream mbo courses. These short courses lead to occupational qualifications. The courses are provided on a full-time basis and last two to three years.

Adult education

Adult education includes all government-subsidized activities and provision for the training and education of adults (people over the age of 18).

There are special evening and part-time variants of mavo, havo, vwo and mbo for adults, providing the usual curriculum for these courses in a compressed form and with modified teaching methods: this is known as secondary general adult education (vavo).
Adult vocational education leads to occupational qualifications.
Adult basic education offers students opportunities to acquire the knowledge (reading, language, arithmetic) and communicative and social skills they need to function within society.

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1 This Member State report employs the following terms to describe IT activities within vocational education:
- mbo: includes all senior secondary vocational education;
- apprenticeship system: includes short senior secondary vocational courses, the apprenticeship system and the vocationally-oriented subject areas within lbo;
- the general subjects within lbo come under 'general secondary education'.

1.6 Quantitative data

The tables below provide an insight into the volume of pupil numbers, the size of schools and the numbers of teaching staff.

Over the last few years, there has again been a slight up-turn in the number of pupils in primary education. A halt has been called to the growth of special education. Numbers of students in higher education are also increasing. In general, as compared with a decade ago, young people are staying on longer at school before entering the labour market.

Table 1 - Pupils/students x 1000 situation in 90-91

type of education	*full-time*	*part-time*
primary education	1441	- -
special education	109	- -
vwo/havo/mavo	680	119
junior sec. vocational	217	- -
senior sec. vocational	276	157
higher vocational	183	50
university education	160 (inc. part-time students)	
adult education		156
total	3066	472

Source: Education budget 1992, Key educational statistics

There is a continuing expansion in the scale of establishments, which began with hbo in 1987, continued in mbo (1990) and is now occurring within secondary education. Primary education is likely to experience the same trend. This expansion in scale is prompted by government measures with regard to minimum school-size and by the provision of extra financial facilities for bigger schools. Expansion is motivated by the goal of greater efficiency.

Table 2 - Schools and school-size in 1991

	no. of schools	average no. pupils
primary education	8.422	170
special education	1.004	109
vwo/havo/mavo	1.228	588
junior sec. vocational	420	388
lbo- mbo	39	1.962
senior sec. vocational	146	1.395
higher vocational	73	2.507
university education	12	13.879

Source: Education budget 1992, Key educational statistics

Table 3 - Teaching staff (full-time posts) x 1000, situation in 1991

primary education	71,8
special education	17,9
vwo/havo/mavo/lbo	69,7
mbo and adult education	31,7
higher education	.....

Source: Education budget 1992, Key educational statistics

2. PROMOTING DEVELOPMENTS IN NEW TECHNOLOGY

2.1 Introduction

Education has a key role to play in preparing people for changes in society. The large-scale introduction and countless applications of information technology, later followed by other new technologies, are the sort of changes to which the education system must respond.
Not only the demands of the labour market but also the needs of individuals with regard to their ability to function within society and to develop personally require courses of education which take account of the new technologies. Every level and sector of education is involved. Everyone needs a general knowledge of information systems and many people will need to study informatics either to equip them for further study or as a preparation for working life. In 1982, fearing that the Netherlands was falling behind in the technological field, the government came up with promotional measures for education.

Promotion took place over four periods of time, each marked by a *policy document* presenting the government's plans for the following few years. *Legislative measures* were therefore not employed. Even today, only one or two matters have been laid down in the form of regulations, viz. the modification of the examination requirements for physics in pre-university education (vwo) and computer science as an examination subject within senior secondary commercial education. There is also draft legislation to include 20 hours of information and computer literacy in the initial years of secondary schooling (Basic Education).

Rather than being done through legislative and regulatory measures, promotion in the Netherlands has taken the form of a number of promotional programmes. Chapter 3 is devoted to these.

2.2 Funding

The funding of promotion from 1982 to the present can be traced back to four types of sources:

- government: Ministry of Education;
- government: Ministry of Economic Affairs;
- industry: via participation in government projects;
- industry: via sponsoring of particular local schools.

The last of these comes into the category of 'private initiatives', over which government has no control.

To date, the *government* has spent approx. 600 million guilders on *one-off* promotional campaigns. The greater part of this has come out of the Education Department budget. Because substantial cuts have had to be made in education in recent years, this money has been made available by reducing budgets elsewhere.

Ever since 1982, the Ministry of Economic Affairs has contributed to those elements of programmes which place a high priority on human-capital objectives:

- 100 schools project: 1 million guilders
- INSP lbo and mbo and hbo: 75 million guilders
- NaBoNT: 15 million guilders
- PRESTO: 9 million guilders

Such contributions have been used principally for innovative or large-scale acquisition of hardware, and occasionally for software.

There is now, from 1993 onwards, a *structural* sum of 115 million guilders included in the multi-year estimates for replacement and maintenance within the Education budget (20 million for primary, 25 million for secondary and 70 million for vocational education). For example, a secondary school with 1000 pupils will have an extra NLG 12,000 a year available for replacement; for primary schools, the corresponding sum will be NLG 2000, starting in 1995.

Industry has not been unrepresented. The hardware industry participated in the NIVO project[1] for primary and secondary education to the tune of 40 million guilders. Various projects within vocational education have been able to call on the industry to supply free equipment or price reductions for equipment and training.

The educational publishers have formed an exception, making virtually no contribution to the funding of projects or participation unless matching subsidies were available.

2.3 Equal opportunities for girls and boys

In the beginning there was almost no awareness of the danger that IT might become a male province in the schools. This risk was pinpointed in 1984 by the working party on Women and Information Technology, which on its own initiative presented the Minister with a report on the matter.
This was successful in focusing attention on the issue, at least in secondary education. One of the most practical measures taken was to make it obligatory for at least one of the three participants from each school attending the compulsory in-service training under the NIVO project to be a woman.
When in 1986, in response to the growing demands on its services, the working party resorted to the establishment of a National Centre for Women and Information Technology, the government decided to provide subsidy for this initiative. The working party became a Foundation.
The subsidy came from three departments: the Ministries of Education and Science, Economic Affairs and Social Affairs (through its Emancipation portfolio). This joint subsidizing arrangement lasted for five years. In 1992, however, Economic Affairs is no longer providing subsidy and from 1993 onwards the Centre will also have to manage without financial support from the Ministries of Education and Social Affairs.

The Ministry of Education is giving the Foundation increasing numbers of commissions to develop learning materials. Such commissions originally related to primary and secondary education. It was not until 1991 that the first practical measures were taken to provide extra encouragement to get girls in vocational education involved in IT.

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1 These projects are described in greater detail in chapter 3, in 3.2.2 and 3.3.2 respectively

These measures then related to service sector and health care courses, a sector of education populated mainly by girls, and the subsidies came not from the information technology budget but from money available for emancipation purposes.
Likewise in the context of the PRINT project[1], special materials and courses have been created with a view to increasing the involvement of girls in IT within primary and secondary education.

Of the Education Department's total expenditure on the promotion of information technology since 1986, some 0.5 million (0.1%) has been spent on promoting equal participation.
In addition to this, emancipation budgets within the Education Department and the Ministry of Social Affairs have enabled other measures to be taken: videos have been made; there was a public information campaign exhorting girls to opt for maths and sciences; and subsidies have been given for special vocational schools where women returning to work can take job-oriented courses in IT.

Meanwhile, there has been an increasing recognition of the need for extra attention to be given to the position of women and girls in this area. Nonetheless, IT still continues in most schools to be a male reserve.
There is currently no prospect of further promotional measures to combat this.

2.4 Priorities

The priorities with regard to promotion can be identified at various levels:
- objectives - the intended achievements;
- system level - varying emphasis on different sectors within education;
- within sectors - aims for each sector;
- functional areas - elements of promotion;
- target groups - focus on special groups;
- strategic choices - approach.

1 The PRINT project is explained further in 3.3

Objectives

From the start, the order of priorities with regard to the objectives was as follows:

1. preparation for work: human capital;
2. preparation for the information society;
3. supporting the process of teaching/learning in order to improve the performance of the education system.

This order of priorities has not been subject to real change. Interest in the third objective has, however, increased as greater progress has been achieved in relation to the other aims. Because the CAI objective is the most problematic (from the point of view of technology, innovation, and educational theory), it has received a relatively large amount of attention.

System level

At the level of the sectors within education, the current priorities are as follows:

1. vocational education, especially senior secondary vocational education;
2. first stage of general secondary education (ages 12 - 15);
3. second stage of general secondary education (ages 16 - 18);
4. primary education;
5. adult education.

Here too it can be said that the main emphasis has been on these sectors in this order. At the moment, the main focus of policy interest is on primary education, as well as on the question of whether any further effort should be put into promoting CAI in secondary education, in view of the limited results so far obtained in that sector.

Within sectors

Within each sector there is also an internal ordering of priorities.

Vocational education:

1. senior secondary technical education;
2. senior secondary commercial education;
3. technical and commercial education: short mbo courses (kmbo) and apprenticeship system;
4. senior secondary personal and social services and health care courses.

Secondary education:

1. information and computer literacy in the initial stage (lbo, mavo, havo, vwo; 12 to 15-year-olds);
2. CAI;
3. computer science in the second stage (havo, vwo; 16 to 18-year-olds).

Adult education:

1. information and computer literacy in adult general secondary education;
2. basic education;
3. vocational education.

Primary education:

1. CAI, evolving in the direction of Computer Managed Learning;
2. IT in relation to school administration.

This has been and remains the order of priorities for the application of promotional measures.

Functional areas

No priorities were established in advance with regard to elements requiring attention. In retrospect, however, it is possible to identify the items which predominated in the various different periods:

- first half of INSP[1] ('84 - '85): hardware acquisition;
- second half of INSP ('87 - '88): in-service training, and a more integrated approach;
- end of INSP, OPSTAP[1] ('88 -'89): courseware;
- second half of OPSTAP ('90 - '91): implementation;
- present ('92): implementation.

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1 The INSP and OPSTAP are discussed in 3.2.1 and 3.3 respectively

Target groups

At the level of the target groups, virtually no priorities were set. The development and experimental projects did indeed start with a few willing schools, but from the beginning it was always the intention that, so far as financial resources permitted, *all* the schools should in due course be provided with hardware and that in-service training, software and support should eventually be available throughout the system.
The aim of promotion was therefore to provide a basic physical and knowledge infrastructure for the entire school population.

Special action for the benefit of particular groups within the school population remained limited: for the sake of pupils of non-Dutch origin, attention was paid to the development of courseware for the teaching of Dutch as a second language, and with an eye to participation by girls and women, subsidies were provided for the Women and Information Technology Foundation (see also 2.4).

Strategic choices

From 1982 through to around 1989, promotion of IT was dominated by the idea of controlling the supply. This was true with regard to courseware production, curriculum development, in-service training and the provision of hardware. An exception however was senior secondary technical education, where the schools had an obvious need for equipment. The change has come since 1990, with the emergence of greater sympathy for the idea of passing the initiative to the demand side: the schools must become active and demanding consumers rather than passive recipients.

The great initial interest in establishing an infrastructure for software development for education should also be viewed in this light.
Rapidly advancing understanding in this field and the availability of tools mean that use is now mainly being made of concepts and aids from the world of business computerization and there is very little interest in infrastructural issues for education as such.

Summary overview

COMPARISON OF PROMOTIONAL PROGRAMMES FOR NEW TECHNOLOGIES IN THE NETHERLANDS											
Project	100-schools	INSP	NIVO	NABONT	POCO	New Media	PRINT	OPSTAP	COMENIUS	PRESTO	ENTER
period	82 - 84	84 - 88	86 - 90	87 - 92	87 - 91	87 - 92	89 - 92	89 - 92	90 - 94	91 - 93	93 - 96
budget	6 mln	270 mln	100 mln	95 mln	26	14 mln	100 mln	50 mln	105 mln	45 mln	450 mln
sectors											
primary education		x			x	x	x	x	x		x
general secondary education	x	x	x		x	x	x	x			x
junior and senior sec. voc. ed.		x		x	x	x	x	x		x	x
higher vocational education		x		x							
university education											
adult education		x					x	x			x
infrastructure*		x				x	x	x			x
(in service) training		x		x		x	x	x			x
aims											
training for citizenship**	x	x	x				x	x	x		
human capital***		x		x			x	x		x	x
CAI		x	x		x		x	x	x		x
computerization of administration											
expenditure											
hardware acquisition	x	x	x					x	x		x
courseware development	x	x	x		x		x			x	x
courseware acquisition			x					x	x	x	x
application software acquisition		x								x	x
in-service training	x	x	x	x			x		x		x
curriculum development		x	x				x			x	x
support for implementation							x				x
information			x				x	x	x	x	x
* measures to stimulate production of educational software											
** preparation for the information society											
***preparation for satisfactory performance at work											

3. DUTCH POLICY-MAKING: VIA PROMOTIONAL PROGRAMMES

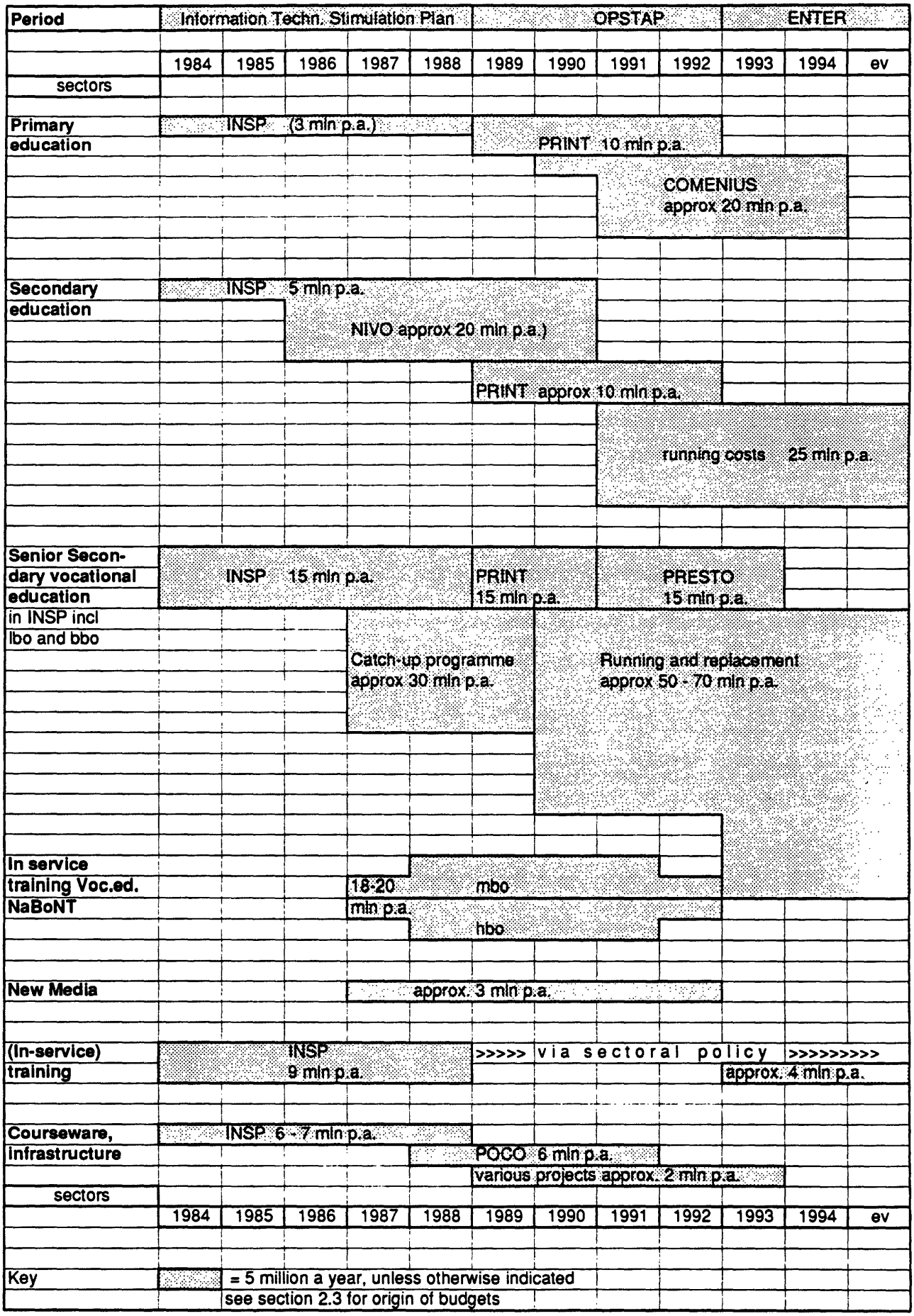
For this Member State report we have drawn up two summaries of promotional programmes to date: figure 3 is a financial overview giving an indication of the volume of promotion, while figure 4 takes the form of a matrix providing a point-by-point description of the programmes.
The abbreviated form reveals clearly the differences in emphasis between the programmes.

We review the following consecutive periods and projects in this order:

1982 - 1983:	Exploration (3.1)
1984 - 1988:	Basic provision and introduction (3.2)
1989 - 1992:	Implementation (3.3)
1993 onwards:	Consolidation and integration (3.4)

COMPARISON OF PROMOTIONAL PROGRAMMES FOR NEW TECHNOLOGIES IN THE NETHERLANDS

Project	100-schools project	Inform. Techn. Stimulation Plan	NIVO	NaBoNT	POCO
period	1982 - 1984	1984 - 1988	1986 - 1990	1987 - 1990	1987 - 1991
budget	6 million	270 million	100 million (inc. 35 INSP)	95 million	26 million
sectors					
primary education		15 million			x
general secondary education	100 schools	35	years 1 - 4 inclusive		x
junior and senior second. voc.ed.		75 (inc. agricultural education)		x	x
higher vocational education		43		x	
university education		–			
adult education		5	only general secondary education		
infrastructure		35			
(in-service) training		45		x	
aims	to gain initial experience				
citizenship	x	primary	1st		
human capital		primary		x	x
CAI		secondary	2nd		x
computerization ol administration					
control	open objectives		shared responsibility	from demand side	
government	ministry project group	central project staff	government, education, external	project group and steering group	coordinator technology policy
external		project managers p/sector initiator	government, education, external	project manager as broker	project manager
expenditure			coordinated approach:		
hardware acquisition	8-bits CP/M, 8 per school	x	MS-DOS 16-bits, 11 per school		
courseware development	inf. and comp. literacy, by SLO	x	inf. and comp. literacy and CAI		x
courseware acquisition			software voucher, NLG 2000 p/school		
acquisition application software		x			
(in-service) training	40 hrs by teacher training establ.	x	three per school, min. one woman	x	
curriculum development	x	x	computer science and integration CAI		
support for implementation					
information			software starter pack		
Effects					
positive	initial focus on IT creating front runners	basic infrastructure in mbo and hbo influences from outside education insight into integrated approach multiplier-effect new projects external project management	hardware standard basic infrastructure in all schools computer science in most schools in-service training for II schools	broad participation supply also from private sector experience with controlling demand	development user interface cooperation with publishers courseware development based on market research relation with curriculum
negative	technical problems hardware one supplier went bankrupt	one-sided focus on hardware courseware development failed	sponsoring by rest of industry starter pack didn't work problems with network subject integration not achieved	responsibility for translation into practice with teacher alone	long delay in results no link to marketing


Period
Information Techn. Stimulation Plan
OPSTAP
ENTER
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
ev
sectors
Primary education
INSP (3 mln p.a.)
PRINT 10 mln p.a.
COMENIUS approx 20 mln p.a.
Secondary education
INSP 5 mln p.a.
NIVO approx 20 mln p.a.)
PRINT approx 10 mln p.a.
running costs 25 mln p.a.
Senior Secondary vocational education
INSP 15 mln p.a.
PRINT 15 mln p.a.
PRESTO 15 mln p.a.
in INSP incl lbo and bbo
Catch-up programme approx 30 mln p.a.
Running and replacement approx 50 - 70 mln p.a.
In service training Voc.ed.
NaBoNT
18-20 mln p.a.
mbo
hbo
New Media
approx. 3 mln p.a.
(In-service) training
INSP 9 mln p.a.
>>>>> via sectoral policy >>>>>>>>>
approx. 4 mln p.a.
Courseware, infrastructure
INSP 6 - 7 mln p.a.
POCO 6 mln p.a.
various projects approx. 2 mln p.a.
sectors
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
ev
Key
= 5 million a year, unless otherwise indicated
see section 2.3 for origin of budgets

Project	New Media	PRINT	OPSTAP: several projects	COMENIUS	PRESTO	ENTER
period	1987 - 1992	1989 - 1992	1989 - 1992	1990 - 1994	1991 - 1993	1993 - 1996
budget	14 million	100 million	50 million	105 million	45 million	92 million, excl. exploitation
sectors						
primary education	x	x	x	x		x
general secondary education	x	x	x			x
junior and senior second. voc.ed	x	x (till 1990, see PRESTO)	x		senior secondary educat.	x
higher vocational education						
university education						
adult education	x	x	x			
infrastructure	x	x	x			x
(in-service) training		x	x			x
aims	to explore applications					
citizenship		x		secundary		
human capital		x			x	
CAI		x		primary		x
computerization of administr.						
control					initiatives by schools	
government	steering committee	policy coordinator	policy coordinator	representative in steering group	policy coordinator	at several departments
external	project manager per project	group of support organiz.	several project managers	representative in steering group	project manager	platform ministry, experts, field
expenditure	study projects					
hardware acquisition			x	MSDOS-AT, 1: 60 pupils		choice lies with schools
courseware development	x	x				x
courseware acquisition			x	softw. voucher NLG 500 p/school	x	choice lies with schools
acquisition application software						choice lies with schools
(in-service) training		x		courses for introduction		choice lies with schools
curriculum development		x			x	
support for implementation		x				choice lies with schools
information		x	x	course on television	x	via public-privatepartnership
Effects						
positive	attention to professional develoment	responsibility at suppport structure	INSP effects continued	hardware standardization preparation period for teachers alignment to needs of schools	not yet assessable	not yet assessable
negative	no transfer to schoolpractice	bureaucratic approach long completing periods insufficient accaptance by Polytechnics		coordination to PRINT ratio pupils per computer	not yet assessable	not yet assessable

3.1 1982 - 1983: Exploration

The first steps along the (at least for government) uncertain path of information technology were taken in 1982 in the form of the 100 schools project. This project was limited in scope, embracing only the initial years of secondary education. The approach was accordingly experimental: a start was made with just 100 (of the then approx. 2000) schools.
The aims of the project were left open: 'let a thousand flowers bloom'; at that stage there was still too little understanding of the importance of IT for the educational world to be able to formulate clear objectives.
The project focused on computer and information literacy, the creation of the necessary awareness with regard to information technology. It included the provision of hardware, the development and implementation of in-service training, and curriculum development.

3.2 1984 - 1988: Basic provision and introduction

During the second period, in which the tone was set by the Information Technology Stimulation Plan, promotion assumed a totally different character. Due mainly to the fear of falling (further) behind economically, substantial budgets were set aside - in a time of government cuts - to promote IT in society. The aim of promoting IT within education was explicitly instrumental in character: the programmes were dominated by the idea of creating human capital and preparing pupils for life in society.
This period laid the foundations for the infrastructure necessary for the educational world to be able to use IT: hardware, courseware and expertise all became available to the schools. This allowed introduction to commence.

In the light of the reasons for promoting IT, it is not surprising that priority was given to the types of schools which for many people represent the end of academic life: initially the largest budgets were awarded to vocational education, followed by general secondary education. Primary education remained rather out of the picture during this period.
The hook on which promotion was hung was the Information Technology Stimulation Plan (INSP), published in 1984. Over the next few years there followed a number of other large-scale projects in different parts of the field. These are described one by one below.

3.2.1 Information Technology Stimulation Plan (INSP)

The significance of the Information Technology Stimulation Plan (INSP) extended far beyond the 100 schools project. It was a cabinet plan in which education was seen as just one sector of society alongside promotion of IT in the market sector, government and research. The educational element related to the whole of the education system with the exception of the universities.
With regard to education, the term originally used was information technology (IT), but this was eventually expanded, especially within vocational education, to include the New Technologies (NT). In addition to applications rooted in information technology, scope was also created for projects relating to fields such as new materials and biotechnology.

Organization
Policy proposals, and therefore budgets, were organized partly by educational sector and partly by function (in-service training, training, infrastructure). The main focus in sector-based projects was initially on hardware acquisition. Eventually, however, it became clear that better results could be obtained through an integrated approach embracing hardware provision, courseware development and in-service training. An innovative approach was adopted, involving project-by-project control of the programme with supervision by external project managers and a central project headquarters with budgetary powers within the Ministry, and this proved successful.

Aims
The *primary* objectives of the INSP were:
a. information and computer literacy as an essential element of preparation for life in society;
b. to improve the quality of vocational preparation of 'human capital'.

A major motivation underlying the INSP was the fear of falling behind other countries. The working population of the Netherlands had to come to the starting line well prepared, and the general public needed to be aware of and familiar with the rapidly spreading influence of IT within society: this idea led in most schools to the introduction of information and computer literacy.

Within the context of the INSP there was accordingly a full-scale renewal of the debate concerning the interface between the labour market and the education system. Contacts between education and the 'outside world' have been established by most vocational education establishments and many secondary schools on the basis of developments surrounding IT.

The INSP mentioned the use of IT to enhance the learning process itself (Computer Assisted Instruction, CAI) only as a *secondary* possibility. Nevertheless, a significant proportion of the development activities focused on this aspect.
Particularly on the part of educationalists and software developers within universities, there was great enthusiasm for grasping the potential of IT to achieve qualitative improvements in education. This led to ambitious development projects, but also projects for more elementary CAI were established.
The activities in the context of 'Infrastructure' organization were all but totally directed at the potential for courseware development for CAI.

Approach
In each of the clusters (a single sector of education or area of functional interest), projects were carried out under the supervision of the project manager for that particular cluster. These managers were drawn from the business world or the universities. They were assumed to have an understanding of relevant developments, applications and possibilities of IT. It was their job to convert this understanding into projects for education.

The project manager produced proposals for the acquisition of hardware and software. He took initiatives with regard to development projects, brought together schools and developers and monitored substantive and procedural progress.
The projects might involve the exploration of virgin territory, but could take further developments which were already under way in the schools.

Multiplier effect
The INSP led to a number of major parallel projects (see also figure 4):
- the NIVO project for larger-scale provision of hardware and in-service training to secondary education, on the initiative of three computer suppliers;
- the NaBoNT project, creating substantial opportunities for people from vocational education to receive in-service training in the business world and industry;

- the POCO project, intended to bring onto the market a critical mass of rapidly usable courseware;
- the INSP period also produced the idea that it was necessary to look beyond the technologies already available to education and through to the New Media. A separate programme was started for this.

These parallel projects produced an increase of approx. 200 million guilders in the original INSP budget of 270 million.

There follows below a description of these activities.

3.2.2 New Information Technology for Secondary Education (NIVO)

The NIVO project (New Information Technology for Secondary Education) was a collaborative project involving government, business and umbrella organizations within education. Its aim was to promote computer education in lbo, mavo, havo and vwo. In view of the fact that the Information Technology Stimulation Plan made only limited financial resources available for the pupils in the early years of these types of education (25 million guilders for 1800 schools), three companies (IBM-Nederland N.V., the Nederlandse Philips bedrijven B.V. and Tulip Computers B.V.) decided to direct their efforts particularly at these types of schools. Underlying this was the urgency ascribed to the need for secondary school-leavers to be familiar with IT applications in the work-place.
On 16th October 1985, the signing of an agreement between these companies, the Kingdom of the Netherlands (the Ministries of Education and Science and of Economic Affairs) and the umbrella organizations within education signalled the official launch of the NIVO project. The NIVO agreement provided for an integrated plan of action with regard to the provision of hardware, the development of educational software and the organization of in-service teacher training. It was a result of the invitation issued by the Information Technology Stimulation Plan for government and industry to cooperate in this area.
The plan was financed jointly by the government and the companies on whose initiative the project took place. It had been intended that a proportion of the funding should take the form of sponsorship by other companies, but the results of canvassing were disappointing in this respect.

For the implementation of the NIVO project, a *coordinated approach* was chosen to the introduction of new information technology in secondary education. This approach involved in-service training for teachers, the supply of hardware and the development of educational software. For this purpose, the NIVO project was divided up into four sub-projects:

- hardware (equipment);
- in-service training;
- courseware;
- public relations and information.

The *hardware* sub-project was directed at the provision of the agreed hardware and system software to the schools. Under the NIVO agreement, the supply of hardware and system software was a matter for the participating companies.
The *in-service training* sub-project was directed at producing sufficient numbers of trained teachers to enable the hardware and software provided to be used in the classroom.
The *courseware* sub-project was directed at developing teaching materials to make it possible for the hardware provided actually to be used within the curriculum.
The *public relations and information* sub-project was directed at fulfilling this function both inside and outside education.

Hardware

The hardware sub-project achieved the following results:

- within secondary education there is now a hardware standard for the application of information technology: hardware with 16-bit micro-processor and MS-DOS, version 3.1 or higher as its operating system;
- all schools providing lbo, mavo, havo or vwo courses have a working configuration consisting of one file server and eight pupil workstations linked to form a network, plus two stand-alone computers intended for specific use in the subject areas.

In addition, a contract was signed with the companies supplying the hardware guaranteeing the equipment and providing for its maintenance.
Finally, in the context of the in-service training project, the companies developed and implemented a course on systems management.

In-service training

The in-service training sub-project eventually adopted the aim of providing in-service training for three teachers from each school, at least one of them to be a woman.
In order to achieve this, training was organized on a cascade model. Some 60 tutors from teacher training institutions attended courses by the companies and software houses, giving them a solid basis of knowledge concerning the potential and applications of IT. This group were then to provide in-service training for the selected teachers in the schools. The idea was that these teachers would then ensure further introductory training within their schools.
The reason for deciding to give preparatory training in IT to three teachers per school was in order to create a broad enough base within the schools. This was in part prompted by contemporary experience that pioneering teachers tended to leave for jobs in industry, where a substantial shortage of IT trainers was then emerging.
The three teachers were given a basic course lasting 80 hours. In addition, teachers could receive in-service training in information and computer literacy and in the use of information technology in the various subject areas.

Courses were also developed and provided to train systems managers. The systems manager had to be able to carry out systems management, to keep hardware operational and to solve everyday technical problems with the hardware (or arrange for their solution).
Activities were also organized for school principals and vice-principals, albeit at a later stage. The heads of the schools involved needed to have sufficient expertise to be able to assess and direct developments in the IT field within their schools.

Curriculum development

The 100 schools project had made a start with the development of an information and computer literacy curriculum with model lessons.
During the INSP, curriculum development was extended to other course-years and other applications of IT. The NIVO project took this further:

1. curriculum development focused on the preparation of *information and computer literacy*, a subject which was to gain a place in the first two years of lbo, mavo, havo and vwo courses. This was to be a general introduction to the subject. The aim at the time was to create a separate information and computer literacy subject area involving 40 hours of classroom teaching;

2. for the "middle years" (fourth or possibly third year of vwo courses, and third or possibly fourth year of havo), *computer science* was developed as a separate subject area;

3. building on computer science teaching in the middle years, there was then to be an *integration of elements of information technology* within the curriculum for appropriate examination subjects. Subjects in mind here were physics, applied and pure mathematics, business economics and social studies. Since then, physical computer science has also gained a place as part of the final examination curriculum for physics.

Courseware development

Courseware development was dominated by these lines of thought: various development projects were carried out in relation to information and computer literacy and computer science, as well as with regard to the integration of these as components in the other subject areas.

The projects were carried out by schools, working together with universities or support organizations. Wherever possible, the products were marketed through educational publishers.

From the start, interest on the part of educational publishers has been limited: after all, the schools had little or no money to buy software, provision was limited and only a proportion of the teachers were aware of the potential of IT.

Availability of courseware

In addition to the projects for courseware development, thought was also given to making courseware available in the short term, so that the hardware could be used immediately. The products of the development projects would, after all, take some time to come through.

For this reason, the schools were given a *"starter pack"* of software. This consisted of wordprocessing packages, a spreadsheet, a data bank program and an author language. In the course of development projects, model lessons were also produced. The eventual use of these in the classroom was, however, disappointing.

The teachers had some difficulty in integrating the software into their classroom practice, and as regards applications like wordprocessing and spreadsheets, there was a general preference for standard packages rather than the versions specially adapted for use in schools.

In order to encourage the acquisition of educational software by secondary schools and to help create a market for such software, a *software voucher* was introduced. This was a one-off subsidy of NLG 2000 in the form of a bank credit. Schools could use this money to make their own choice from a list of programs which had all been catalogued and evaluated. This information was made available to the schools, who were then able to use it to reach their own decisions as 'critical consumers'. They had two years in which to do so. The issue of software vouchers created a market worth almost 4 million guilders and involving 1800 customers.
Making software vouchers available was supposed to create a more attractive market for "textbook-plus-software" products: in the light of the purchasing power created, educational publishers were expected to begin supplementing their written methods with complementary courseware. However, most of the programs on the list were isolated courseware packages which might or might not correspond to some element in the curriculum.

3.2.3 In-service Training for Vocational Education in the New Technologies (NaBoNT)

In the light of the important 'human capital' objective, in-service training was an essential precondition for the introduction of new technologies within education. Teachers in vocational education have to be able to include new technologies in their teaching. To do so, they need to have sufficient grasp of the business applications relevant to the vocationally-oriented subjects they teach to be able to provide instruction at the right level in relation to these applications.
The in-service training that the teacher training institutions could provide was inadequate in terms both of quality and of quantity: on many NT applications they had no up-to-date knowledge at all. In addition, there were too few tutors available to be able to reach the great mass of teachers in vocational education.

The government recognized the importance of good in-service training and in 1986 launched a large-scale in-service training project: NaBoNT (In-service training for Vocational Education in the New Technologies). After an initial preparatory period, NaBoNT ran for five academic years.
Over this period, some 95 million guilders was made available to enhance the expertise of teachers in vocational education (both secondary and higher).

Aim

The aim of in-service training was to introduce new technologies into vocational education by up-dating the knowledge and skills of the teachers. It was vital to gear this to the needs of industry, and the business world was accordingly involved in the implementation of the project. The courses offered by business training institutions and by hardware and software suppliers were thrown open to teachers in vocational education, who until then had been able to receive in-service training only through the teacher training institutions.
The project consisted of two parts:

1. a technological in-service training project, as described in the policy document on "Higher Education, Technology and the Private Sector", aimed at training teachers in senior secondary and higher *technical* education. A total of NLG 75 million was available for this project;
2. projects for other kinds of vocational education: other services, health care and commercial education sectors, and the lower levels such as junior secondary vocational education, day-release schemes and short senior secondary vocational education (20 million). This part was added on later.

Procedures

The NaBoNT Project office (an external bureau) collected details of existing and new courses being provided by industry, private institutions and educational organizations. From these, a selection was made on the basis of assessment by experts in the relevant field and the results of courses given earlier. The courses on offer also had to be appropriate to the target group and the priority areas identified. On the basis of research, the following areas of technology were identified: production technology (including process technology), telematics, materials technology, office automation and logistics.

NaBoNT also provided subsidies for teachers to spend periods in industry. Occasionally, for instance where no courses were available in a field relevant to NaBoNT, funds were made available for course development.
NaBoNT funded not the course providers (the supply side) but the schools (the demand side) and awarded subsidies to schools sending teachers to attend the relevant courses. The school had to pay a proportion of the course fees itself. In the case of hbo, the project office reimbursed for 75% of the course fees approved by NaBoNT, and for mbo and other types of vocational education 95%.

The project is being wound up in 1992. By that time, it is expected that some 40,000 courses will have been attended. The number of participants will be less than this, since some have enrolled for more than one course. As regards participation, the project may therefore be deemed a success. A flaw in it, however, is that most courses have not addressed the question of use within education. The teachers themselves are having to make the translation into teaching practice.

3.2.4 Courseware development: POCO

During the implementation of the INSP, it was found that the development projects were failing to produce sufficient courseware capable of meaningful and easy use by teachers in the course of their year's teaching. In order to prevent stagnation, temporary measures were adopted in 1987 aimed at promoting the production and distribution of this kind of courseware: Software Development for Computers in Education (POCO).
The POCO project is producing courseware which can be used directly within the existing syllabuses. This courseware will also be useful for the initial and in-service training of teachers.
The leadership of the project is in the hands of the Educational Computing Consortium (ECC), the privatized reincarnation of the expert Centre for Education and Information Technology.

The products developed are being offered to the educational publishers in order that they can make them available to the schools through the usual channels at an acceptable price. Any profits will be used by the management of the project for new developments.
The project lasts four years. The development period ended on 1st August 1991, but it will be some time after that before the products actually become available.

NLG 26 million was available for the project. On this budget, 35 products have been produced, offering a total of many hundreds of hours of courseware.
The products of the POCO project reflect the general order of priorities as between different sectors of education:

- primary education 7
- general secondary education 12
- vocational education
  - technical vocational education 9
  - other vocational education 7

In the case of a number of the products intended for vocational education, the courseware forms the core of a new element in the curriculum. In these cases, the remaining teaching materials have been developed by the educational publisher concerned.

POCO differs in a number of respects from the earlier development projects:

- there is careful coordination with the curriculum;
- the ideas for programs originate in the wishes of the educational world;
- there is market research to assess the value of the ideas;
- subject specialists are brought in from education and (for vocational education) from the business world;
- products are to be marketed by educational publishers and publishers are accordingly being involved in development right from the start;
- a standard user interface has been developed;
- development is taking place according to a fixed pattern;
- programming is being contracted out to software houses on the basis of tenders.

The major disadvantage of the project is that the project management is responsible only for the development of the courseware. Its conversion into marketable products (complete with manuals, packaging, marketing) is in the hands of the publishers. This limitation has already been identified by the project management and by the Advisory Committee for the Promotion of New Technology and Education. The Ministry has preferred, however, to adhere to the principle that learning materials should be marketed by educational publishers.

3.2.5 Steering Group New Media

The Steering Group New Media is responsible for gathering together knowledge concerning the potential applications of new media in education, in order to use it to formulate recommendations with regard to longer-term policy. To this end, the steering group monitors developments in the Netherlands and abroad, initiates or supports projects and promotes research. For example, research has been conducted on the educational use of the interactive video disc in Great Britain and the United States, and the potential of videotex within education has been explored. Another activity is the pilot school for new media, where a wide range of hard and software has been made available and researchers are examining the possible uses which emerge.

3.3 1989 - 1992: Implementation

At the end of 1988 there was general agreement that the promotion of what is now called NT should not end with the INSP. In an attempt to provide a further boost for NT within education, government funds were made available for a further period of four years: the OPSTAP period. The intended aims of OPSTAP were the same as those of the INSP: to enhance the quality of preparation for working life and for the information society and to use CAI to optimize the process of teaching and learning.

In two respects, the new project broke with the procedures of the INSP:

1. it was decided partially to uncouple the integrated approach: hardware acquisition and infrastructure measures were brought under the control of the Ministry (see 3.4), while courseware development, in-service training and support came under the aegis of the support organizations in the PRINT project (see 3.3);
2. control was no longer in the hands of external project managers; instead, the reins were handed to those bodies which have traditionally developed and supported educational innovation. This change had already been announced in the INSP.

3.3.1 PRINT

The OPSTAP policy document formulated the basic principles to be adopted in relation to activities in the field of education and information technology throughout the OPSTAP period (1989 - 1992). The document proposed that the promotion of activities in this field in primary and secondary education should be located within a single educational development project under the auspices of the six national support organizations. To this end, they were to set up a joint steering group: the Steering Group Support for Information Technology (SVI). The name of the project was to be PRINT: PRoject Implementation New Technology.

Within PRINT there are three distinct sub-projects for the different sectors of education:
- primary and special education;
- general secondary education;
- vocational education, with the exception of higher vocational education.

In order to ensure satisfactory implementation of activities within the context of PRINT, the SVI formed a management team (MT) consisting of:
- the general manager;
- the sector manager for primary/special education;
- the sector manager for secondary non-vocational education;
- the sector manager for vocational education.

Each year, the Minister of Education and Science has set out a policy framework for the subsequent calendar year, detailing the activities to take place in that year. Based on this policy framework, the SVI has then drawn up a draft plan of action.
This action plan has been finalized by the Minister of Education and Science following consultation within the central Educational Consultative Committee.

Objectives
The activities carried out by the support organizations within the context of OPSTAP have been brought in under the PRINT project.
PRINT aims to offer schools help with their own process of development in the field of the new technologies through:

- the development and production of courseware together with the associated implementation programmes.

Two kinds of projects are being set up for the development of courseware, one for courseware of directly use within the current system of education and the other for courseware which is future-oriented and responds to changes in the curriculum;

- the development and programming of professional development, coordinated with the provision of hardware and software or the production of aids for this, and ensuring the necessary knowledge transfer/advance training.
  Professional development amongst teachers is approached sector by sector (primary/special education, secondary non-vocational education, vocational education). Considerable attention is being paid to training for management;
- the provision of advice and information concerning the use of computers in education. Advice and information provision is focused on informing schools about developments in the field of information technology, about potential applications within schools and about actual products.

3.3.2 Primary and special education

So far as primary education was concerned, the legacy of the INSP was modest, with no more than a few long-term development projects having being launched in this sector; for special education, however, some promising prototypes had been produced.

The time was now (1988), however, thought ripe to give a hefty boost to IT in the primary schools. This was done in a project under the name of COMENIUS.
During the INSP, it had been deliberately decided to carry out no more than a few experiments aimed at exploring the value of IT in the primary sector.
What were termed 'autonomous developments' -the initiatives which the primary schools were themselves by that time taking on a large scale- were deliberately restrained and discouraged.
Within primary education potential was thought to lie particularly in the use of CAI, and within special education in the prosthetic function.

The COMENIUS project included the supply of personal computers. Following a vigorous debate on hardware (Macintosh versus MS-DOS), extending even into the pages of the national press, the schools are now being provided with MS-DOS ATs, with Windows software.

They are receiving one computer for every 60 pupils, a ratio which leads to individual use of the computer by single pupils or small groups of pupils. There will, therefore, be no computer labs to make it possible to use the computer for traditional education. By analogy with the NIVO project, there is a steering group to arrange the provision of hardware which includes representatives of the computer supplier (Philips), the organizations of school boards and the Ministry of Education. Courseware development, in-service training and implementation are in the hands of the support organizations under PRINT.

In designing COMENIUS, extensive use has been made of the experience gained from INSP projects with regard to major preconditions. The schools are now first being given a year to prepare themselves for working with IT. A computer coordinator is trained in advance and the hardware is supplied while in-service training -designed on a team basis- is still going on.

Because of the chosen software standard (Windows), primary education is now experiencing the same initial problems as secondary education in the past: there is as yet no courseware. The schools do receive a starter pack of Windows software, but a proportion of this is suitable only for the teachers and not for use in class.

PRINT's contribution: support

The PRINT sub-project for primary and special education is chiefly directed at supporting the introduction of personal computers in primary education and some categories of special education. PRINT has a 'follow-up' role, with the emphasis on in-service training and information provision, although some attention is also paid to courseware development. The in-service training of the teachers focuses primarily on the use of computers in the teaching process, on the policies to be adopted towards information technology in education by school managements and on systems management and technical knowledge and skills. The distinction between COMENIUS's role with regard to provision and PRINT's for implementation regularly gives rise to problems of coordination which could be avoided if there were an integrated project.
The problem is all the more acute now that the hardware also sets a standard for the software. PRINT has to base itself on these standards and has therefore to be kept informed of them.

For certain categories of special education, in particular education for children with physical and sensory handicaps and education for children with severe learning difficulties, there are on-going pilot projects.

Expectations
There are high expectations with regard to the use of IT in primary schools.
Primary education enjoys a number of advantages as compared with secondary:

- the organization of teaching presents fewer obstacles to flexible introduction in the classroom;
- the value of application is clearer for individualized learning;
- the larger number of schools probably makes it more attractive for publishers to bring courseware onto the primary school market;
- a number of educational objectives for which the computer is particularly well-suited are better established within primary education: problem-solving approaches to learning, information handling, etc.

3.3.3 General secondary education

PRINT activities within secondary education are dominated by the idea of continuing to pursue the lines mapped out during the INSP and NIVO project.
It remains desirable to promote courseware development and in-service training over the 1989 - 1992 period. The emphasis is on the use of IT via CAI in the various subject areas, with a particular focus on the use of computers in the teaching of Dutch as a second language to pupils of non-Dutch origin.

PRINT-secondary education (PRINT-VO) is supposed to contribute over this period to the introduction of computers in the schools, since computers offer the potential to achieve improvements in the quality of education. PRINT-VO is building on the gains of NIVO. In-service training of teachers is being further extended. Courses are, for example, being provided to train systems managers and special courses for school heads are addressing the issue of how to draw up plans for the introduction of information technology in the school.

Courseware development is focusing primarily on:

- aids for teachers (wordprocessing, score-keeping etc);
- general skills;
- integration of information and computer literacy in subject areas for the middle years of havo and vwo;
- integration of computer science in the final examination syllabuses for physics, mathematics, social studies and business economics.

Curriculum development

The Basic Education curriculum provides for 20 hours of *information and computer literacy*, instead of the 40 hours originally envisaged. Sufficient teaching materials and model lessons are now available for this. In addition, elements of information and computer literacy are being absorbed into the areas of Dutch language, mathematics and technical subjects. What are termed "core objectives" have been formulated and courseware is being developed for these.

The projects in the area of *computer science* in the middle years and the integration of elements of computer science within examination syllabuses imitate curriculum and courseware development during the NIVO period by relating to the following parts of the syllabus:

- basic syllabus for computer science;
- computer science in the final examination syllabus for physics;
- computer science in the final examination syllabus for social studies;
- computer science in the final examination syllabus for mathematics;
- computer science in the final examination syllabus for business economics;
- computer science in other final examination syllabuses.

The course of these projects can be divided into a preparatory phase and an implementation phase. Concrete products of the preparatory phase are a definition of the learning objectives, teaching materials, and a definition of the preconditions within the school, such as the number of hours of classroom time and the necessary learning materials and tools.

Support for disadvantaged pupils

This relates to individualized teaching to help pupils of non-Dutch origin who are having difficulty in achieving the core objectives laid down, particularly with regard to mathematics and Dutch language. Preparatory studies have now been carried out in this area, but no development projects have yet been launched.

In-service training

Activities in the field of in-service training follow on from those launched in the context of NIVO, viz. basic and follow-up courses in information and computer literacy, subject-oriented courses, the systems manager course, the activities for other teachers and the course for school heads. The supply is tailored to the various target groups in the school, such as the principals, the teachers and the educational support staff (technical teaching assistants, etc.) and to the queries voiced by schools in relation to the introduction of information technology.

In-service training includes subject-oriented courses in relation to information technology for geography, history, Dutch language, modern languages, economics, mathematics and technical subjects teachers, courses for information and computer literacy teachers, courses to train systems managers and computerization coordinators and courses for school managements.

Hardware and software

The norm-based reimbursements made to schools have been adjusted to take account of hardware maintenance and replacement, software acquisition and the costs of consumables. A school with 1000 pupils can spend approx. NLG 12,000 a year.

3.3.4 Vocational education: PRINT

The objectives of the PRINT sub-project for vocational education likewise to a major extent pursued the line established in the INSP. The project focused not only on information technology, but also on the broader field of the new technologies, including new materials etc. Its main concentration was on courseware development, principally with regard to topics already the subject of interest during the INSP period. In-service training was carried out under NaBoNT.

PRINT organized the development work in the form of projects. Its adopted criterion for the definition or selection of projects was that such projects had to increase the acceptance of computers within the education system. This was put into practice by:

- addressing schools holistically;
- developing materials which could be used immediately;
- supporting the school's own process of development.

PRINT focused on technologies already fairly well established within the business world. In order to avoid overloading the syllabuses, there was a constant process of consideration required to decide for each type of school concerned what the basic skills of the pupils should include. In defining these basic skills, it was important to liaise with the relevant parts of trade and industry.

Courseware development

Within the vocationally-oriented subject areas, schools providing vocational education frequently make use of software also employed in the world of work. Adaptation is sometimes required to fit such software for use in education. In addition, attention was given to developing simulation software for those areas where there are objections to or practical difficulties associated with practice in the actual workplace and/or where simulation can replace the use of expensive production equipment.

Hardware and software

Since 1989, the provision of hardware and software has no longer been made on a project basis, with the government approving requests for additional purchases. Instead, schools providing vocational education have been given an increase in their operating budgets and can now decide for themselves what proportion of their budgets they can afford to spend on computer equipment and software. This means that there is no longer any direct link between the development of curricula and courseware and the acquisition of tools.

From PRINT to PRESTO

On the advice of the Advisory Committee on the Promotion of New Technology and Education (1990), the activities of the vocational education part of PRINT ended as of 1 January 1991.

The results were disappointing and faith in the management of the project proved inadequate. For that reason, vocational education has since 1991 been brought in under PRESTO.

3.3.5 Vocational education: PRESTO

PRESTO (PRoject management for Effective Promotion of Technology in Education) took over the reins from PRINT. Again, this project's principles and aims were laid down by the Minister in an official policy document.
A major difference as compared with the previous projects is that PRESTO is coordinating the introduction of the new technologies into senior secondary vocational education within the context of a general policy of reform being pursued in relation to vocational education, viz. expansion of scale, the formation of multi-sectoral schools and reform of teaching. This general process of reform is producing greater individual freedom for the schools to design and organize their own teaching. Funding is being adjusted to take account of this, with a system of norms being introduced.
Accordingly, the tasks of the PRESTO project manager include coordinating demand from the world of education in the process of changing from a supply-oriented to a demand-oriented approach.
PRESTO aims to promote "active individual involvement" on the part of the schools.
PRESTO is to run from 1991 to the end of 1993 and has a budget of around 35 million guilders with which "to promote the introduction of the new technologies in senior secondary vocational education". The project is concentrating in particular on the issue of teaching materials and is not in principle intended to provide hardware or in-service training.
It is not concerned with the development of advanced teaching materials, but rather with the use of courseware in classroom situations. The educational institutions can bring questions concerning the development of courseware to the PRESTO-Courseware-transfer point, which will coordinate supply and demand and provide opportunities for users to compare notes.

PRESTO places the initiative in the hands of the principals of schools for vocational education.
To this end, the school heads have to set out on paper their ideas with regard to technological innovation.

In Technological Innovation Programmes (TIPs) they indicate what technological innovations are serving as starting-points in firms and institutions, how their own educational institutions aim to distinguish themselves technologically, what actual projects have priority in the short term, and how these are to be implemented and funded.
PRESTO provides support for the development of Technological Innovation Programmes, for the *joint* financing of projects and for the acquisition of relevant information, particularly with regard to courseware.
PRESTO leaves the initiative in the hands of the educational institutions and through this approach aims:

- to unite educational institutions, firms and organizations around the issue of the technological reform of senior secondary vocational education;
- to obtain cooperation between educational institutions in the development of new and advanced teaching materials;
- to trigger an independent process of reform with its own continuing momentum.

In order to obtain funding for projects from the PRESTO management, it is necessary therefore to reach agreements at an early stage with (clusters of) educational institutions. The project encourages the formation of such clusters.
The educational institutions must turn their project proposals into Technological Innovation Programmes and submit these to the management of PRESTO.

For the development of courseware, two types of project are recognized:

a. *implementation projects*, i.e. projects for mbo based on the examination syllabuses or curricula, and from 1st August 1991 on the attainment targets or (where the apprenticeship system is concerned) the programmes of practical training;
b. *pilot projects*, i.e. projects in areas of technology which have not yet won a generally accepted place in education.

The basis of the *implementation projects* is demand from individual schools. The project manager is responsible for translating the demand for courseware into projects either of broad application or of limited application to a specific area of occupational training.
He also ensures that all types of vocational training are involved in the planning.

In principle, the results of the projects are to have been implemented in the schools within a period of two years. An additional aim is usability by the largest possible number of school types.
At least 80% of the available budget is earmarked for implementation projects.
Pilot projects are projects in areas of technology which have not yet won a generally accepted place in education. The aim of such pilot projects is to establish whether, and if so how, the particular technology concerned could be introduced into education.

In-service training
Until the end of the 1991-1992 academic year, in-service training is being done in the context of NaBoNT. After that, no further funds for in-service training will be provided via NaBoNT and the available resources will be given directly to the schools. They will then decide for themselves whether they wish to spend money on courses, and if so which and how much. In doing so, the schools will not be restricted to courses provided by teacher training institutions, but will be free to turn to industrial trainers etc.

3.3.6 Adult education

Adult education became involved in the INSP at a relatively late stage. Accordingly, the adult education activities within the context of the INSP were concluded not in 1988 but in 1989, and were then continued under PRINT. In adult basic education, attention was paid to information and computer literacy within the 'social knowledge and skills' component of the course.
The development of computer science within part-time adult education begun in the context of the implementation of the INSP, was further expanded under PRINT.
With the introduction of secondary general adult education (vavo), the orientation and transition programmes will have to take account of this. As regards the development of courseware and professional development for the computer science subject area, there has been an attempt to achieve coordination with young people's education. In courseware development, research has also been done to establish what modifications are necessary to make courseware designed for use in the education of young people suitable for that of adults. Equally in the case of in-service training, there has been coordination with in-service training for young people's education. Where necessary, provision has been specially tailored to meet the needs of adult education.

As of 1st January 1990, the development of information technology for adult education became part of PRINT. PRINT-Adult Education includes adult basic education and secondary general adult education. As regards the sub-field of adult basic education, there are two main themes, viz. the use of new technologies in the classroom and the development of courseware in the context of open learning, as a means to achieving flexible modular learning paths.
Resources have been made available for the purchase of hardware.

Courseware development
The priority in developing courseware for adult basic education is placed on Dutch language, arithmetic and social skills.
With regard to general secondary adult education, research is being done to determine what modifications of the courseware products from young people's education are necessary to make these products suitable for teaching adults. Here, therefore, the emphasis is on the modification of existing courseware and/or the use of courseware under development. In addition, the outline programmes are being 'filled in' and supplementary materials are being produced.

In-service training
During the INSP period, a modular range of in-service training courses was set up, taking account of the transition to PRINT. The underlying principles were that:

- in-service training should be closely coordinated with the supply of the hardware and the starter pack;
- given the wide disparity in levels of expertise amongst teachers, the range on offer should be modular and flexible;
- the greatest possible use should be made of existing provision (PRINT-VO; NaBoNT);
- the greatest possible use should be made of materials already in existence.

Hardware
Within adult education, it was decided to adopt the same standard as in primary education. This meant that the MS-WINDOWS line was adopted.
Hardware provision took place in 1991 on the basis of the budgetary norm of one computer for every 60 students.

3.3.7 OPSTAP: other activities

Besides PRINT, some other activities are taking place in the context of OPSTAP under the direction of the Ministry of Education and Science.

1. With regard to *infrastructure*: schools are being offered the opportunity to update their existing hardware, software and knowledge infrastructure. This is being achieved by:
   - making resources available for the purchase of hardware;
   - making resources available for the purchase of software;
   - making resources available for maintenance and replacement of hardware;
   - making budgets available for in-service training.

   In almost all these cases, the schools are already free to spend this money either on IT or for some other purpose. This is the consequence of the transition to a norm-based system of funding (see 1.2). It is not known to what extent the schools are actually devoting these budgets to expenditure on NT.

2. Initially, the promotion of NT took place in isolation from other developments within education. Nowadays, greater care is being taken to achieve coordination of curriculum developments with policy developments in the various sectors:
   - expansion of scale: bigger schools, more sectors combined;
   - structural changes, like basic education;
   - cooperation between primary and special education.

3. Creation of preconditions for the curricular development of NT:
   - modification of examination syllabuses;
   - setting standards of professional competency;
   - regulatory activity, such as change in decrees governing school organization.

On this front, action is being undertaken only in 'slow motion'.

3.4 1993: Consolidation and integration

At the beginning of 1992, policy planning once again finds itself at a crossroads: will promotion be continued, or left in future to the untrammeled forces of the marketplace? In order to prepare policy proposals, the Ministry has set up a number of studies and called for advice, mostly in 1991. Summaries of these recent documents are included in the appendices.

Chapter 6 indicates the main lines of policy for 1993 and subsequent years under the title 'ENTER: the future'.
The motto for the period is 'integration and consolidation'. This suggests a confirmation of the status quo rather than fresh initiatives with regard to new elements.
Before going on to discuss the plans for the future, however, we focus first on the current situation (chapter 4) and the effects of the strategy in terms of successes and disappointments (chapter 5).

4. THE CURRENT SITUATION

4.1 Areas for special attention

At the time of writing (February 1992) a number of themes are particularly live.

- Current policy interest is concentrated particularly on the switch from an approach driven by supply to one driven by demand: who is to direct this process, what is the role of government, of schools, and of other institutions - and which institutions?

- The financial resources are increasingly being concentrated within the ordinary reimbursement of running costs. Funds for promotion are changing colour: instead of their being earmarked for NT expenditure, schools are now being allowed to decide for themselves whether to devote such funds to the purchase of software, hardware, or IT courses, or rather to use the money for new books, curtains, the window-cleaner, etc. The question is whether NT is already so deeply rooted in schools that managements will continue to ratify the priority given to it.

- The lag in implementation within secondary education is a matter exercising many minds. The number of hours available for information and computer literacy is very limited and integration in other subject areas is an uphill struggle. Some people blame this on the fact that too few supply initiatives have yet been taken to reach all the schools and all the teachers. Others feel that there has been a lack of a proper marketing approach based on the principle of the teacher as primary user. And yet a third category believe that the benefits to secondary education are either insufficient or too threatening.

- With regard to vocational education, the main question is whether all the schools will be able to continue to introduce reforms at the same pace, now that they themselves have to take the initiative and reach investment decisions in this respect.

- In primary education, the issue is now mainly one of the acceptance of IT in the schools. As already noted, expectations are running high.

- Ways are still being sought to induce greater activity on the part of the educational publishers. A study on the potential for public-private partnership with regard to courseware development has produced ideas which are now being developed in more detail.

4.2 Main results

4.2.1 NT in the curriculum

Integration in the curriculum differs from sector to sector.

Primary education
It is too soon yet to be able to speak of integration of IT in the school work plans of the primary schools. It is not the intention of government to prescribe information and computer literacy as a subject area within primary education. Use of IT will add a powerful medium to the teaching aids already in use and may produce new educational objectives.

Special education
Within special education, NT has affected not so much the content of the curriculum as the aids with which pupils with sensory handicaps are taught (information and computer literacy for the mentally handicapped??).

Secondary education
Virtually all secondary schools are now teaching information and computer literacy. Accordingly, the introduction of a compulsory 20 hours of information and computer literacy as part of the Basic Education curriculum is expected to give rise to few problems.
There is some rather uncertain progress as regards integration within examination subjects: physics, mathematics and Dutch language. Work on social studies and business economics is still in hand.

Vocational education
Within the technical sector, the curriculum now includes the use of NT, insofar as it occurs in the workplace. The same applies to a great extent with regard to commercial courses. Within the health care and services sectors, however, the updating of the curriculum is still lagging somewhat behind.

Teacher training
All student teachers are being given training to prepare them for the use of computers in teaching (CAI), as well as the opportunity to attend a basic course in information and computer literacy if as they have not already received one as part of their previous schooling.

4.2.2 Availability and use of hardware and software

With regard to hardware, the main result has been the achievement of standardization within each of the sectors. Secondary and vocational establishments are gradually replacing (or supplementing) their XTs with ATs, which are already standard within primary education.

Secondary education - inspectorate survey
In the autumn of 1990, the Educational Inspectorate visited a random sample of 242 schools involved in the NIVO project. Its reports revealed the following.
The average number of hours of information and computer literacy teaching per year varied sharply between different types of schools: lbo 80, mavo 20 and havo/vwo 40. Only in schools offering at least 40 periods of information and computer literacy per year was there any uniformity in the curricula; this was because these schools were virtually all using methods produced by the educational publishers.

Most information and computer literacy teachers were mathematics specialists.
In approximately 15% of the schools visited, information and computer literacy lessons were given by a woman teacher.

Computers were also being used in a number of schools for subjects other than information and computer literacy.

Use of the equipment in support of teaching was found to increase proportionate to the number of periods of information and computer literacy provided at the school. Computers were being used both in demonstrations and for remedial teaching, practice and individual study on the part of pupils.
Traditional computer use is a problem where no additional hardware has been purchased to supplement the NIVO hardware, since there are then only 8 computers. This was the case for a quarter of the schools in the third tranche and half the schools in the fourth tranche. 10% of the schools inspected indicated that they used none of the software in the NIVO starter pack, while by contrast in around 65% of the schools these programs were in very intensive use. In general, the NIVO vouchers had been used to buy a lot of 'subject' software, especially for Dutch language and mathematics.

COMPED-NL data
In 1989, information on the use of computers in education was collected from over 875 schools in the Netherlands within the context of the comparative international study on "Computers in Education" (COMPED[1]). The survey was organized by the International Association for the Evaluation of Educational Achievement (IEA) and was carried out in the Netherlands by the Centre for Applied Research on Education at the University of Twente.

The survey involved more than 2000 teachers in answering questions on such issues as the availability of equipment, the subject areas and learning activities in which computers were being used, the effects of computer use, the problems experienced in relation to the use of computers and the reasons for using computers or not doing so. The study attempts to answer the question of how the introduction of new information technologies actually takes place in the classroom and to what extent the expected effects are in fact achieved. Comparisons both over time and with other countries produce data contributing to an evaluation of policy in the field of the introduction of information technology into education.

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1 Pelgrum, W.J., Tj. Plomp: *The use of Computers in Education Worldwide, Results from the IEA 'Computers in Education' survey in 19 Education Systems*, Oxford 1991 - further referred to as COMPED.

The data was collected between March and May 1989 in primary and secondary (lbo, mavo, havo, vwo) education. The study examined the use of computers in education from three different points of view: that of the school heads, that of the computer coordinator, and -as regards primary and secondary schools- from the point of view of the teacher.

The results should now be treated with a degree of caution. They represent a 'snapshot' taken three years ago, and that is a long time for an aspect of education in such rapid development. In addition, it should also be noted that closed questions were used, and that these may have prevented certain effects emerging as clearly as they might.

A new survey is anyway due to take place in 1992, so that more up-to-date figures will soon be available.

Numbers of computers

In 1989, a good half of all primary schools had an average of 3 computers, 90% of the secondary schools had an average of 21 computers and the schools providing senior secondary vocational education had an average of 44 computers. Within mbo, schools providing courses in the services and health care sectors (mdgo) had relatively few computers (16) as compared with commercial schools (meao), with an average of 59, and technical schools (mto) with 51. The general secondary schools had in 1989 on average 10 more computers available than had been provided in the context of the NIVO project (1 file server, 8 pupil workstations and 2 subject-specific computers).

school type	bao n=124		avo n = 203		lbo n = 111		mdgo n = 29		meao n = 35		mto n = 45	
	%	av	%	av	%	av	%	av	%	av	%	av
1985	21	2	79	11	78	8	42	8	97	15	95	14
1986	38	2	90	12	92	10	77	11	100	20	98	19
1987	70	3	97	14	96	13	83	12	100	26	100	27
1988	94	3	100	17	99	16	93	14	100	34	100	38
1989	100	3	100	21	100	21	100	16	100	59	100	51

Table 7 Increase in numbers of computers over the 1985 - 1989 period in schools processing computers in 1989.
Source: COMPED 1989

Why do schools use computers in teaching?
School heads in primary, secondary and senior secondary vocational education see two main reasons for introducing computers for teaching purposes: to provide experience which pupils will need later (95% - 100%) and pressure from the grassroots, i.e. the enthusiasm of teachers for using computers in the classroom (76% - 85%).
An additional major reason, particularly in secondary education (65%) and even more so in mbo (76%), is to keep the curriculum up-to-date.

In addition to the motives given above, primary school heads also mention the encouragement of individualized learning (75%) and the boost to pupil performance (70%).

School policies
Most school heads indicate that the policy of their school is directed at giving all pupils experience with computers (average 88%). This is least the case in mdgo (58%).
A further aim of school policies, especially in schools providing secondary and senior secondary vocational education, is to prescribe the curriculum of a course in information and computer literacy/computer science or programming, to prescribe computer use in particular years of courses and to encourage particular forms of computer use in the classroom.
In addition to bringing all pupils into contact with computers, the policies of primary schools also focus on encouraging particular forms of computer use in particular groups.

Problems with computer use according to school heads
The school heads were asked what problems were seen as particularly acute with regard to the use of computers in education.

The following problems emerged in all sectors of education:

problem	*bao*	*avo*	*lbo*	*mdgo*	*meao*	*mto*
insufficient software	63	78	68	60	52	69
insufficient time to develop lessons	70	68	62	52	67	67
too few computers	80	55	60	68	55	72
lack of knowledge amongst teachers	54	64	53	56	36	35
difficult to fit into usual classroom practice	37	63	52	32	27	37

Table 8 Problems with computer use according to school heads
Source: COMPED 1989

Reasons for not using computers for teaching purposes

Where primary and secondary education was concerned, the reasons mentioned for not using computers relate to the same factors that schools see as obstacles to using them.

Reason for not using computers	*bao*	*avo*	*lbo*	*mdgo*	*meao*	*mto*
insufficient knowledge and skills for classroom use	61	75	44			
insufficient time to develop lessons	39	72	11			
insufficient software	45	70	22			
too few computers	62	43	67			

Table 9 Reasons for not using computers
Source: COMPED 1989

The only difference between computer users (Table 8) and non-users (Table 9) lies in the order of importance in which the problems are mentioned. This indicates that those who are sceptical have, at any rate, good reasons for being so.

Views of school heads on computer use

The need for information on the potential for computer use in teaching exists in all sectors, amongst both users and non-users.

More than half of all school heads in both primary and secondary education and seventy-five per cent of heads in senior secondary vocational education feel that computer-related in-service training should be made compulsory.
Most school heads see the computer as a valuable aid to improving the quality of teaching (schools using computers 87%; schools not using computers 69%), without having any clear idea of the nature of that improvement. Around half of all heads feel that computers help to make teaching more efficient, while some 40% don't know if that is so. There is also some doubt about improvements in pupil performance as a result of computer use. Around 60% of the schools in which computers are used do not know whether pupil performance is improved, and among schools not using computers 80% are unsure whether computer use produces any improvement in pupil results.

Duties of the computer coordinator

In the primary schools, the main job of the computer coordinator is to assist pupils in using computers. In secondary schools and senior secondary vocational education, the provision of computer education is frequently included in the package of duties assigned to the post. In addition to these responsibilities which vary from sector to sector, in most schools the computer coordinator also performs the following tasks:

- maintaining computer hardware and software;
- providing for additional training or individual study on computers;
- training and assisting colleagues with regard to the use of computers;
- selecting educational software and arranging for its availability.

Type of hardware

As shown in Table 9, a large number of schools have computers with different operating systems.

	bo		vo		mbo	
	%	number	%	number	%	number
MS DOS processor IBM 8086/ 80286/80386	19	2	98	15	100	41
Philips P 2000/MSX processor Z80	69	3	32	9	12	7
Commodore 64/Apple II processor other 8 bit	33	3	39	9	16	11
Atari/Apple Macintosh processor Motorolla 68000	10	2	2	5	9	6

Table 10 Available hardware broken down into computer (schools with computers = 100%)
Source: COMPED 1989

The overview given above clearly reveals the results of government policies in the INSP period, during which the secondary schools and senior secondary vocational education establishments were equipped with MS-DOS hardware.

Availability of educational hardware

Within all sectors of education, almost all schools possess a wordprocessing program. In addition, most primary schools possess (educational) games programs and drill and practice software.

Virtually all secondary schools and senior secondary vocational education establishments have a spreadsheet program and a data base program, in addition to a wordprocessing program. In addition, most secondary schools have drill and practice software, computer assisted learning programs and an author language. All the schools providing senior secondary technical education have cad/cam software.

Software per subject area

Most primary and secondary schools have programs for arithmetic, Dutch language and geography.

Ninety per cent of the secondary schools have software for information and computer literacy, as do 80% of the schools providing senior secondary vocational education and 47% of the primary schools.

Within senior secondary vocational education, there is almost no software available for general subjects like Dutch language (17%), mathematics (20%) and foreign languages (21%). In senior secondary vocational education, there is little use of computers in relation to the general subjects. Most such schools (94%), do however, have software available for the vocationally-oriented subjects.

Problems according to computer coordinators

Almost 75% of computer coordinators in both secondary and senior secondary vocational education feel that the main problem is the extremely limited amount of time available for the development of lessons in which computers can be used.

In addition, the following are seen as the main problems within secondary education:

- lack of educational software (71%);
- lack of knowledge and skills amongst teachers (72%);
- shortage of computers (50%);
- the integration of computers in existing classroom practice (59%).

In senior secondary vocational education, besides the shortage of time, the main problems are:

- lack of hardware (60%);
- lack of software (mdgo 69%; mto 62%; meao 34%);
- lack of technical support to keep computers in operation (40%).

Within primary education, lack of time is a less pressing problem than in secondary and senior secondary vocational education. The main problems in the primary schools are:

- lack of hardware (73%);
- lack of software (69%).

Teaching activities using the computer

Around half of all teachers in primary and secondary education use the computer as an aid to testing.

Virtually all primary school teachers who use computers do so for drill and practice. Similarly within secondary education, computers are frequently used for practice programs. The use of the computer to manage the learning process occurs most often in the area of information and computer literacy.

In primary schools, computers are also widely used to provide remedial help, with pupils making slow progress being given extra practice exercises to do on the computer.

This kind of use also occurs in secondary schools.
In both primary and secondary education, there is little use of computers for differentiated learning.
Within secondary education, the integration of computer use in existing subject areas had by 1989 still been achieved only on a limited scale.

Problems according to the teachers
There is a considerable overlap between the problems experienced by teachers using computers and the reasons given by other teachers for not using them.

In general, according to the teachers, the following problems can be identified as the main obstacles to the process of introducing computers in education:
- insufficient educational software (average 55%);
- insufficient time to develop lessons (average 52%);
- insufficient hardware (average 48%);
- lack of knowledge (average 37%).

Views of teachers
The vast majority of teachers feel that computers are a valuable aid to improving the quality of education. Most teachers try to maintain an up-to-date knowledge of technological changes. Around half of those teachers who use computers find that pupils pay more attention where computers are used. There proves to be an enormous need amongst teachers for supplementary training in relation to the didactic role of the computer within the process of education. Neither computer users nor non-users have much knowledge about the effect of computer use on learning. Computer users tend to expect effects in the area of pupil motivation rather than any actual improvement in performance.

Involvement of girls and women
In the Netherlands, as compared with other countries in the COMPED study, IT proves to be an exceptionally heavily male-dominated area.

Relatively speaking, only a very small number of women teachers within primary education are actively involved with IT. In secondary schools, however, the picture in 1989 was considerably better. The reason for this can be found in the obligation to send at least one female teacher for in-service training in the context of NIVO (even though only a proportion of these women teachers are now still involved with IT).

	bao	avo
female teachers	63	28
female principals	6	3
female computer coordinators	5	2

Table 11: % women involved, source COMPED

Of those schools in which computers are being used, only a minority pay any particular attention to the involvement of girls. Primary education leads the field in this respect with 32% of primary schools saying that they pay special attention to this matter, as compared with only 26% of general secondary schools claiming to do so.

4.2.3 In-service training

Since 1982, a wide range of in-service training courses have been provided for teachers. In the early years, it was the teacher training institutions which developed and implemented such courses. They were later joined by suppliers in the private sector. The COMPED study provides figures for numbers of teachers given in-service training in relation to particular topics. It is hardly surprising that the more technically oriented courses (in programming and concerning hard and software) were taken mainly by the IT teachers. They, after all, were among the pioneers, and the 'first generation' of IT in-service training courses focused mainly on technical aspects. The interest in applications came later. Of training in specifically educational use there is little trace. Up to 1989, the supply was hardly directed at this.
It is striking what large percentages of the group of non-computer-using teachers in secondary education have actually attended IT courses.

subject	bao IT use	avo IT teachers	avo other subjects
computer and society	29	77	35
applications	51	86	50
programming and problem analysis	42	90	54
hard and software	44	87	46
specifically educational use	<	<	<

Table 12 In-service courses attended
Source: COMPED

4.3 New activities in schools and beyond

As a result of all the government action over the last few years, a number of new activities are now under way in schools:

- vocational education: vocationally-oriented subject areas using NT, contract education;
- secondary education: information and computer literacy on a large scale and CAI on a more modest scale;
- traditional educational publishers: new methods in particular are being provided with courseware; new books are appearing on the basis of courseware for vocational education;
- publishers of educational software: this kind of company has grown up side by side with the traditional book publishers; they have generally started 'from home' but a number have now expanded into more professional publishing houses.
- at the policy level, a wide range of international contacts has been established;
- involvement with IT has offered new job opportunities for some people in the education system and for other functionaries concerned.

4.4 Changes in school organization

There have been no essential changes in school organization in the sense of any shift from traditional to individualized teaching, or any completely new interpretation of the role of the teacher, etc.
However, NT in schools has had some impact on functions and procedures:

- most schools now have a computer coordinator;
- many schools have an IT working party;
- in some schools, experienced users are providing courses for their novice colleagues;
- a teacher or technical education assistant is acting as systems manager;
- measures are having to be taken with regard to booking computer rooms, use of the network etc.;
- schools are having to take decisions on how to spend NT budgets, and on the choice of in-service training courses and people to attend them;
- schools in the vocational field are providing contract education (commercial courses) using hardware and software.

4.5 Evaluation of effects

The main evaluations at the level of the individual school are performed by the Educational Inspectorate. A number of large-scale descriptive studies have been carried out in the various sectors of education (with virtually 100% response, due to obligatory participation). These have produced mainly quantitative information.
The effects of a number of in-service training programmes have been evaluated by the Inspectorate. Such Inspectorate reports are presented to the Education Minister, who uses the data as background information for policy-making.

CITO (the National Institute for Educational Measurement) has drawn up a plan to identify the effects of the PRINT project. The results are intended primarily for use in answering to the Ministry on the effectiveness of the approach adopted and are therefore not so much directed at identifying the effects at individual school level.

The COMPED comparative international study, carried out in the Netherlands under the aegis of the University of Twente, has not only provided much descriptive data in relation to the Dutch situation, but also offers the opportunity to compare these data with those of the other countries involved. It will soon be possible, once the second round of data collection is completed, to observe the changes over time.

A qualitative study commissioned by the PRINT project manager for Secondary School introduction has recently been carried out in ten pioneering schools (see also the summary in the appendix).
This study has sought to identify the factors involved in the success or failure of IT introduction in secondary education. This provides a good insight into the motivation of teachers and a firm foundation for programmes of implementation. Unfortunately, the project plans have taken little account of the findings.

The Ministry of Education regularly commissions future-oriented policy studies, the results of which are used in the development of new policy.

All in all, therefore, the emphasis is on quantitative evaluation performed retrospectively and little qualitative research is being undertaken.

Dissemination of results takes place primarily within the closed world of the policy planners, support organizations and project managers. For the benefit of the schools, the main outline of results is also summarized in the weekly periodical published by the Ministry of Education, but this can hardly be termed active dissemination.

5. EFFECTS OF THE STRATEGY

There follows a point-by-point summary of the successful and less successful elements in the strategy. Some of these concern the achievement or non-achievement of intended effects, while others relate to side-effects which proved either positive or negative.

5.1 Successes

Vocational education (mbo and apprenticeship system).

- Most key elements of NT have now found a place in vocational education, on the basis of hardware, software and modifications in the curricula.
- Contacts have been established between schools and the local business communities.
- Schools are using hardware and software for the provision of contract education.
- Teachers in vocational education have been given the chance to attend professional courses on a large scale; there have been approx. 40,000 course enrolments.
- The initial results of the demand-driven approach are encouraging.
- Schools have themselves purchased extra computer equipment, so that a fairly good level of provision has now been achieved.
- Regional centres have been set up, where pupils can be familiarized with the use of advanced systems employed in the workplace.

Secondary education.

- Hardware standardization has been achieved.
- Almost all the schools are providing information and computer literacy courses, even though this has not been prescribed by statute, there have been no arrangements for teaching qualifications and other facilities have also been lacking.

- Many schools have used their own money considerably to expand their collections of hardware through the acquisition of PCs (these days mainly ATs) and peripheral equipment.
- The computerization of school administration has taken off in a big way.
- Various companies have emerged to market properly usable courseware.
- Some 16,000 teachers have attended introductory courses. Around 1500 teachers have been retrained as information and computer literacy teachers and 2200 have taken one or more courses relating to the use of IT in their own subject areas.
- In the development of new curricula, computer use is being integrated as a matter of course.

Primary education.

- Following discussion, hardware standardization has been achieved here too.
- Thanks to experience from earlier projects, a sound strategy has been developed for primary education.
- Despite the policy of discouragement during the INSP era, the schools have continued to pursue their own initiatives on a large scale; COMENIUS is now harvesting the benefits, tapping into with the spontaneous process already under way in many schools.
- In 1992, 2750 primary schools are to make a start with the implementation of IT on the COMENIUS computer in the classroom. 3000 other schools are starting with initial introduction via attendance at in-service courses and familiarization with the potential of the hardware and software. After that, another 3750 schools are to begin.
- By the end of 1992, over half the schools' representatives qualifying to do so will have received initial in-service training.

Infrastructure for software development.

- The cataloguing and assessment of software by a central organization has been important in terms of creating information material and preparing schools to act as critical consumers.
- There is increasing recognition of the importance of user participation in the development of courseware.

5.2 Disappointments

Vocational education.

- Initially, motivated by the then current realization of their lack of equipment, the schools were really only interested in obtaining hardware.
- It was difficult to establish in consultation with the labour market what skills the education system should be producing.
- NT has prompted many schools to adopt yet further specializations and options, even though the business world's main requirement is for the thorough teaching of basic skills.
- The question is whether senior secondary vocational schools will fall by the wayside with regard to further innovation, now that this is dependent on initiatives by the schools themselves.

Secondary education.

- The realization that school heads have to be 'won over' to IT came too late; their support is a critical factor for success.
- Another critical success factor was well recognized: projects offering PCs to staff at reduced prices. Within the structure of the Dutch education system, however, it was regarded as impossible for government itself to take any initiative in this respect. The government did recommend the idea to school boards, but it was rarely taken up. As a result, the positive effects remained limited.

- Actual use of CAI in secondary education is occurring only on a very limited scale, by a select group of teachers.
- Many teachers given the obligatory NIVO in-service training are no longer employed in the schools, so that the basis of at least three trained people is no longer invariably available. Of the women given training, no more than a third are still active in the field of information and computer literacy.
- Systems management facilities are extremely limited.
- The ambitions of the IT developers were dictated primarily by the potential of the medium. Recognition of the importance of market research came only at a late stage.
- Since the ending of subsidies to the demand side, the contribution of educational publishers has been disappointing.
- In implementation, too little attention has been and is still being paid to the teacher as the main focus for change and acceptance.
- Within the Basic Education curriculum, only 20 hours have been earmarked for the teaching of Information and computer literacy, while current practice varies from 20 to 80 hours.
- Decision-making on the introduction of computer science in the second stage is still not complete.

Primary education.

- Initial signals from the Educational Inspectorate suggest that, for many schools, a single year's preparation preceding introduction is too short a period. The reason for this is that both the hardware and the software standard are different from what they were used to.
- The choice of a modern software standard (Windows 3.0) is producing delays in the availability of courseware and development of software.

(In-service) training.

- There has been no reduced-price distribution of PCs to staff within the education system.
- There was a long run-up period before the first good courses became available.
- Subsidies were available for in-service training only where these were provided by teacher training institutions. There has been no financial support or encouragement for peer-group training in schools, even though this form of training proves effective where it is used.

Infrastructure.

- The attempt to organize software development along the lines of models used in industry has led to products which are too expensive for the schools.
- It has also led to lines of development which offer the inexperienced educational world too little opportunity to change original ideas.

6. PLANS FOR THE NEAR FUTURE

In February 1992, the State Secretary for Education and Science published his intentions for the IT policy area in a policy document entitled 'ENTER: The Future'. A striking feature of this document is that it reverts to the term 'information technology' (instead of New Technology), and that this now also includes the 'new media'. NT does, however, reappear with regard to vocational education.

The section below outlines the principles and main lines of future policy, while in 6.2 we go on to explore a number of aspects in greater depth.

6.1 Policy intentions 1993 - 1996: ENTER

The policy document presents a distinction between three different 'facets' of IT.

- As an *object*: this includes the way the technology works, social implications, and the ability to use general applications. This aspect of IT is comparable to information and computer literacy.
  State of play: This has been introduced into virtually all secondary schools.

- As an *aspect*: this relates to IT as an integrated component of a subject area.
  State of play: This is common in vocational education, where IT has already been widely absorbed into the curricula. There is also an increase in such integration within general secondary education.

- As a *medium*: the use of computers as a means to transfer knowledge and organize learning. Using IT in this way can produce improvements in the performance and effectiveness of education and also makes it possible to bring new goals within reach, allowing quality enhancement to ensue.

  State of play: amongst teachers and school heads there is already a realization of the great inherent potential this represents. There is, however, a lag in practical application.

Four principles are decisive in directing policy:

1. The role of the school is central: autonomy and control over its own affairs.
   The point now is to integrate and consolidate the gains of the last ten years.
   An approach must therefore be adopted which leaves authority and responsibility in the hands of the schools themselves.

2. A basis has already been established within the schools.
   The policies pursued in the past have led (or in the case of primary education will lead) to a basis being established in schools in terms of electronic teaching aids, in-service teacher training, modified curricula and a well-equipped support structure. The reimbursements for running costs have also been adjusted.
   Schools can now direct integration for themselves.

3. Linkage with main policy themes.
   Since the basis has now been established, IT no longer needs to be a main policy theme. It must now be given a place within policies for the various sectors and schools will decide for themselves how to interpret it.

4. Selective role of central government: conditions, finger on the pulse, safety net.
   Government will confine itself to the core tasks: identifying goals, establishing criteria, and making resources available. These conditions have been met by provision such as the infrastructure now existing in and around the schools and by the standards for hardware and software.
   There remains a role for government in terms of monitoring technical developments and translating these into curricula or examination syllabuses. The government also sees a role for itself with regard to courseware development for small target groups.

The detailed development of policies is in line with these principles, as is shown in the discussion of aspects below.

6.2 Description of a number of aspects

Organization and funding
The organization of the ENTER programme illustrates the policy intentions for the next few years.

There is no question of any detailed definition of how the policies are to be interpreted:
- the greater part of the budget goes directly to the schools, ruling out any further government intervention;
- two elements are indicated in broad terms: there is to be a platform composed of experts, officials and educational organizations, with an annual budget of 1 million guilders to enable it to monitor advanced applications within education. Consideration is also being given to setting up a public-private partnership (ppp), for which a 'central coordinating organization' is to be created which will not itself have any executive role;
- the greater part of the budget in government hands is earmarked for what is called 'intensification'. This is not elaborated from an organizational point of view: "Specific measures can only be taken once a problem analysis is available from a given sector of education or field of technology".

The department will no longer include a Technological Policy Coordination Unit, as it has since 1984. Instead, the policy responsibility will probably be transferred to the relevant directorates of education. This is in line with the principle that IT must above all be integrated into sector policies.

Funding
The 'ENTER' policy document indicates that a total of 573 million guilders will be available for expenditure on IT between 1993 and the end of 1996.
The larger part of this falls outside the direct authority of the Ministry: 400 million will go straight to the schools via the reimbursement of running costs. This may be regarded as *passive promotion*. Of the remaining 173 million, approx. 82 million is tied up in the run-on of projects dating from the OPSTAP era: COMENIUS, PRESTO and a small part of PRINT. This still leaves more than 90 million guilders with which *actively* to influence policy. The heaviest expenditure will come in 1995 and 1996.

	available in mln		decision (% budget)	
	NLG totaal	% totaal	central	schools
Primary education	22,6	16	12	88
Secondary education	26	18	24	76
Vocational education	70	50	-	100
General, intensification	22,5	16	100	-

Table 11: overview of available budgets
Source: ENTER: The Future, Ministry of Education and Science 1992

The source of funding is the Ministry of Education and Science. There is no mention of any involvement by the Ministry of Economic Affairs or of any contribution from industry, with the exception of the ppp.

Number of schools involved

As noted earlier, promotional measures have always been directed at involving the entire population of schools in NT, passive promotion. In this sense, therefore, there may be said to be an expansion of intentions.

All the schools are to receive money automatically through the increase in their operating budgets, irrespective of their level of activity in the area of NT. They will be free to decide for themselves whether to send it on NT.

So far as development projects are concerned, participation in such projects funded by the Platform will be open to all. In contrast to the original position, however, the schools themselves must now also make a financial contribution.

It is as yet unclear how schools can be involved in what are termed intensification projects.

Hardware

On the part of the government, no action is to be taken with regard to hardware acquisition. This will be entirely a matter for the schools. There is an expectation that the general secondary schools and schools providing vocational education will buy mainly ATs when replacing or adding to their hardware.

With regard to primary education, it remains uncertain whether schools will themselves order extra hardware, over and above the 1:60 provision made by the government.
he policy seems, however, to assume that they will.

Courseware development
Generally speaking, the last few years have seen a perceptible move towards the government giving less clear substantive direction to the use of NT in education. An exception to this rule is courseware development, in particular as regards secondary education, which remains a source of anxiety and a necessary focus of attention.

During the INSP era and the early years of OPSTAP, the emphasis was on the promotion of courseware development and therefore on the *supply* of courseware.
The demand side was influenced only to a limited extent, in particular through the software voucher in secondary education. Availability of good, usable courseware was seen as an essential precondition to stimulating the emergence of a greater demand for courseware on the part of the schools.
Nowadays, the stress is shifting from stimulating the supply to promoting the creation of a healthy market in courseware. In this area, the purchasing power of the schools is of prime importance. To this end, the schools are each year to receive financial resources for the acquisition of software, though without their being obliged actually to devote the money to this purpose.

The government also wishes to promote joint efforts by government and publishers to create an autonomous market for courseware. Work is going on to create a public-private partnership, in which the government (Ministry of Education and Science and the Department of Economic Affairs) and educational publishers will strive in concert to stimulate the market for courseware.
This operation will be confined to *secondary education.*

As regards the development of courseware for *primary education*, the document concludes that "the arrival of the standard (for software) (...) removes an obstacle for educational publishers (...). No extra attention is necessary with regard to the development of courseware for primary education".

Future support for the production of courseware for *special education* is, however, still envisaged, since this category of schools is so small that no commercial input can be expected in this respect.
With regard to courseware for vocational education, the document remains silent.

Beyond all this, there is to be a modest budget (1 million guilders) for advanced projects to be carried out at the request of schools and with financial participation.

As regards the promotion of courseware *use*, four different elements may be identified:
- the continued cataloguing and assessment of courseware and potential uses by central organizations;
- the provision of public information campaigns via the ppp;
- an expectation that the support organizations will continue to provide schools with information on classroom use;
- extra support in future for in-service training concerning use of NT in subject areas.

Classroom activities
On the basis of the applications now generally accepted, it may be expected that the following will continue in the future, though some change may perhaps be expected in the numbers of teachers involved in these applications.

Vocational education
- NT is now indispensible to the preparation for working life provided by vocational education. In view of the contacts established (partly in the light of NT) between education and the labour market, the up-dating of education is likely to be a continuing process. The schools will be able to decide for themselves on relevant investments.
- There is at present no sign that the use of NT in general subjects is likely to increase. There may, however, be a growth in interest in this type of CAI if schools in the vocational education system begin to offer a wider range of courses (including adult education, short and long courses etc.).

General secondary education

- It may be expected that all secondary schools will provide courses in information and computer literacy. This will be for at least 20 hours in the initial years of courses, as prescribed. Schools may well also decide to devote a proportion of the 'freely disposable teaching periods' to the subject, especially given that many schools are already giving more time to it now.
- The use of CAI within individual subject areas has so far been disappointing. It is doubtful whether the promotional campaigns aimed at achieving change in this area will manage to strike the right chord. For CAI in secondary education, the next few years will prove decisive one way or the other.

Primary education

The expectations with regard to computer use in primary education are mainly derived from the potential of the medium in these schools and the pattern so far emerging in the schools which have begun on their own initiative. Traditional use seems unlikely, in view of the available hardware infrastructure.

It may therefore be concluded that use is likely to occur mainly in connection with:

- remedial teaching;
- drill and practice;
- prosthetic and communications functions in special education.

The schools may also use the equipment for administrative support, although (in view of their scale) it will be a relatively long time before benefits can be achieved in this area.

In-service training

Time alone will tell what preferences emerge in the area of in-service training:

- Will there be a decline in enthusiasm for introductory courses, because all those interested have already been on them? Or will there in fact be a new wave of 'late adapters'?
- Will there be a growth in interest in courses concerning use in individual subject areas, based more on software? Or will there be a rapid spread of disillusionment in this area?
- Will teachers embrace the opportunity to use computers to support the managerial aspect of their job: record-keeping, testing, wordprocessing, graphics?

- Will vocational education continue to call on professional suppliers for the latest applications? Or will there be a preference for courses providing tips on specific educational use?
- Will in-service training tend to attract a new cohort of participants or will most be 'returnees'?
- Will in-service training perhaps assume a new face, by exploiting the possibilities of the medium, for example in combination with other media?

Curriculum development

There is likely to be little change in the approach to curriculum development as such: the same institutions will retain their responsibilities in this area. As always, the aim of curriculum development will continue to be the introduction of modifications in line with the latest ideas on the curriculum and on teaching methods.

The last few years have demonstrated, however, that a change in the curriculum offers a choice opportunity to introduce aspects of NT. Examples are the introduction of computer science in commercial education, physics in secondary education and NT in a wide range of vocationally-oriented subjects.

As regards actual activity in this field, development will be dominated by the idea of 'integration':

- in Basic Education (12 - 15-year-olds): integration in the core objectives of a number of subject areas;
- in examination syllabuses for lbo, mavo, havo and vwo.

There is no definition of *which* subject areas and syllabuses are envisaged.
Nor is there now any mention of the development of a separate 'computer science' subject area for the third/fourth years of havo and vwo. That plan has apparently fallen by the wayside.

Changes in school organization

Apart from the matters mentioned in 4.3 and 4.4, no other radical changes are currently expected.

7. EPILOGUE

This chapter considers in retrospect what has so far been achieved in the Netherlands in the field of IT. In doing so, it relates the results to other developments in the various sectors of education.
The main question it seeks to answer is "Why was it possible to achieve what has been achieved?"

7.1 Effects in the various sectors of education

Vocational education
It was not difficult to persuade vocational education of the importance of vocational preparation with regard to IT/NT. By their very nature, schools of this kind have a greater empathy with a distinct client group, and this made it possible for signals and trends to get through to the schools. Where teachers were still hesitating over the practical value of 'all this new stuff', the pupils themselves were also coming up with the questions via their work experience placements.
The importance of IT/NT for the quality of vocational training was really beyond dispute at a very early stage.

Another reason can also be identified for the relatively smooth progress of implementation in this sector. The period from 1984 onwards saw a trend towards 'a businesslike approach', and the idea of 'coordination with the labour market' also began to catch on in the educational world. Working with computers was an excellent way for the vocational schools to demonstrate how on the ball they were.

It should be noted that vocational education translated the importance of NT in terms of 'hardware'. The main aim of schools was to get their hands on equipment, and preferably the most up-to-date and sophisticated available. Its actual use within education was a secondary consideration.

The direct usefulness of CAI applications in general subjects is less obvious, even within vocational education. Accordingly, this was less successful in getting off the ground, just as it lagged behind in other sectors.

Secondary education

At first sight it is amazing that information and computer literacy is now being taught as a subject in virtually all general secondary schools, even though it has not been possible for them to call on government for the usual facilities: certification arrangements and teacher time etc. Encouragement was in fact only fragmentary. So why did the subject succeed despite all this?

In our view, this success can be traced back to three factors:

1. In the period from 1982 to 89/90, there was a 'policy vacuum' within secondary education: there were no major curricular reforms or radical structural changes under way. This freed the 'mental energy' for a topic like IT. By itself, however, such energy is not enough.

2. Another important point is that many schools saw their survival in its present form as to some extent under threat from the decline in school enrollment. For them, working with computers was a way to make their mark in the struggle to attract the declining numbers of pupils available (Now that virtually all schools have included IT in the curriculum, the computer room is no longer a distinctive 'recruitment feature').

3. As a result of this same decline in school enrollment, many teachers saw themselves under threat of redundancy. Some of them seized on IT as a way to make their mark within the school, or to take advance action to increase their chances of a job outside the world of education.

Together, these developments produced a climate in which information and computer literacy was able to win a place despite everything. Now that the subject area has been included in the Basic Education curriculum, the requisite facilities are becoming available and the transition can proceed relatively smoothly.

In this respect, IT came not a moment too soon; the mental energy available for this sort of activity would now be much less: too many minds are now preoccupied by the introduction of Basic Education, the mergers currently under way and the change in the system of funding.
In addition, there is the realization that CAI and the integration of IT in the subject areas have not so far 'made it'.
Apparently, the majority of teachers have not come to the conclusion that computers have on balance a positive contribution to make. Perhaps they are ignorant of the benefits or not sufficient well-informed about them, or perhaps they overestimate the disbenefits.
In many cases, the individual cost-benefit analysis has probably been made unconsciously and has simply come out against IT.
Another factor may be that the activities surrounding information and computer literacy have provided an alibi for teachers in existing subject areas to abstain from personal involvement: 'the school is already doing something'.

Primary education
Here, too, it is the case that many schools tackled the issue without any encouragement to do so. Those interested just pitched in and found their own way, or failed to do so.
There is now a major government project, which at the level of the individual school is delivering no more than a handful of computers, a range of in-service training courses with notes on use, and a number of software packages. Both the equipment and the software are quite different from what everyone was used to: they are, after all, the very latest thing.
Also, courseware is in short supply.
This means that even the pioneers are having to begin all over again. The question is whether they will be able to maintain their initial enthusiasm. After all, it will be some time before there is sufficient suitable courseware available for this new standard.

We may find in a few years time that the schools in the final tranches of the COMENIUS project will in fact have gained most from it: they will be able to begin immediately with the courseware and teaching materials which will then be available (if in fact they are).
If until that time they have pursued their own course, they will by then be ready to change to one offering wider potential and greater user-friendliness.

The schools then making the acquaintance of IT for the first time will be able to profit by all the experience already gained. They will be able to begin with fewer teething problems.

Adult education

In this sector likewise, there has been a fairly matter-of-fact and down-beat introduction of IT. Adult education has never been the central focus of interest; promotional measures have always been derived from things already done with regard to young people's education.

This meant that adult education could ride on the coat tails of provision and ideas and translate these for its own purposes. An additional factor of importance was the climate in the labour market. Unemployment was high, there was a demand for people able to cope with IT, and there was keen interest on the part of women returning to work and wishing to gain a foothold in the labour market. Against this background, IT courses could kill various birds with one stone.

A third factor is that the potential for using IT for individualized learning and to enhance learning performance are major benefits in the context of adult education. The value of CAI applications is persuasive.

Curriculum development

Experience over the last few years shows that the integration of IT benefits from a forthcoming change in the curriculum or in examination syllabuses. Any such change offers a natural opportunity to include the relevant elements of IT in education. Implementation then follows 'automatically' and educational software gains a place in the teaching materials produced by the educational publishers. The teachers allow themselves to a major extent to be led by examination requirements and find support for this in the methods.

Courseware development

This involves two aspects: the technical production of courseware and the market for the products.

At first, attention was focused exclusively on overcoming the technical problems involved in the production of courseware.

There were initial attempts to find separate procedures for the development of software for educational purposes. But, now that the software industry itself has also started to attach so much more importance to user participation, the methods usual within the industry are increasingly being adopted.

Initially, when courseware development was being approached in terms of the market concept, the emphasis was placed on the quantitative aspect: it was necessary to create a 'critical mass' and 'purchasing power' on the part of the schools. Government gave an extra boost to this. The position of the educational publishers was, however, characterized by a 'wait and see' attitude, except as regards vocational education.

Gradually, the view emerged that it was important to coordinate development with the curriculum. Later, however, it became increasingly clear that this was also not enough in itself: courseware must also correspond to the method and the teacher's way of working. Nevertheless, this more qualitative approach has not been consistently pursued. There is still no clear recognition of the teacher as a consumer of IT and therefore as an initial focus for the introduction of IT. Perhaps some effort can be made in this direction via the public private partnership activities.

7.2 Lessons from the past

We note that the ratio between promotion and effect is not 1:1.
In a number of cases, effects have been achieved without promotion, or with very little promotional effort (primary education, adult education). Elsewhere, a very great deal has been achieved against all the odds (information and computer literacy). And in yet other cases frantic efforts have produced only disappointing results (courseware development). It may also be said that money has, in some instances, been spent on promotion where the same effects would in fact have been achieved without it (parts of vocational education).

What lessons can now be derived from this? Should such well-intentioned government intervention never again be undertaken?
That is a conclusion we should be most reluctant to link to this analysis.

It is, however, clear to us that the effectiveness of any stimulus is greatest where it corresponds to trends already under way or to motives already possessed by those involved. Introduction must therefore be viewed in the context of the organizations within which it is to take place: what else is going on in them, is there in fact the energy available?

Where the government lets itself be led primarily by the potential of the medium and ignores these factors, it will be difficult to persuade the field and much money and energy may be wasted. This, at any rate, should be avoided in future.

Finally, some remark is in order concerning the balance of promotion over time. It is clear from the measures we have described that the order of priorities has remained constant: first, vocational education (with top priority being given to technical vocational education), then general secondary education with information and computer literacy and CAI, and lastly primary education.
This order is retained in the plans for 1993 - 1996. The ENTER programme includes *passive promotion*: schools are to be given extra purchasing power with regard to IT, but can choose for themselves how to use the money. A much smaller proportion of the budget is for *active promotion* via projects and experiments.

Expressed in monetary terms, the same order of priorities in force for almost the last ten years is maintained without change. We wonder in all honesty whether this is the right choice. To us it seems strange that over the next few years:

- firstly, promotional effort is to be focused on areas where implementation of IT is already well-established and has developed its own impetus: in vocational education (especially technical);
- secondly, attempts are still to be made 'to save what can be saved' with regard to applications for which there has so far been little enthusiasm: in general secondary education;
- thirdly, virtually nothing more is to be done with regard to the very sector in which the context seems appropriate and where there are high expectations concerning the potential of the medium: in primary education.

We feel that the budget for active promotion at least should be directed at those areas of relatively virgin territory in which there are prospects of promising applications, rather than on dead-ends or paths already well trodden in the past.

APPENDIXES

PUBLICATION

author(s):	J.I. van Deursen and J. Moonen
title:	Een actieve school met electronische leermiddelen [An active school with electronic teaching aids]
date:	September 1991
occasion:	report at request of Ministry of Education and Science concerning continuation of promotion

SUMMARY

* The introduction of IT into education has occurred in three stages: the pioneering phase, INSP and OPSTAP. Three trends are currently emerging:
  - the content is displaying a conscious evolution from 'learning about IT' to 'use of IT in the teaching situation'
  - the process is revealing an evolution from 'centrally controlled promotion' to 'consciously increasing the autonomy of establishments' and
  - there is a conscious attempt to increase the basis of support for this reform.

* After a promising start with the introduction of IT, effective integration is failing to get off the ground. The main reason for this is the inertia generally encountered in relation to radical changes in education. Continuous stimulus is necessary if the process of change is to be maintained.

* Promotion should continue, albeit in a different form: no longer via nationwide projects but by focusing on active schools. Continuation is important in the light of the steady evolution towards the information society.

* There has still been no market created for electronic teaching aids. Boosting demand for electronic teaching aids is the best way to ensure that the supply assumes a quality appropriate to the user.

* The government should take statutory measures to reward and promote the use of electronic teaching aids: final examinations and attainment targets, qualification arrangements, and the availability of support staff in the school.

* A non-governmental agency is needed to be responsible for marginal evaluation of school plans and to distribute funds.

PROPOSITIONS on the basis of the publication

1. Society is moving irrevocably in the direction of an information society. If computerization gets bogged down, the position of the school will inevitably contract. Without integrated application of IT, schools will become obsolete in the 21st century.

2. The investments made in the past are slowly beginning to bear fruit, even if the situation varies from sector to sector and from school to school. The real harvest has yet to come. We must work consciously to give that harvest every chance.

3. Responsibility for the growth of IT must be located in the school. This will make the third phase of IT promotion, as it were, 'the proof of the pudding'. Schools will either take up the idea and build further on it ... or not.

PUBLICATION

author(s):	J. Timmer, SCO Amsterdam
title:	Koplopers, een studie naar het gebruik van educatieve software in het VO [Front runners, a study of the use of educational software in secondary education]
date:	June 1991
occasion:	commissioned by PRINT-VO, research into promising applications

SUMMARY

This qualitative study focused on ten schools leading the field as regards the use of computers. The schools differed from each other in every other respect.

* Applications of educational software must match with the existing culture:
  - traditional teaching: practice, testing, demonstration
  - practical lessons: simulations
  - less traditional ways of working, such as project-based education: open software, problem-solving learning, etc.

* One obstacle experienced is the fact that teachers wish to keep control of the learning process. Use of the computer means that the teacher loses that control and loses sight of the activities of the pupils. Another major obstacle lies in the time investment required on the part of the teacher.

* A teacher employs three decision-making criteria:
  - congruence: does it correspond to my way of working and my teaching aims?
  - supportive character: to what extent does it support my aims and activities?
  - costs: what is the ratio between extra time investments and extra returns?

* The researcher argues for selective encouragement of (groups of) schools wanting to go further and also urges further work on successful programs rather than development of new courseware.

PROPOSITIONS on the basis of the publication

1. The strongly controlling culture in the school constitutes an obstacle to the use of educational software, since such use undermines existing control structures. Use of educational software is therefore not only a question of introduction, but means an essential change.
2. In view of the variety of ways of working and of cultures within education, and in view of the motives of teaching staff, it will not be sufficient to provide one set of information or of guidelines.
3. Ideas about benefits may vary widely not only from subject to subject, but also from school to school and, most importantly, from teacher to teacher.
4. It is wasteful not to exploit promising developments already occurring in schools.
5. The efforts of schools and support organizations are not being closely enough coordinated.

PUBLICATION

author(s): J. Moonen and B. Collis, University of Twente
title: Multimedia in het onderwijs, een verkenning [Multimedia in education, a survey]
date: February 1991
occasion: commissioned by the Steering Group New Media

SUMMARY

* 'Multimedia' is present where:
  - more than one medium is used
  - control is exercised via the computer
  - an interactive approach is possible.
* The authors identify three different categories of multimedia use in education:
1. conceptually integrated multimedia environment, not electronically linked; e.g. written teaching materials with software, video with teaching materials and/or software; this has the most change, in view of the traditional resistance and limited financial resources.
2. electronically integrated multimedia environment, available at a single location; e.g. interactive video, CD-ROM, CD-I; currently too expensive for use in education.
3. electronically integrated multimedia environment, available from various locations; e.g. distance education, telecommunications; also too expensive at present.

* New media possess great potential with regard to the achievement of objectives such as insight-promoting and problem-solving activities. This implies a dual innovation: both objectives and media use.
* The teacher is a crucial element. If media are to be used, they must:
  - be easy to modify to fit the learning and instructional context
  - be available in examples of actual use
  - require minimal preparation time
  - be matched by the availability of adequate technical facilities
  - offer opportunities for extending or adapting the product.

PROPOSITIONS

1. Everything suggests that multimedia will dominate the 90s. It is extremely unlikely that education will be able to ignore this new trend.
2. Insight into the results of using traditional media is a first step towards acquiring insight into the new media.
3. The effect on learning is determined not by the medium but by the educational implementation of that medium.
4. Technology will have no significant impact on education unless:
   - that technology explicitly meets the objectives of education
   - the working situation of the teachers is improved by it (in practical, motivational or intellectual terms)
   - the learning situation of the pupils is improved (in terms of motivation and job prospects)
   - the organization of education has to be modified.
5. Developments which may evoke the need for new media are:
   - greater stress on optimizing pupils' individual learning process
   - electronic decentralization of the supply of education due to problems of transport and the environment
   - recognition of the importance of on-going records of pupil progress.

PUBLICATION

author(s):	N. Lagerweij et al., University of Utrecht, ISOR
title:	School en nieuwe media [School and new media]
date:	September 1991 - draft
occasion:	report requested by Steering Group New Media

SUMMARY

Issue to be examined in this report: under what conditions can the introduction of new media lead to change and improvement of the education provided in schools?

* Provision to the schools should be made in the light of quality improvement. The authors see the importance of the media primarily in terms of quality improvement.
* The problem with this innovation is that a change needs to be wrought within education, although there seems to be very little desire to this effect on the part of the educational world itself.
* Actual reform of the school from without remains a difficult task due, on the one hand, to the extensive system of bureaucratic regulations and, on the other, to the professional character of the school organization.
* The introduction of new media can succeed as an educational reform only if such introduction is based as a matter of principle both on the school as a whole and on the teacher as the initial focus. The development of new products also remains a major line of approach to introduction. The quality of such products needs to be persuasive.
* The achievement of educational change requires some (external) pressure on the autonomous position of schools and teachers.
* A lesson using educational software must so far as possible be regarded as a conventional lesson. Teachers must be given more opportunity to control the learning process, with the new media playing a supporting role.
* Good and relatively rapid study results are one of the keys to a growing involvement on the part of sceptical teachers.
* The literature outlines various obstacles to the introduction of computers: these are physical, financial and material in nature but also include problems of lack of time, internal and external support, timetabling and issues relating to the curriculum. To these, the authors add recommendations of a substantive kind.

PROPOSITIONS

1. If the introduction of new media is to be successful in the near future, the schools will need already to have gone some way in making (structural) changes.
2. It would appear that the pressure to introduce new media comes from outside education rather than from within it.
3. Attempts at educational reform only have any chance of success where those drawing up and implementing innovation plans recognize the factors determining the capacity for change.
4. Even the most minor change can easily require a period of between three and five years before there is any sign of improvement.

PUBLICATION
author(s): PRINT
title: Press release on Icarus debate, dated 28th and 29th November 1991
date: October 1991
occasion: debate on advice to be presented to the State Secretary

SUMMARY
The SVI wishes to present the State Secretary with advice on promotional policy after 1992. In the lead-up to this, a searching discussion is taking place between teachers on the one hand and representatives of government, industry and educational (trades union) organizations on the other: this is the Icarus debate.

* Over the next few years, concern will centre around the following questions, relating to the necessity for and design of further government promotion:
  - is implementation now far enough advanced that it can proceed further under its own steam?
  - should there be support for all schools or only for those schools wishing to go further?
  - should the government be responsible for maintaining the existing infrastructure (hardware, software and organization)?
  - is there sufficient good quality educational software being produced?
  - is there an adequate and varied range of provision for further professional development?
  - is the education system not too over-stretched for successful implementation of IT?
* An estimate of the state of play at the end of 1992 in those schools which have taken part in PRINT:
  - 20% are now integrating applications in subjects like reading/language and arithmetic;
  - 40% are now drawing up implementation plans and taking decisions;
  - 40% are not yet at that stage: half of these are waverers, where the introductory process has gone wrong, while the other half are stragglers, where the process has gone off the rails.
* Teachers are discouraged from using computers by:
  - preparation time and complicated organization
  - inadequate numbers of computers
  - lack of clear benefits
  - other educational developments demanding attention
  - the fact that the computer is seen as undermining the role of the teacher.

PROPOSITIONS
1. Reconsideration is required with regard to the sometimes revolutionary character ascribed to the promotion of computers.
2. One of the shortcomings of a promotional policy largely imposed from above has been that too little account has been taken of the expectations, experience and possibilities of the education system itself.
3. It can already be concluded that the penetration of IT by 1993 will be completely inadequate and (that) implementation will vary widely from sector to sector.
4. The potential of IT is limited by the resources available, by lack of clarity concerning the significance of IT for the education system, by other developments in education resulting from government policies, and by the complexity of use.

PUBLICATION

author(s):	D. Kabel, Institute for Research on Government Expenditure
title:	Kosten-effectiviteit van informatietechnologie en nieuwe media in het onderwijs, een literatuurstudie [Cost-effectiveness of information technology and new media in education, a study of the literature]
date:	September 1991 - draft
occasion:	commissioned by Steering Group New Media

SUMMARY

* New media and IT offer opportunities for making education better and more exciting. On the other hand, there are costs associated. Costs and benefits will need to be weighed against each other.
* Such comparisons can be made via cost-benefit analysis, with all the positive and negative effects being expressed in money and compared with each other. This method is not appropriate since the objectives of education cannot be expressed in monetary terms.
* An alternative method is that of cost-effectiveness analysis, concentrating on one positive effect and comparing that with other projects and methods aimed at achieving the same goal. This is the method adopted in this study.
* Cost-effectiveness analysis requires:
  - situations in which alternatives with the same objectives have to be weighed against each other
  - carefully specified alternatives
  - an objective which can be accommodated within some measure of effectiveness
  - availability of accurate details on costs
  - availability of test scores; these constitute the only objective measure of educational progress.
* No empirical research has been done in the Netherlands with regard to cost-effectiveness. There is some literature from the US and Canada, but the results of this cannot be translated to the Dutch situation; they relate to CAI in the '70s and '80s.
* The possibility of cost-effectiveness analysis has been examined in relation to the current projects of the Steering Group New Media. However, most of these are development projects rather than applications, so that it is only at a later stage that analysis may have a role to play.
* Even then it will be difficult, since New Media often involve:
  - new or additional objectives
  - new target groups
  - methods which are specific and not applicable on a large scale

PROPOSITIONS

1. On the basis of existing effectiveness analyses, it is not possible to say how investments in IT and New Media should be targeted.

2. The cost-effectiveness of IT and New Media depends more heavily on the situation than on the medium employed. *How* IT and New Media are used is more important than *that* they are used.

PUBLICATION

author(s):	O. Goedhart, W. Verscouteren, M. Verdoes
title:	De school achter de schermen [The school behind the scenes]
date:	November 1991
occasion:	commissioned by the Ministry of Education and Science, Wolters Kluwer and the ECC, in the context of ppp

SUMMARY

The issue for this preparatory study was to investigate the extent to which the intended public-private partnership could help to speed up the creation of a market for educational software for use in secondary schools.

* No satisfactory market for educational software has yet been established. On the demand side, there is a lack of autonomous demand; it is partly as a result of this lack of adequate demand that the range of products tailored to meet it is also inadequate. There is limited interaction between supply and demand.

* The ppp is supposed, via its professional market-oriented approach, to achieve a change in behaviour on the demand side.

* Promotion has paid too little attention to the didactic benefits of EP.

* The use of EP imposes various demands on teachers:
  - to acquire new skills
  - to gain an understanding of the various kinds of EP
  - to change from traditional ways of working to ways focusing more on the individual pupil
  - to abandon the magisterial role of instructor in favour of a guidance function.

* Attention should be focused on those schools and teachers most keenly interested, approx. 10 - 30%. The assumption is that they will then influence the other schools around them.

PROPOSITIONS

1. In view of the current failure of the market for educational software to get off the ground, the early enthusiasm is turning into disappointment and scepticism. In that sense, the situation in the market is worse now than it was a few years ago.

2. The problems surrounding the acceptance of any new teaching aid with uncertain benefits and high costs are playing a major role.

3. There is no curricular necessity for the introduction of educational software within secondary education.

4. Establishing a link between the advantages of EP and greater chance of success in attracting pupils may be an effective means of persuading schools to make this choice.

PUBLICATION

author(s):	Steering Group Support for Information Technology (SVI)
title:	De computer de school in [Computers into schools]
date:	June 1990
occasion:	report presented to the State Secretary on steering group's own initiative

SUMMARY

* By 1995, the following should have been achieved:

- all the schools should be acquainted with the potential of computers; in view of the expected differences in needs, a wide range of in-service training courses and support should have been created.

- a start should have been made with cross-sector standardization of hardware and operating software, with the AT established as a minimum standard.

- a clear, structured range of computer programs should be available for the introductory stage; the emphasis in development should be on the subject areas, with a proportion reserved for courseware which 'breaks new ground'.

- the legitimation of software development should have been settled and the private sector actively involved; the national support organizations should be active with regard to educational design and quality maintenance, as well as in the area of classroom implementation.

* By way of 'transitional goals', the following should be accomplished:
  - drafting of implementation plans in schools
  - agreements on standardization of hard and software
  - coordination of packages, both within and between sectors
  - improvement of the infrastructure for courseware development, with a clear allocation of roles
  - establishment of an implementation strategy for all the sectors
  - development of a varied range of in-service courses and support, based on analysis of the needs of schools.

PROPOSITIONS

1. The SVI feels that the activities launched within PRINT should be continued even after the demise of the project in 1992.

2. The introduction of computers within education means that teachers have to learn to manage the computer in the school situation. This demands a planned approach. Only then will computer applications gain any real place within education.

PUBLICATION

author(s):	H. Coltof, H. Scholtes, L. Panen, Tj. Plomp
title:	Report of the Advisory Committee on New Technology and Education
date:	May 1990
occasion:	request by the State Secretary for a report on the continuation of promotion

SUMMARY

The objectives of the INSP remain relevant:

- the need to achieve computer literacy in all pupils is now unchallenged. This means that computer studies must be fully implemented both as a separate subject and via applications in secondary education.
- the importance of adequate preparation for working life is equally evident; further implementation is required in all sectors of vocational education.
- the value of different forms of CAI in increasing returns on the learning process in the eyes of teachers must be demonstrated over the next few years and deserves vigorous support, given the great potential of IT.

* The remaining period of promotional policy should be more heavily dominated by the idea of further organization and development of cooperative arrangements on the demand side.
* Promotion (...) between now and the end of the OPSTAP policy must be much more strongly focused on:
  - transforming schools from passive to active participants in the market
  - introducing 'rewards' and 'penalties' with regard to the schools
  - equipping the suppliers in the market and in the private sector with relevant market information
  - integrated approach to the market
* In order to get the production of courseware under way, a public-private partnership should be started.
* The committee makes a number of recommendations:
  - the subsidies to the schools during OPSTAP and the years immediately after should be in the nature of targeted subsidies;
  - the State Secretary should without delay issue unambiguous statements on the implementation of computer studies and computer science in secondary education;
  - courseware development should be focused on computer studies and computer science in other subject areas;
  - implementation in the schools should be closely monitored, so that more information can be made available with regard to the market;
  - the hardware standard for primary education should also be adopted for secondary education.

PROPOSITIONS

1. OPSTAP may be the successor to INSP, but in fact there is virtually no difference in their methods of promotion.
2. Schools are (...) frequently not really regarded as knowledgeable or serious discussion partners.
3. Apart from by its strong orientation towards the supply side, OPSTAP is also characterized by a virtual absence of any strategic choices producing an order of priorities.

PUBLICATION
author(s): various American authors
title: various articles in US journals
date: 1991
occasion: critical retrospective examination of investments made in IT

SUMMARY
In the US, there is great interest in the effects of IT on productivity. Comparisons are made in this respect between effects on 'blue-collar labour' and 'white-collar labour'. Productivity in the blue-collar sector has increased considerably, while in the white-collar sector there is little or no improvement in productivity. More than anything else, IT has demanded heavy investments, and managers are beginning to wonder what the returns will be.

Improvements in productivity are generally equated with improvements in efficiency and therefore regarded in terms of quantity, time and costs: more items in less time or at lower cost. Because the results of white-collar work are less easy to express in terms of items per unit of time or costs per item, improvements in returns flowing from the use of IT are less easy to establish in this way.

In fact, effectiveness is a much better measure of improved returns since it takes account of the quality of the work, initiatives and innovation. Quality improvements certainly are achieved in the white-collar sector as a result of IT.

Another reason why efficiency improvements due to IT are difficult to establish in relation to white-collar work is the fact that the method draws no distinction between productivity at different levels: the individual, the department and the entire organization. Individual measures of white-collar work are frequently either unobtainable or meaningless. The individual is, after all, just one link in the chain.

In relation to white-collar work, improved returns become proportionately easier to establish as:
- input is clearer and more stable
- activities or working procedures are more closely specified
- results produced are more tangible or specific.

PROPOSITIONS
1. If the stress is placed on improving quality, costs are often automatically reduced.
2. Educational performance does not lend itself easily to measures of efficiency:
   - the input is unclear and must be flexible
   - the same goes for the process
   - the results are only partially measurable and are extremely diverse in nature.

LIST OF ABBREVIATIONS

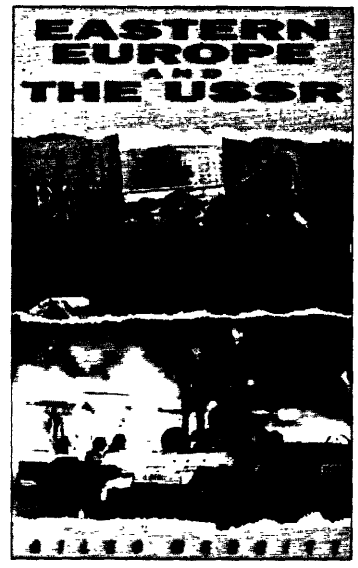
ARO	:	Adviesraad voor het onderwijs Advisory Council for Education
avo	:	general secondary education
bao	:	primary education
bo	:	primary education
CAI	:	Computer Assisted Instruction
CITO	:	Centraal Instituut voor Toetsontwikkeling National Institute for Educational Measurement
COMPED	:	COMPuters in EDucation
ECC	:	Educational Computing Consortium
havo	:	senior general secondary education
hbo	:	higher vocational education
INSP	:	INformatica StimuleringsPlan Information Technology Promotion Plan
lbo	:	junior secondary vocational education
llw	:	apprenticeship system
mavo	:	junior general secondary education
mbo	:	senior secondary vocational education
meao	:	senior secondary commercial education
mdgo	:	senior secondary personal and social services and health care education
mto	:	senior secondary technical education
NaBoNT	:	NAscholing docenten BeroepsOnderwijs Nieuwe Technologieen In-service Training for Vocational School Teachers in the New Technologies
NIVO	:	Nieuwe Informatietechnologie in het Voortgezet Onderwijs New Information Technology in Secondary Education
NLG	:	Dutch guilders
OPSTAP	:	Operationeel Plan STimuleringsActiviteiten en Procedures t.b.v. de onderwijsondersteuningsstructuur Operational Plan for Promotional Activities and Procedures in relation to the educational support structure
POCO	:	Programmatuur Ontwikkeling voor Computers in het Onderwijs Software Development for Computers in Education

ppp	:	public-private partnership
PRESTO	:	PRojectmanagement voor Effectieve Stimulering Technologie in het Onderwijs Project management for the Effective Promotion of Technology in Education
PRINT	:	PRoject Invoering Nieuwe Technologieën Project for the Implementation of the New Technologies
SCO	:	Centre for Research into Education (University of Amsterdam)
SLO	:	Stichting Leerplan Ontwikkeling National Institute for Curriculum Development
SVI	:	Stuurgroup Verzorging Informatietechnologie Steering group Support for Information Technology
TIP	:	Technologisch Innovatie Plan Technology Innovation Plan
vavo	:	dult general secondary education
vo	:	secondary education
vso	:	secondary special education
vwo	:	pre-university education

Eastern Europe and the USSR

THE CHALLENGE OF FREEDOM

GILES MERRITT



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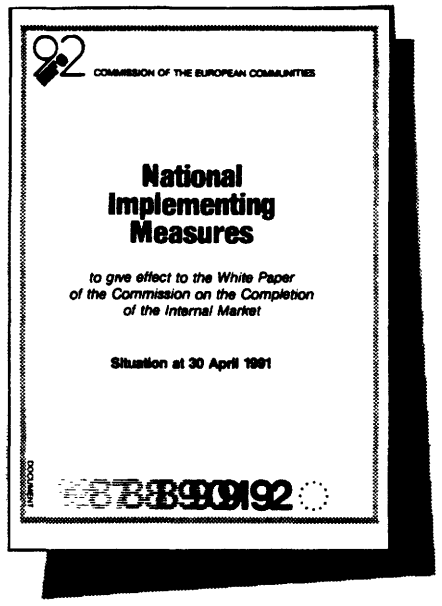

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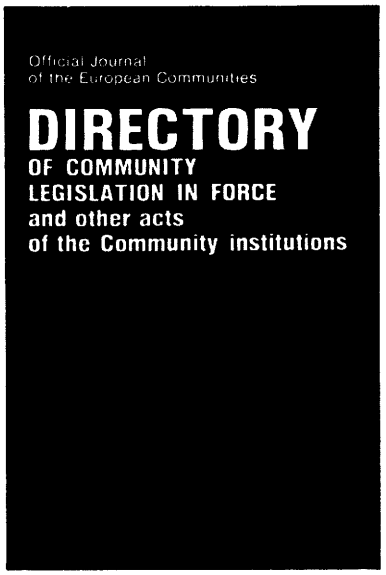

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ISBN 92-77-77093-7 (Volume I)
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15/07/82

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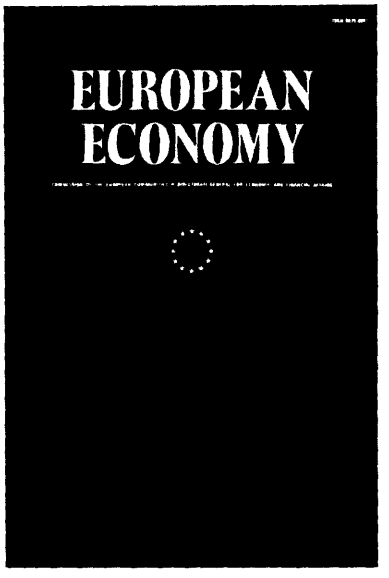

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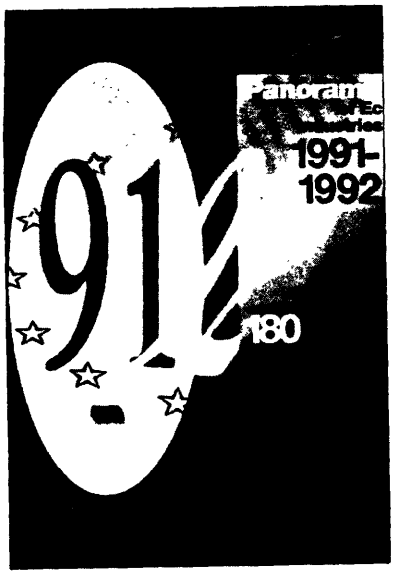

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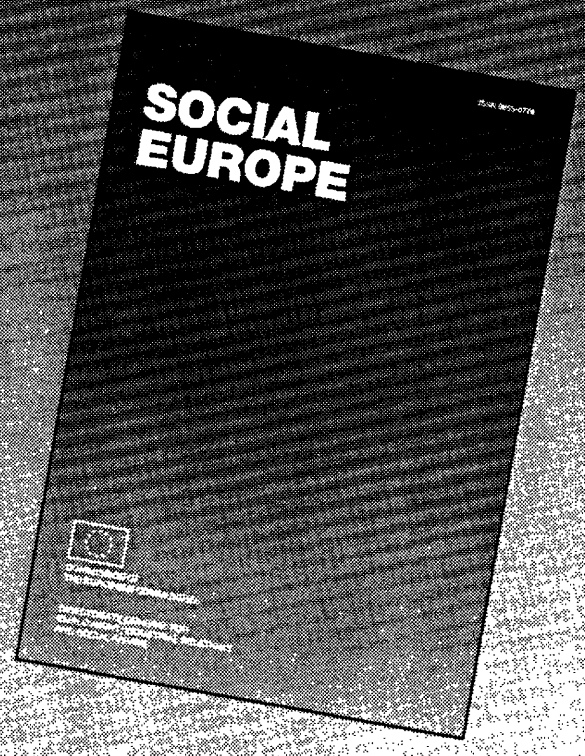

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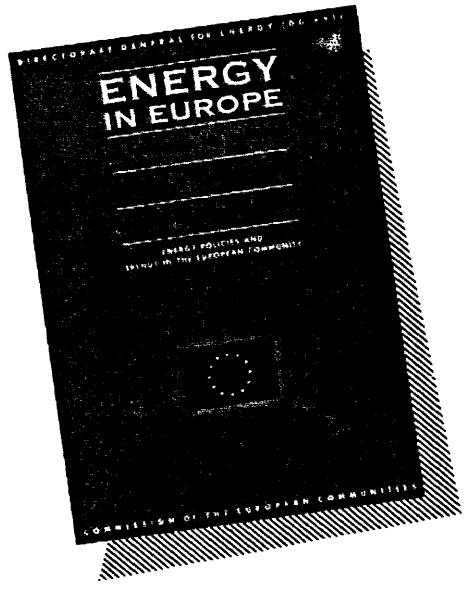

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