

THE E-UNIVERSITY COMPENDIUM

VOLUME ONE

**Cases, Issues and Themes in
Higher Education Distance e-Learning**

CHAPTER FIVE

Impact of the Internet on Higher Education in the Netherlands

**Petra Boezeroy and Eric Beerkens
with Professor Betty Collis, Jeroen Huisman
and Professor Jef Moonen**

Prepared by CHEPS (November 2001)

Edited by Paul Bacsich (with Sara Frank Bristow)

THE HIGHER EDUCATION ACADEMY

Editor's Overview and Contextualisation	4
1. Introduction	5
1.1 Aims of the Project	5
1.2 Research Questions	5
1.3 The Two Cases.....	6
1.4 Structure of the Report	6
2. Higher Education and ICT in the Netherlands	6
2.1 The Dutch Higher Education System.....	7
2.2 Technology in Dutch Higher Education.....	7
2.3 Governmental Policy about Internet Use in Higher Education.....	8
2.4 The SURF Foundation.....	8
2.5 Digital University.....	17
3. Profile of the University of Twente	22
3.1 Introduction.....	22
3.2 General Background	23
3.3 The Start of Being Innovative: the Entrepreneurial University.....	23
3.4 Examples of Educational Innovation.....	24
3.5 ICT and the University of Twente.....	25
4. The Initiation and Institutionalisation of the Course Management System (TeleTOP).....	31
4.1 Introduction.....	31
4.2 Historical Background	31
4.3 Central Policy.....	32
4.4 C@mpus+ Approach.....	33
4.5 Implementation Strategies.....	34
5. The University of Twente and External Collaboration	38
5.1 Digital University.....	38
5.2 EUNITE.....	38
5.3 ECIU.....	41
5.4 EUNICE	42
5.5 University Network of Innovative Student Centered Education (Uniscene).....	43
6. Financial Analysis.....	43
6.1 At the Central Level.....	43
6.2 SURF Budgets	44

6.3	<i>Digital University</i>	45
6.4	<i>Summary of Central and External Funding of ICT Projects at the University of Twente</i>	45
6.5	<i>Financial Arrangements for Both Students and Staff</i>	45
7.	Future Perspectives	46
7.1	<i>Introduction</i>	46
7.2	<i>Future National and International Co-operation</i>	47
8.	Summary and Conclusion	48
8.1	<i>Preliminary Thoughts on the Success and Failure Factors</i>	50
Appendix A: Requirements for the Decision to Use TeleTOP		53
Appendix B: About TeleTOP, the Digital Learning Environment at the University of Twente		55

Editor's Overview and Contextualisation*

This report looks at two leading institutions that are key to higher education's use of e-learning in the Netherlands – and from which lessons can be drawn that are relevant to UK HE. In contrast with some other chapters in this compendium, these lessons are not restricted in their applicability just to those organisations trying to build e-universities; they are of general relevance to any university engaged in formulating or refining an e-learning strategy – that is to say, to more or less all universities.

The first is the SURF foundation. In many ways this is the Dutch analogue of JISC, but (as usual with such comparisons) in other ways it is not. (There is a similar discussion regarding CANARIE, the Canadian analogue, in chapter 10.) There is an increasingly deep collaboration between SURF and UK agencies, starting of course with UKERNA and JISC, but in the last two years involving collaboration (including annual events) also with the Association for Learning Technology (ALT).

The second is the University of Twente. This is a very successful technology-intensive university in a relatively rural part of the Netherlands, with the corresponding issues of engagement with the region, as well as nationally and internationally. It has also developed its own learning management system. Readers will certainly find more than one analogue of that situation in the UK.

The report also gives an overview of the European university collaborations relevant to a university such as Twente.

It also touches on the Dutch Open Universiteit and the issue (current at the time of writing) of its inclusion into the Dutch Digital University – but both of these really would need chapters to themselves. In particular, the Dutch Digital University is still not well known in the UK, yet may provide many lessons for the UK to reflect on.

Contextualisation Issues

One of the benefits of this report is that it was written by experts not only very familiar with the Dutch higher education scene, but also fluent in the language. In terms of our contextualisation, we unfortunately had to rely solely on the English-language sites available. Those with some knowledge of Dutch will be able to delve much deeper into the subject, hopefully using our initial comments and set of Web sites as starters. To this end, the Twente Dutch-English academic dictionary at <http://www.utwente.nl/en/links/TerminologyDUENG.doc/index.html> and/or the Nuffic glossary at <http://www.nuffic.nl/glossary/> should be of value.

* Contextualisation and footnotes by Paul Bacsich, July 2004. Critical reading and additional research provided by Terence Karran.

1. Introduction

A survey as part of the *Business of Borderless Education* project* revealed that few British institutions have recognised the importance of strategic issues such as demands from new groups of learners, working adults, lifelong learning, “just-in-time” learning and flexible learning. This situation forms a major concern with respect to the competitiveness of UK higher education and its readiness to meet the global challenges of borderless education. The Higher Education Funding Council for England (HEFCE) therefore decided to embark on a project to identify how the UK is keeping up with world leaders in the use of Information and Communications Technology (ICT) in higher education teaching and research, and what it should do in the future to be globally competitive.

1.1 Aims of the Project

In order to identify the future agenda for institutional and national policy initiatives in the UK, this project – the “Impact of the Internet” project – will focus on identifying leading-edge players in the world of ICT. These are defined as “players that are setting or are likely to set the pace for the future”. The study aims to gain insight into the factors that make those players leading edge and insight into their strategies and plans.

As part of this project,[†] two higher education institutions (HEIs) are studied in depth, with specific attention to their internal strategies as much as to the structures embracing the institutions in terms of national and international partnerships/consortia. The case studies are carried out by the Center for Higher Education Policy Studies (CHEPS) and the Faculty of Educational Science and Technology (TO) of the University of Twente.

1.2 Research Questions

For the two case studies, the following research questions will be addressed (as far as these are relevant and appropriate):

- Which external conditions influence the strategic choices of the higher education institutions and how?
- Which internal conditions and measures are taken in order to achieve the strategic targets?
- Which choices for technology use, including course management systems, are made and why?
- What are the institutions’ views, and – to the extent possible – is there evidence with respect to the efficiency and effectiveness of chosen technologies?

* The final report of this was published in March 2000 by CVCP (soon to become UUK).

[†] There were eight studies in the overall project. One case study, this one, was split into two chapters for production reasons.

- What role do external collaborations and partnerships play in achieving strategic objectives?
- What strategic choices do institutions make with respect to the use of ICT in the view of their future mission, profile and market orientation?

1.3 The Two Cases

The two cases selected are the University of Helsinki (Finland) and the University of Twente (the Netherlands). Both are selected on the criterion that they are perceived to be, or acknowledged as, important players in the field of ICT in higher education in Northern Europe. In addition, the research team has access to high-level contacts and data at both universities. The report will show that – despite the fact that both universities are considered leaders – there are considerable differences between the cases. The University of Twente seems to be much further along in actually implementing ICT at different levels within the organisation, whereas the University of Helsinki is, to a considerable extent, in the phase of development, strategic planning and targeting markets. As a consequence, in the case of the University of Twente, much more attention could be paid to the actual activities, whereas the focus in the case of the University of Helsinki is much more on the contextual factors of influence.

1.4 Structure of the Report

For each of the case studies, a more or less similar format is used to describe the most salient features of the university. First of all, a description is given of the structures embracing the higher education institutions in terms of national and international partnerships/consortia. Subsequently, in describing the HEIs themselves, attention is paid to (a) strategies, aims and instruments, and target markets; (b) main activities; (c) organisational structure; (d) financial analysis; (e) technology; (f) content and pedagogy; and (g) future developments. The two cases are presented integrally to allow for reading the cases independently. The case on the University of Twente has been written by Petra Boezeroy and Eric Beerkens; the case on the University of Helsinki by Betty Collis and Jef Moonen. Jeroen Huisman has written the introduction and edited the draft text.

2. Higher Education and ICT in the Netherlands*

In this section an overview will be given of Dutch higher education and governmental policies on ICT in higher education. This is followed by a description of one of the most important Dutch organisations in the field of ICT: the SURF Foundation. Also, a description is given of one of the latest governmental initiatives: the Digital University (DU).

* The rest of this chapter deals purely with the part of the case study dealing with the Netherlands. The part dealing with Finland forms chapter 6.

2.1 The Dutch Higher Education System

The Dutch higher education system is a binary system which consists of 13 universities and 58 institutions offering higher professional education (the so-called HBO institutions). The latter are to a considerable extent comparable to the German *Fachhochschulen* or the former British polytechnics. Besides the 13 traditional research universities, there are a limited number of small “designated institutions” that are part of the university sector: a university for business administration, four institutes for theological training and a humanistic university, as well as several international education institutes. Similar designated institutions also exist in the HBO sector.*

The research universities prepare students for independent scientific work in an academic or professional setting. Of the 13 universities, nine offer programmes in a wide range of disciplines, three provide mainly technical and engineering programmes and one specialises in agriculture. Together the universities offer some 200 different programmes, some of these provided in part-time mode. The HBO institutions prepare students to practise a profession and enable them to “function self-consciously in the society at large”. Together, they too offer around 200 programmes, including a substantial number of part-time programmes. Next to these two major sectors, higher education in the Netherlands is also provided through the Open University of the Netherlands (Open Universiteit Nederland), located in Heerlen with a number of support centres around the country. The Open University offers a wide range of courses, leading to both formal university and higher vocational education degrees.†

2.2 Technology in Dutch Higher Education

In Dutch universities and colleges, ICT is used on a large scale by both students and staff. The use of standard applications (word processing, calculating programmes, communication and Internet) and also to an increasing extent the use of electronic learning environments (ELE,‡ e.g., Blackboard, WebCT or systems such as TeleTOP) is found in the standard facilities of many of the students and staff in Dutch higher education institutions. However, the availability of more extensive digital learning applications, the expertise of teachers and the systematic embedding of central faculty ICT policy can still be improved.

With regard to the use of electronic learning environments inside HEIs (both the university and the HBO sector), a survey was carried out at the end of 2000.¹ The first conclusion drawn from this survey states that many ICT applications are used in the field of communication and information gathering, but not yet that much for didactical

* These figures have changed little since the time of writing. The current figure is 14 universities and 60 HBOs (in Dutch, *hoger beroepsonderwijs*). See *World Education News & Reviews*, March/April 2004, <http://www.wes.org/ewenr/04March/Netherlands.htm>. Mergers have substantially reduced the number of HBO institutions from almost 350 in the mid-1980s.

† The Open University of the Netherlands is often called the Dutch OU; the recognised abbreviation for it was Ou until recently. See <http://www.ou.nl/info-alg-english-introduction/index.htm>.

‡ One can regard ELE as synonymous with LMS or VLE.

purposes. The second part of this survey concentrated on the existence of electronic learning environments. Almost all HEIs do use, or intend to implement, such an ELE:

- 23% of the institutions surveyed had already implemented an ELE.
- 24% of the institutions had started a pilot project. 43% of the institutions had plans regarding an ELE.
- The remaining 10% of the institutions did not (yet) have any plans for the implementation of an ELE.

2.3 Governmental Policy about Internet Use in Higher Education²

At this moment there is no governmental legislation in the Netherlands specifically related to e-learning, nor are there plans to prepare for such legislation. e-Learning is seen as a tool for education or as a specific form of education. As such, the already-existing legislation is also valid for the use of ICT in education. Education is free in the Netherlands; but if universities wish to provide formal degrees, or apply for state funding, they have to follow national rules. These cover both traditional education as well as e-learning, and national providers as well as international providers. As far as matters of intellectual property and copyright are concerned, the Ministry of Education, Science and Culture follows the policies of the European Union.

Concerning quality assurance, the Ministry of Education, Science and Culture does not feel the need to establish specific measures.* In the Netherlands there has been a system of quality assurance in higher education for several years, which covers almost all programmes in higher education. If a new provider, of a digital or traditional nature, intends to enter the Dutch market by offering recognised degrees, it has to conform to this system of quality assurance. In conformance with the bachelor's-master's degree system (for more information, see below), an accreditation system will be implemented; and a national body for accreditation will be instituted in 2002. As the quality assessment of HE programmes relates to the content of the programme and not to its form, it is expected that there will be no need for special testing procedures for e-learning programmes.†

2.4 The SURF Foundation

2.4.1 General Background

The SURF Foundation (<http://www.surf.nl/en/home/>) is the most important Dutch co-operative organisation for institutions of higher education and research in the field of network services and ICT. SURF was set up in the mid-1980s, with the primary goal of promoting co-operation in the field of ICT among Dutch institutions for higher ed-

* That is, to cover e-learning.

† The Netherlands Accreditation Council was founded in 2003. (It now covers Flanders as well.) Their Web site is at <http://www.nvao.nl/index.php>. Note that it operates largely via subsidiary accrediting agencies.

ucation and research. The activities of SURF are based on four-year, long-term plans. The aim of SURF is to provide an optimal use of ICT throughout the Dutch higher education and research system, in which the common factor in all SURF programmes is the *dissemination of knowledge*.

2.4.2 Structure

The Board of Directors of SURF contains representatives of the following sectors: the universities; higher professional education; non-commercial, non-academic research; and several other parties (including scientific information providers). The strategic policy is prepared and implemented by the Executive Committee. The Scientific Technical Council (WTR), in which national authorities in a wide range of ICT areas hold seats, provides universities and colleges with independent advice in the development of their ICT policies. Upon request, the WTR can test ICT initiatives or provide consultancy regarding specific technical or managerial problems.

In the 1980s, one of SURF's first initiatives was the development of a national network organisation (SURFnet).^{*} SURFnet, in which the SURF Foundation holds a majority share, provides member institutions with advanced network services on a not-for-profit basis. The second subsidiary company, SURFdiensten bv³, has managed to obtain numerous attractive campus licenses for software and other products and services since 1992. The institutions are free to decide whether or not they make use of either of these organisations' services. The organisations operate on a self-sufficient basis. Both operating companies have proved very successful in this respect.

SURFdiensten⁴

Founded in 1991, SURFdiensten is a not-for-profit organisation. Its goal is to provide end users in education and research in the Netherlands with quality products and services in the extensive field of ICT at affordable prices. SURFdiensten has negotiated license agreements with approximately 100 ICT providers, mainly in the field of software, but also in "infoware" (access to data files), courseware (courses, online learning), hardware and "lifeware" (consultancy services). This is an extensive portfolio of SURF licenses that are tailored to the needs of educational institutions. A SURF license usually runs for several years and grants staff and students of the institution the right to use the latest versions of the product covered.

Partner Organisations

SURFdiensten closely co-operates with its partner organisations, SLBdiensten and APS IT-diensten. SURFdiensten provides SURF licences to higher education and research institutions in the Netherlands and Belgium, SLBdiensten to vocational, adult and secondary education institutions, and APS IT services to primary education institutions. Since 1999 SURFdiensten has been working in co-operation with EduServ

^{*} SURFnet is at <http://www.surfnet.nl/en/>. This is the Dutch analogue of UKERNA (who run JANET), but in the Netherlands the network and the company running it have the same name.

Chest, the organisation that negotiates ICT licences for higher education in the UK.* This co-operation entails that SURFdiensten can grant licences in the Netherlands that were negotiated by EduServ Chest, and vice versa. SURFdiensten also has a co-operation agreement with the NBLC, the branch organisation for libraries in the Netherlands which allows the Dutch public libraries to participate in SURF licences as well. SURFdiensten is now looking into the possibilities of extending the service to museums.

SURFSPOT.NL

In 2000 SURFdiensten started SURFSPOT.NL, an Internet shop where staff and students can order several ICT products online at very reasonable prices. Their slogan is "legal software for illegal prices". Identification and authentication take place using a student smartcard. SURFSPOT.NL is unique in that it displays only the software that is available to the buyer, based on the SURF licence agreements obtained by each institution. This tailored offer is made possible by STPA (Smart Three Party Authentication), a SURFdiensten-commissioned implementation of the STPA smartcard protocol. With its wide range of SURF licences, its co-operation with different partners and its unique Internet shop SURFSPOT.NL, SURFdiensten fulfils its role as a broker between ICT and education, bringing supply and demand closer together.

SURFnet⁵

History

In the 1980s, the SURF Foundation target group (higher education and research) felt an increasing need to use information and communication services. The increase in the number of people who wished to use these services prevented the construction and management of a special facility for each connection desired. It was therefore decided to create a national network which could cater all users and all services. A precondition for a successful network was the establishment of a professional organisation which could steer the expected growth into the right direction, manage the network, and provide information on the use of the network and the services available through the network. At the end of 1986 the SURFnet project started, to study the feasibility of such a network and its management. The SURFnet project was turned into SURFnet bv on 1 January 1988. At that moment, 20 institutions were connected to SURFnet. Over the years this number has increased to around 250 (as of the beginning of 2001). The SURFnet target group includes the Dutch universities, HBO institutions, academic hospitals, research centres, scientific libraries, etc.

For some time other educational institutions such as museums and primary and secondary education could use SURFnet, but now a separate new network, Kennisnet, is being developed for this group.†

* Eduserv Chest is at <http://www.eduserv.org.uk/chest/>.

† Kennisnet has a comprehensive Web site at <http://www.kennisnet.nl/>, but only a few pages in English.

The SURFnet network is part of the Internet. Institutions for higher education and research can make full use of SURFnet. Within the framework of the national GigaPort project (see below), companies and other institutions can use SURFnet for testing and developing new advanced services. On-going innovation and the network's exclusivity ensure that SURFnet users have one of the world's fastest and most advanced networks at their disposal. Speed, reliability and security of the network are the key issues. Users have access to SURFnet from the office, and increasingly from their homes. They can retrieve information and communicate with other network users. An estimated 400,000 staff and students from over 200 organisations connected to SURFnet make daily use of the network.

Ongoing Innovation: GigaPort

To remain in the lead, SURFnet keeps improving its infrastructure and developing new applications, ensuring faster and better access to new Internet services for its users. SURFnet is an important partner in the GigaPort project, the national project involving the development of the next generation Internet in the Netherlands. GigaPort entails the development of one of the world's most advanced communication networks, SURFnet5*. It will function as a proving ground where businesses can do pre-competitive research for new applications. SURFnet5 will also provide the higher education and research community with Internet connections 100 times faster than they are now, including connections to prominent institutions abroad.

The national research network is not the only thing to be renewed. The international connections to other networks in North America, Asia and Europe will be extended and enhanced. A third important component, besides enhancing the backbone and international connections, is improving access to the network for member organisations and their end users. To this end, SURFnet will apply new fixed and mobile connection technologies such as ADSL,† GPRS (high-speed data via GSM) and fibre optics.

Not-for-Profit Organisation

In its 12-year existence, SURFnet has developed into a trustworthy, reliable partner for its member institutions. SURFnet is a not-for-profit limited company; any revenues are returned to the services provided by the organisation. SURFnet offers support to its member institutions in different ways, including SURFnet News, a weekly electronic information service, and a help desk that is available for students around the clock.

Services

SURFnet offers its member institutions a wide range of services. Most services can be used exclusively by staff and students of member institutions, but some are available

* The GigaPort Web site is at <http://www.gigaport.nl/>.

† ADSL stands for Asynchronous Digital Subscriber Line. It is one of the most common technologies for delivering broadband to the home, and the one typically favoured by telephone companies.

to the general public (for more detailed information about SURFnet services, see <http://www.surfnet.nl/en/>).

- Seminars to inform customers of its services.
- The “SURFkit” for network managers, offering technical information (installation, testing, etc.) on SURFnet services; information for end users can be found on the SURFkit (Dutch) CD-ROM or Web site.*
- Experience with video-conferencing.
- Information on the SURFnet Expertise Centre service.
- Directory services (LDAP),[†] electronic directory and discussion lists.
- Help desk, incident management, questions and remarks concerning SURFnet services.
- Access to the SURFnet network from home via the pilot projects “Students Online” and “SURFnet at Home”.
- Advice about connecting to SURFnet, and information about publications with information on the SURFnet services.
- Tens of thousands of News groups.
- Reports and utilisation overviews of several SURFnet services.
- Network security, incident response (CERT-NL) and other security services.[‡]
- Streaming video and audio.
- The SURFnet WAP-site for mobile Internet access.
- The SURFnet World Wide Web services.

Apart from initiating innovation and diffusion projects in the field of infrastructure (by SURFnet and SURFdiensten), the SURF activities can be categorised into three areas: scientific information dissemination (IWI), organisation and management (IABB), and the latest, ICT in education (SURF Education, in Dutch *SURF Educatie*^{<F>}).

* The site is at <http://www.surfkit.nl/> and still all in Dutch.

[†] LDAP stands for Lightweight Directory Access Protocol. It is the most modern and popular technology nowadays for building directory services. Like so many Internet technologies, it has its own “fan site”, at <http://www.ldap.org/>.

[‡] These are, sadly, an increasingly vital component of any network service. CERT stands for Computer Emergency Response Team; each network has such a team. Information on the JANET team can be found at <http://www.ja.net/CERT/>.

IWI (Scientific Information Dissemination)

Dissemination of scientific information is radically changing due to technological developments. An administrative policy is therefore urgently required. IWI's innovative efforts have been aimed at improving existing processes, but in the next few years they will be aimed at the process of creating and spreading information, taking the user as their starting point. Intellectual property rights are high on the IWI agenda. The focus will be on making and keeping information accessible to research and education.

IABB (Organisation and Management)

The goals of IABB are promoting standardisation, building expertise and furthering the common interests of higher education and research in relations with third parties such as suppliers, banks and the national government. The IABB programme focusses on innovation of ICT in management. The prevalent technological trends are the introduction of the smartcard for identification and authentication purposes, client/server architecture, e-commerce, and data models for key performance indicators. In the field of authentication the possibilities are being explored of developing an authentication infrastructure for higher education.

2.4.3 SURF Education (ICT in education)⁶

SURF Education, SURF's latest programme, aims at innovating higher education using ICT. As this programme has been very important for the stimulation of innovation within higher education institutions, the following paragraph provides a short description of the SURF Education programme.

SURF Education

The SURF Education programme aims to initiate, stimulate and facilitate innovative use of ICT in higher education in the Netherlands. Furthermore, SURF Education stimulates and organises co-operation in four areas: education innovation projects; development of expertise; research programmes; and the EduSite (a Web site which provides an up-to-date and rich resource concerning ICT innovation in Dutch higher education).^{*} Roughly speaking, the major tasks of SURF Education involve the coordination of innovation projects, the dissemination of knowledge and the provision of a support programme to make both the projects and dissemination a success. The innovation projects comprise a diverse set of experiments and implementations of new ways of education using ICT. Dissemination activities involve workshops, brainstorming, surveys and seminars, as well as applied research projects. The support programme places an emphasis on heeding the lessons learned in respect of both the content of the projects and experiences regarding management, commitment, continuity and dissemination issues.

^{*} This is at <http://www.edusite.nl/>. It appears very comprehensive and a good guide to what is of interest to Dutch educators.

A Bottom-up Approach

The SURF Education programme line touches the core business of the HEIs: “ICT in HE” means involvement in the primary processes of developing and delivering education. This means that SURF Education is not in a position to offer the latest expertise which is available in the HE field itself, but it can provide benefits of scale, collaboration and shared knowledge as a co-ordinating power. Aware of this, SURF Education has opted for a consultative, customer-driven approach. This “bottom-up” policy has earned SURF Education a reputation as a strong networking force, a stimulant for new alliances and ideas with an ability to uncover existing but unknown expertise in the HE field.

Matrix and Strategy

The 3x3 matrix of SURF Education activities is as follows: “innovation projects”, “dissemination” and “flanking policy”, are cross-linked with the perspectives of “students”, “business” and “internationalisation”. Taken together, the above convinced all Dutch HEIs (both universities and HBO institutions) to work together. A key factor is the courage to share knowledge, to participate on both sides of the “get some and bring some” strategy: a strategy that leads to a more generic approach, a shared knowledge base for improvement, a network of experts and peers, and results that matter to all.

Call for Tenders

Since 1999, SURF Education has invited proposals for annual grants aimed at the higher education sector. Proposals for each tender (1999, 2000 and 2001) are reviewed by the WTR of SURF on basis of the following criteria:

- Projects must be carried out co-operatively by at least two HEIs.
- The SURF subsidy should be matched by the participating HEIs.
- The educational philosophy should involve facilitating and stimulating new and better use of ICT in educational activities (thus projects should not focus on administrative services and information services, but should aim specifically at innovation in education).
- The maximal duration of a project should be two years.
- The maximum amount of SURF subsidy per project is 1 million Dutch guilders/NLG (£286,000).
- An implementation plan has to be included in the proposal.
- The education of instructors is important and the project proposal must state how this will be achieved.

- The project plan has to include a thorough didactical conception of how to use ICT in the project; the project should not intend to develop new ICT tools, but to further expand the ICT tools already in use.
- An evaluation plan should be included.
- A structured approach to disseminating the knowledge and outcomes of the project should be presented. ([http://www.surf.nl/en/home/.](http://www.surf.nl/en/home/))

So far 22 innovative projects have been started, which are aimed at integrating ICT into higher education practice and at developing electronic learning environments (in 1999, 16 proposals were received and 5 were selected; in 2000, 17 proposals were received and 4 were selected; in 2001, 28 proposals were received and 13 selected).

As already indicated, SURF Education aims at innovating, stimulating and facilitating the use of ICT for education purposes and not, for example, for administration or information services. For example, the projects submitted by higher education institutions in the first tender (1999) addressed innovations in curricula with the assistance of ICT. In the second tender (2000), a lot of the projects were aimed at improving the communication between lecturers and students, or at supporting the design of educational processes through electronic learning environments.

The below listed examples provide an indication of what kind of projects have already been funded by SURF Education.

Like many other Dutch HEIs, the University of Twente took part in the first call for tenders in 1999, with a tender for the further institutionalisation of TeleTOP. This project was granted a subsidy of NLG 1 million (£286,000) from SURF Education. However, this amount had to be matched by the universities involved (the University of Leiden and the University of Twente both have to match NLG 500,000, or £143,000). Half of this amount is funded by the participating faculties and the other NLG 250,000 (£71,500) is funded by the central level of the universities.

Following up the tenders of 1999 and 2000, SURF Education issued a tender for the Educational Innovation Projects 2001 on 31 January 2001. Via this tender, SURF Education wanted to stimulate the redesign of (parts of) the education process itself. The University of Twente (UT) together with the Erasmus University Rotterdam was subsidised with NLG 1 million (£286,000) for a project called ZAP (Very Active Psychology).

At the UT, besides these two projects, a project called MultiVLA is being carried out and has partially been funded by SURF Education via the tender of 2000. One of the aims of this project is the development and implementation of a digital course management system in order to offer distance education. Another aim is to redesign the current curriculum, mainly by integrating interactive visualisations.

Projects at other higher education institutions include:

- WALHALLA (tender of 1999): involved redesigning the curriculum of five programmes in order to offer the same education at two different locations.

The use of ICT in offering education is stressed, as is interaction between students and instructors and accompanying students.

- VOICE (tender of 1999): aims at establishing and implementing a Virtual Research and Information Centre in order to innovate education in the subject area of Methodology. Electronic learning devices for students are being developed.

Finance

The SURF Foundation works on the basis of a multi-year plan, renewed every 4 years. From 1998–2002, SURF Education has received government funds of about €17 million (£10.7 million). Innovative projects are funded 50% via matching funds from the participating HEIs. For the 1999 and 2000 projects, SURF Education funded about €4 million (£2.5 million). In addition to the €17 million (£10.7 million) of governmental funding, HEIs have to pay a yearly contribution of 1 Euro (63p) per student. Taken together (governmental funding, student contributions and the 50% matching money that institutes pay when their innovation project is selected to be subsidised) there has been a budget of about €36 million (£22.7 million) for 4 years (see table 1 on the next page).

Following up the tenders of 1999 and 2000, SURF Education on 31 January 2001 issued a Tender for the Educational Innovation Projects 2001. Through this tender SURF Education stimulates educational innovation projects (aimed at redesigning of – parts of – the curricula) in the field of ICT. These innovative projects must be of supra-institutional importance. An amount of about €13 million (£8.2 million) is still available from the government for the realisation of these projects.*

* SURF is now going through a transition. In “The Heart of the Matter” (the SURF Strategic Plan 2003–06, <http://www.surf.nl/download/MJP-final.pdf>) SURF argues for a shift in priorities and a consequential shift in organisation. The final page of the report (page 6) has a useful budget summary; in particular it records the core operating budget of SURFNet as €19 million (£12 million), with €8 million (£5 million) per year being put in by the government to support ICT and education. It also notes the useful fact that institutions typically spend around 7% of their budget on ICT.

TABLE 1 Budget of SURF Education, 1998–2002 (millions of euros [and British pounds sterling])

	Funded by government	HEI (students)	Matching HEI
	€	€	€
1999	1.8 [£1.1]	0.46 [£0.29]	1.8 [£1.1]
2000	2.3 [£1.4]	0.46 [£0.29]	2.3 [£1.4]
2001	8.0 [£5.0]	0.46 [£0.29]	8.0 [£5.0]
2002	4.9 [£3.1]	0.46 [£0.29]	4.9 [£3.1]
<i>Total</i>	<i>17.0 [£10.7]</i>	<i>2.0 [£1.3]</i>	<i>17.0 [£10.7]</i>

Source: Data from SURF, <http://www.surfnet.nl/en/>.

2.5 Digital University

2.5.1 Background and Rationale

In the Higher Education and Research Plan 2000 (HOOP 2000) of the Dutch Ministry of Education, Science and Culture, a cutback of NLG 15 million (£4.3 million) in the annual governmental contribution was announced for the Open University of the Netherlands (OUNL). This decision was based on both the decline in enrolment rates of the OUNL and also on the fact that the proportion of OUNL students that had already obtained a higher education degree had increased in the 1990s. The OUNL was established in 1984, its most important objective was to provide higher education to adults that had not yet had the opportunity to attend higher education (the so-called second-chancers). A report in 1995⁷ observed that part of this objective was reached, but it also pointed to the increasing student population that was not within the official target group but rather consisted of highly educated and highly skilled professionals, updating and expanding their knowledge base.

Due to new legislation in 1997, the OUNL gained a second core function: contributing to the innovation of higher education. Although previously the OUNL has carried out several efforts to shape this new core task, in the HOOP 2000 it was observed that, given the limited capacity of the OUNL and its expanding tasks, a new arrangement was needed for the organisation of distance education in the Netherlands. The need to reorganise the distance-education sector was further increased due to the fact that other “traditional” HEIs were also developing innovative ways of delivering and improving higher education.

These observations eventually resulted in two possible scenarios for the future of the Open University of the Netherlands and its relationship to the national organisation of distance education:

- A merger with the University of Maastricht (located near the OUNL).
- A broad consortium in which universities, HBO institutions and private enterprises participate.

On the basis of a scenario study by PricewaterhouseCoopers in July 2000, the Ministry decided that the consortium scenario would be the most attractive and feasible option. The envisaged consortium would be based upon two main objectives:

contributing to educational innovation on the one hand, and providing digital education both as part of regular higher education and for new target groups on the other. The broad financial base of the consortium option played a major role in this decision. Immediately afterwards, the OUNL, three universities and nine HBO institutions signed a letter of intent to participate in the consortium.*

The main rationale for establishing a consortium was the range of operations, which were considered too broad for separate institutions to handle, as individual institutions had neither the resources nor the experience and expertise. Co-operation was therefore seen as necessary to keep up with contemporary and future developments. For the participating institutions, a variety of motivations can be distinguished. The Digital University (DU) can lead to cost reductions through the joint development of products and the sharing of infrastructure facilities. Furthermore, the DU provides access to new markets, to expertise that is not present within the institution, and to new content. Participating institutions enjoy a “first mover advantage” and can make a profit by selling products to non-participants. The DU was officially established on 6 April 2001 in Utrecht. The first products are expected to be available in September 2002.†

2.5.2 Activities and Organisation

The basic activities of the DU, as identified in its business plan, are development, exploitation and facilitation. These functions will be accommodated into its three core units. The first is the Development and Expertise Centre (OEC), which will focus on the development of learning materials in the context of e-learning. It will also concentrate on measures to make the various available learning environments more compatible, and to identify the newest national and international developments. The OEC will make use of the expertise that is available within the individual institutions. The products developed in the OEC can be both general (electronic learning environments and platforms) and specific (online learning materials).

The target group served by the OEC is rather broad. It may consist of consortium partners, other higher education institutions and other organisations; but the OEC also provides expertise internally for the other units. One of these, the Exploitation Enterprise (EBV), takes care of the commercial functions of the DU. This unit will be responsible for sales and marketing of courses and services, and the monitoring of specific demands from the private sector. It focusses on short courses for the private sector and will offer a variety of products and services (more information about the products and services can be found in the sections on financing and distribution).

* It is interesting to note that this change in the function of the OUNL brings it more into line with other collaborative national OU organisations (like the Finnish OU) and away from the monolithic national OUs (UNED, UK's OU) which, although they may have many students as individual institutions, remain the untypical form – most “open university” activities in Europe are in fact carried out by the “conventional” universities.

† The Digital University (Digitale Universiteit in Dutch) is now a consortium of 10 universities. See <http://www.digiuni.nl>. There is a menu choice on the home page which links to an “English” page, where one can download some English-language presentations. (The URLs are too complex to reproduce here.)

The target group for the EBV is thus the “market for lifelong learning” or, more specifically, businesses and other private or public organisations (both national and international). The facilitation function will be performed by the Educational Service Provider (ESP). The ESP’s goal is to make the electronic courses accessible through a Web portal for its target groups, that is, the participating institutions, private companies and their students.* All three units will be established in co-operation with other parties in the education market. In the OEC this will take place on a project basis. For the EBV and the ESP, the DU will look for complementary parties that can contribute additional expertise and the necessary financial capital.

In addition to these three units, five other bodies will be established: a Participant Board, a Supervisory Board, a Directorate, a Programme Board and a Central Office. The Supervisory Board consists of five members and will be responsible for setting the strategic directions and the annual plans, and it will supervise the Directorate, which will consist of two persons. A Central Office will be responsible for the preparation of strategies and the annual plans, for planning and control and for marketing and sales (for the EBV). The Central Office will start off with a capacity of eight full time equivalents, which will be extended to 12. For both the Board of Participants and the Programme Board, all institutions will delegate one representative. The Board of Participants appoints and discharges the Supervisory Board, approves annual plans and financial statements, and will be consulted on issues of major strategic importance, such as a change in regulations or mergers and acquisitions. The voting power of the delegates in the Board of Participants is proportional to the financial input provided by the institution involved. The Programme Board advises the Directorate on the prioritisation of projects. Experts on content (of the particular programme) will be part of this board.

After the official founding of the DU in April 2001, the consortium will initially focus on the OEC. The OEC will be constructed in phases and will be based upon four programmes:

- *The electronic learning environment.* This programme will deal with the compatibility of the various learning environments that are currently used by the different institutions. The objective is not to design a “universal” learning environment, but to create products and services that enable the application of already-available and widespread products. This will enable the re-use of online learning materials.
- *Instrumentation of the learning process.* This programme will ensure the development of innovative products and services that will enable the envisaged transformations in the higher education sector.
- *Development of online learning materials.* In this programme, learning materials will be developed specifically for the various target groups and for the profiles of the institutions that are providing them.

* The ESP is now called Espelon and has a comprehensive Web site at <http://www.espelon.nl/> – but all in Dutch.

- *Development and dissemination of expertise.* This programme refers to the founding of a (virtual) expertise centre for higher education transformation and the establishment of several training routes for the teachers involved.

To complete these programmes, nine projects have started from mid-2001:

- *Electronic learning environment.* An all-embracing project in which all partners will be involved.
- *Portfolio.* An instrument for individual and competence-based learning, which consists of course contracts, assessments, competencies, routes, etc.
- *Virtual project or enterprise.* Simulation of professional practice, in which students jointly work on practical assignments.
- *Developing and establishing the Educational Service Provider.* Developing concepts and instruments for the ESP.
- *Online learning materials in the fields of economics, management and ICT.* Development of a one-year equivalent amount of courses at the master's level for initial students (in dual trajectories) and post-initial students (short courses).
- *Online learning materials in the field of e-business.* Modules (of a half-year equivalent) at bachelor's and master's level for initial and post-initial students.
- *Online learning materials in the field of teacher education and educational technology.* Modules (of a full-year equivalent) at bachelor's and master's level for initial and post-initial students.
- *Online learning materials in the field of law.* Development of a full *propaedeutic* course (first full year at bachelor level) with possible spin-offs for post-initial courses or legal courses outside the discipline of law.

Development and dissemination of expertise. With emphasis on on-the-job training and co-development.

2.5.3 *Composition and Evolution*

As noted before, the DU consortium consisted of 12 institutions in the take-off phase. In the course of this phase, however, three HBO institutions withdrew their participation. At the time the business plan was drafted (February 2001), in which the name "Digital University" was adopted, the participants were the Open University of the Netherlands, the University of Amsterdam, the Free University of Amsterdam, the University of Twente, Fontys Hogescholen, the Hogeschool of Amsterdam, the Hogeschool of Utrecht, Ichthus Hogeschool and Saxion Hogeschool.*

* Although the university members are the same, there seem to have been some minor changes in the Hogeschool participation (see the list at the long URL on the next page –

For many of the higher education institutions participating in the DU, the decision to participate was made at the central level of the university. Only the University of Twente has publicised its reasons for choosing to participate: "Participation of the University of Twente in the Digital University (DU) was considered a necessity on the central level. Given its image and its activities in the area of ICT, the DU initiative was seen as compatible with Twente's ICT strategies".⁸ Another reason for HEIs to participate in the DU is the potential for future returns on developed products; as products can be developed under the framework of the consortium, the participating institutions will receive matching funding from the DU.

A further expansion of the number of participants will not take place until 2003. After 2003, new participants can be admitted if they both comply with the business plan of the DU and buy themselves into the EBV at the market value of the stocks. One can only withdraw from participation at the end of the financial year, following a term of notice of one year. Until 2003, non-participating institutions can profit from the DU by purchasing products at low costs (due to government subsidies); they can also participate in development projects for learning materials.*

2.5.4 Financing and Distribution

Realising the DU in the future will require substantial financial efforts. It has been estimated that the necessary contribution of the participants might amount to NLG 20 million (£5.7 million) per year for the period from 2001 through 2004.

The annual contribution of the participating institutions as presented in the business plan is shared according to the status of the institutions, with universities responsible for 15% (NLG 3 million, or £858,200 a year) and HBO institutions for 5% (NLG 1 million, or £286,000 a year). In this budget the consortia still took a 12-member consortium as the point of departure. In addition, the consortium requested a governmental contribution of NLG 70 million, or £20 million (NLG 30 million, or £8.6 million for the first two years and NLG 40 million, or £11.4 million, for 2003 and 2004). The estimated distribution of the NLG 150 million (£43 million) over the 4 years, and over the different units, is given in table 2 on the next page.

<http://www.du.nl/digiuni/index.cfm/site/Internet/pageid/4F0F2DBB-508B-67D0-5E339E86FC68ECF8/index.cfm>.

* The DU goes from strength to strength, carrying out a wide range of advanced pedagogic and technical projects, from which in our opinion several other countries could learn. In 2003, "22 projects started within de Digital University including: Digital teacher aids for Secondary Teacher training; Toolbox Personnel Assessment; Advanced Digital and flexible testing; Virtual knowledge network; Digital video course for guiding practically-oriented learning; Multidisciplinary Mathematics; e-Xperimenting on a distance; Knowledge bank Hospital Teachers; Collaborative learning Digitally supported; and Costs and benefits of E-learning." (Source: the presentations attached to the "English" page at <http://www.du.nl/>.)

TABLE 2 Contributions to the DU for 2001–04 (in millions of Dutch guilder [and British pounds sterling])

	2001	2002	2003	2004	Total
	NLG	NLG	NLG	NLG	NLG
Participants	20.0 [£5.7]	20.0 [£5.7]	20.0 [£5.7]	20.0 [£5.7]	80.0 [£22.9]
for OEC	18.0 [£5.1]	14.0 [£4.0]	14.0 [£4.0]	14.0 [£4.0]	60.0 [£17.2]
for ESP	...	4.0 [£1.1]	4.0 [£1.1]	4.0 [£1.1]	12.0 [£3.4]
for EBV	2.0 [£0.6]	2.0 [£0.6]	2.0 [£0.6]	2.0 [£0.6]	8.0 [£2.3]
Ministry of Education	10.0 [£2.9]	20.0 [£5.7]	20.0 [£5.7]	20.0 [£5.7]	70.0 [£20.0]
Extra impulse for OEC by OUNL	3.0 [£0.9]	2.0 [£0.6]	1.0 [£0.3]	...	6.0 [£1.7]

Source: Data from Digital University, 2001.

The initial budget will however need some adjustments, because of the decision of the Ministry to make NLG 25 million (£7.1 million) available for the first two years (instead of NLG 30 million, or £8.6 million). At the same time it was announced that funding for a further two years will be under consideration, depending on the results of the DU after the first two years (starting in 2001). So it is not at all certain whether the DU will receive governmental finance after the first two years. Another adjustment in this initial budget has to be made, due to the fact that three HBO institutions withdrew from participation in the consortium in April 2001, leaving a financial gap of NLG 8 million (£2.3 million). The current participants, however, still expect a number of HBO institutions to join the consortium; otherwise part of the deficit will be met by the current participants.

In addition to the contribution from participants and the Ministry,⁹ the DU expects to gain profits from the sale of products and services as from 2002. The products that are being developed will be put up for sale as from September 2002. These products are free for use by the participants in the consortium and are sold at market prices to other HEIs. Half of the returns will flow back into the DU and the other half of the “profit” will be distributed to the participants who developed the products (so not to all participants within the consortium).

The starting phase can also be beneficial for the participating institutions. Projects that are being developed within the institutions can be developed within the framework of the four OEC programmes as from September 2001. Projects that fit into one of the four programmes can be submitted to the DU and thereby become eligible for DU funding. In such cases, 50% of the costs will be covered by the DU and the remaining 50% will be covered by the participating institution(s).

3. Profile of the University of Twente

3.1 Introduction

As in many higher education institutions, at all levels within the University of Twente (UT), innovative experiments have been started over the last decade. In many traditional HEIs, very often this experimental phase (also called the “pioneering stage”) is

the only way in which ICT is used inside the institutions. The case study of the UT describes the process which it has gone through, to expand this pioneering stage through the so-called “1,000 flowers blooming” phase, to faculty-wide managed change and even institution-wide managed change (from a bottom-up to top-down approach).¹⁰ Before tuning into this process, some more general information about the UT will be given, followed by a description of some innovative features of the UT. Finally, a description of the current main activities concerning ICT at the UT is provided.

3.2 General Background

The UT was established in 1961 as the Twente University of Technology. In 1986 the name was changed to the University of Twente (UT). The UT is located in the eastern part of the Netherlands, near the border with Germany. Modelled on the Anglo-Saxon example, the UT is the only real campus university in the Netherlands. In 1964, the first freshmen (247 students) enrolled. Nowadays, the UT offers opportunities to combine technological and social sciences for about 5,900 undergraduate students. The normal duration of the undergraduate programmes is four years but most engineering programmes are offered over a five-year period. The UT also actively promotes multidisciplinary programmes (such as biomedical engineering and environmental technology) and places great emphasis on a continual process of curriculum innovation. On the postgraduate level, a variety of programmes is offered: two-year postgraduate programmes in technological design (geared to the need in industry for highly qualified engineers), various MBA and other master’s programmes, one-year teacher training programmes for secondary school mathematics, physics and chemistry, and finally, four-year doctoral (PhD) programmes in all fields of study.

Characteristic features of the UT are innovativeness and entrepreneurship, as clearly established in its mission statement. The UT strives to be an innovative institution for academic education and research and aims for:

- excellent quality in teaching
- internationally acknowledged research
- functional interconnectedness between the technological and social sciences
- significant enrolments of foreign students
- a major contribution to the economic and social development of the northeast region of the Netherlands

3.3 The Start of Being Innovative: the Entrepreneurial University

The development, implementation and use of Information and Communications Technologies is not the only distinctive feature of the innovativeness of the UT. Therefore a short overview will be given of some other innovative, distinctive features of the UT.

3.3.1 *The Entrepreneurial University*¹¹

In the early 1980s, as a consequence of external changes and demands (demographic trends, more financial accountability, decreasing governmental budgets, governmental interference) and internal changes (a new *rector magnificus*, or president), the UT gradually established the concept of the entrepreneurial university (*ondernemende universiteit*). This indicates an explicit recognition of the University's role in the transfer of know-how, expertise and technology to the broader community. This transfer became, relatively speaking, one of the university's priorities. The UT actively promotes contact with both the business community and public authorities, and has developed structural ways to help individual entrepreneurs to find the resources the university has to offer. An effective bridge between the needs of industry and the UT's research efforts has been made via the establishment of the Liaison Group. The Liaison Group tries to improve the accessibility of the university's knowledge by stimulating contract research projects. It became also the "university gateway" to education and training for the business community and the public sector. The university wanted to play a more dominant and responsive role in the region and in Dutch society through research, knowledge and technology transfer, continuing education, and contract activities. In other words, the university should become more entrepreneurial and market oriented. In this context, non-governmental funds should be raised.

The new concept soon became a well-known and successful phenomenon. It resulted not only in an increase of non-governmental funds and initiatives aimed at strengthening the university's role in society; internal changes also took place regarding the internal "steering philosophy". An entrepreneurial university also meant, at least according to the view of the Executive Board, that units at the decentralised level should have ample room to manoeuvre. Starting in the early 1980s, policies have been aimed at strengthening the autonomy of the faculties in certain respects, e.g., by means of internal allocation on a lump-sum basis (spending freedom within general constraints), budgeting based more on output than on input, decentralisation and de-concentration of certain authorities. The UT became, at least in the Dutch context, a rather decentralised system.

3.4 Examples of Educational Innovation

Following on the entrepreneurial concept, innovation is seen in different ways at the UT. For example, in 1993/4 the TUTOR committee ("Future UT Education", consisting of four full-time professors from different faculties) was brought into being. This committee discussed and advised on the filling-in of the five-year technological undergraduate programmes, and also discussed new methods of education. By virtue of TUTOR, and initiatives started within the faculties, an institution-wide restructuring of the undergraduate programmes began, characterised by:

- More emphasis on self-learning capacities of students, by means of block-scheme teaching and project teaching.
- Rescheduling of the academic year, starting in 1996 (3 trimesters of 14 weeks related to block-scheme teaching).

Another significant year for the renewal of educational programmes was 1997, when discussions about the introduction of the “major-minor” concept started. The major-minor concept implies that students will be offered more flexibility and that they will no longer be bound to a single area of study throughout their programme. This means that after two years of “basic study”, the students select a major from all the programmes offered at the UT. For instance, a student who studied the first two years of applied physics might then decide to major in computer science. In practice, most studies select their master’s subject following their first two years of study. Since each faculty comprises three or four majors, the UT will offer about 50 majors all together. Minors will be extensive subsidiary subjects in a single discipline or in a number of disciplines from different faculties. To try to broaden the scope for students, the basic idea is to combine a technical major with a minor in the social sciences, and the other way around. This “American style of education” is rather unusual in the Netherlands. The concept of major-minor was introduced in the academic year 1999 and is implemented in accordance with the principles of block-scheme teaching and project-based learning.

One of the latest developments concerning the innovation of educational programmes has been the introduction of the bachelor’s-master’s degree system (the so-called BaMa). To help the country become more competitive on the international level, the bachelor’s-master’s degree system will be introduced throughout the Netherlands. Starting from the academic year 2002, under the new BaMa system, university students will first take a bachelor’s programme lasting three years and will then be able to enter a more specialised master’s programme (of one or two years). Students at HBO institutions will be awarded a bachelor’s degree after four years of study.*

Like the universities, the HBO institutions will also be able to set up master’s degree programmes, but contrary to the universities, these master’s programmes will not be financed by government.¹²

3.5 ICT and the University of Twente

The UT is seen as the university in the Netherlands with the best technological infrastructure for students and staff members, and with the most intensive use of it infrastructure. Furthermore, the UT is (together with the Dutch Open University) seen as one of the front-runners in the use of ICT for its primary tasks, i.e. the support and improvement of educational activities.¹³

The UT emphasises that it will not aim to become a virtual university. Face-to-face contact between teacher and student is regarded as essential to developing academic knowledge and skills of high quality. One of the most important characteristics of ICT at the UT is that computers do not replace teaching staff – they are empowering, not replacing – and that ICT is used primarily in initial higher education. Personal contact, the oral transfer of knowledge, communication between teachers and students,

* There was an interesting speech on Dutch higher education, including the BaMa reforms, by the Dutch Minister of Education, Culture and Science on 7 November 2003 – see <http://www.minocw.nl/toespraken/2003/068.html>.

and the interaction between students all remain essential for proper academic training.¹⁴

Most undergraduate students at the UT are traditional on-campus students aged 18–23, although some faculties do have off-campus undergraduate students using the new forms of ICT for their learning. For example, the Faculty TO* has simultaneous participation by regular students attending full time on campus, and part-time students who work during the day and will participate in the majority of activities at times convenient to themselves (without having to leave their homes and workplaces).¹⁵

3.5.1 Governance Structure

At the central level of the UT, the following actors can be distinguished: the Supervisory Board, the Executive Board, the *rector magnificus* and the Management Team. The Executive Board (CvB) consists of five persons (this is unique in the Dutch context; most executive boards consist of three persons) who are appointed by the Supervisory Board. One of these persons is the *rector magnificus*. The Executive Board is supported by a central policy unit, the *Beleids Bureau* (BB). At the UT, the Executive Board decide about the vision, mission statement and profile of the university. In addition, the Executive Board is responsible for the administrative and financial arrangements within the university. The Management Team consists of the Executive Board and the deans of the faculties, and assists the Executive Board on subjects related to the strategic position of the UT. At the faculty level single-headed authority takes the form of a deanship. The dean has substantial power. The Executive Board of the university appoints the deans, who may be drawn from inside or outside the university or faculty.

Policy plans concerning ICT can be submitted to the CvB by faculties or central services (bottom-up approach) and by the central level itself (top-down approach). Before a plan is sent to the CvB for approval, it must pass through several committees, of which the Central Committee for Education (CCO) is one of the most important. The CCO is an important body in the light of the increasing significance of the quality of education. This committee consists of members of the faculty executive boards (responsible for education), representatives of students (two), the Education Centre (OC) and representatives of the Bureau of Student Affairs. Its role is to advise the Executive Board on all matters relating to the educational processes within the UT.

After the CvB has approved a central ICT policy plan (top-down approach), the policy has to be implemented, as faculty-wide changes can only occur within a well-planned and co-ordinated implementation strategy. Important in this context is the establishment of central educational technology support staff for using new forms of ICT in education, especially in relation to the new educational concept of major-minor. This central support staff was an addition to the already-existing central technology infrastructure support staff (called the CIV; see figure 1).

* That is, the Faculty of Educational Science and Technology.

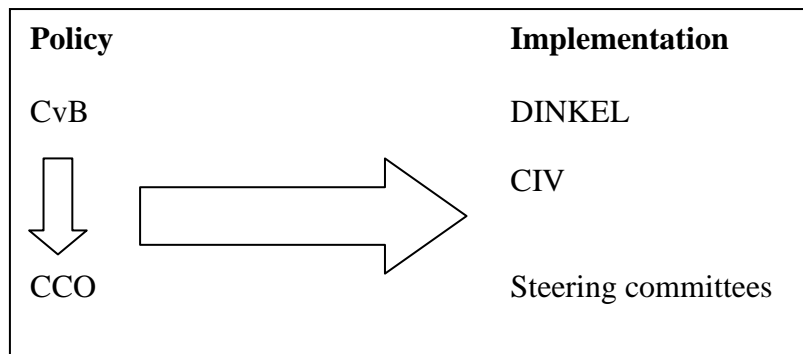


Fig. 1. ICT policy process.

At the University of Twente, the central support office (DINKEL: Development Institute for Knowledge, Education and Learning) was the result of a merger between the university library, the Education Centre (OC) and the University Press in 1999. Although the co-ordination and development of new technologies is one of the main parts of DINKEL's job, this is not the only reason that the central level decided to merge the three already-existing organisations.

Technology-based teaching and learning is just part of a wider approach to teaching and learning (one can think of the quality assurance, new educational innovations such as the major-minor, bachelor-master, etc.) and the integration with the digitisation of both the administrative systems and the libraries and other research activities (the so-called C@mpus+ approach). Furthermore, DINKEL takes care of the internal contact concerning ICT. The Innovation Group¹⁶ and student representatives also belong to this network. DINKEL has relations with commercial software producers as well.

3.5.2 Technical Infrastructure

Like many higher education institutions, the first strategy the UT adopted was to put in place a technical infrastructure: one that would be the most up-to-date and advanced technical infrastructure in the Netherlands. In 1994, on the basis of the already-existing infrastructure, the UT was the first Dutch university to give all its students e-mail access; by 1995, all 2,015 student rooms on campus had access to both the CAMPUSnet and the Internet (via Ethernet at 10 Mbps). In 1998, the UT entered into a contract with the cable proprietor Castel* whereby all students could access the university's network from everywhere in the Netherlands at local telephone rates. This provision is part of a larger deal for students, who can also obtain 10 megabytes of disk space on a central computer which can be accessed at home or at the university.¹⁷ Furthermore all students and staff outside the campus can connect to the

* Castel merged with another cable company in May 2000 to form Essent Kabelcom; see <http://www.essentkabelcom.nl/site/site.php?content=kabelcom/bedrijfsprofiel/english>. As an interesting comparator to UK developments, Essent "increased the speed of its @Home Broadband service from 2560 kbps to 4000 kbps from 1 Jul 2004. It also plans to increase the speed of @Home Budget service from 312 kbps to 768 kbps in August 2004" (see http://www.point-topic.com/content/operatorSource/profiles/Netherlands/Essent+Kabelcom.htm&comp_id=560).

network by a dial-in connection or via cable and ADSL. ADSL is only offered by the UT as a pilot project within the framework of the Dutch GigaPort project, carried out by the SURF Foundation.

3.5.3 *Administrative Facilities*

Historically, information technology has tended to be introduced in higher education initially to support administrative data processing requirements. At the UT, the following administrative ICT systems can be found:¹⁸

- *ISIS*. Central registration system of information about students; for example, number of applications, new entrants, students and graduates (necessary to receive governmental funding), etc.
- *FASIT*. Faculty-student progress information system. Each faculty registers information about their students (grades, progress in terms of study points, examination subjects, etc.).
- *PEFASIT*. Assessment administration; central periodic evaluation of FASIT information by faculty.
- *TAST*. Central online registration system for students to register for exams and to find information about their assigned times and places.
- *TOST*. Central online system, where students can find their exam results.
- *VIST*. An electronic study guide.

3.5.4 *Research Facilities*

OIS (Research Information System)

To manage the research output of all academic staff of the UT, a central online research information system has been developed. This system is called OIS (in the year 2001 replaced by OZIS). Each faculty or research institute has to register all academic staff output with this system.

Digital Library

Currently all students and staff have electronic access to both the faculty and central library facilities via the Internet from both their desktop and laptop machines. To further develop this electronic access, several projects have been set up. First is ARNO (Academic Research in the Netherlands Online); this programme started in September 2000 and will run until September 2002. The aim of this programme is to come to the realisation of a document server for scientific output (document sharing and archiving) integrated with front-end and back-end services. This project is being conducted

jointly with the University of Amsterdam and the KUB (Katholieke Universiteit Brabant) and is funded by the SURF Foundation through the IWI budgets.^{19*}

Second, the UT is developing the concept of the virtual library. In order to offer online information (for example, online magazines) a project has been started to overcome current problems with the digitisation of this material. In addition to this project, the UT has started a pilot in which facilities are being developed to publish digital versions of the master's theses and PhD dissertations. In the framework of this pilot the UT (via DINKEL) is working on matters such as copyright for electronic publications, a printing-on-demand service, support for PhD students, etc.²⁰

3.5.5 *Wireless Campus*

Like the University of Helsinki (UniWAP 2000 project),[†] the University of Twente started to experiment with wireless applications in the year 2000, to further expand the ICT profile of the UT to the outside world. The aim of the wireless campus concept is to act as a test case for the innovative use of ICT tools and the further development of these tools. The UT thinks this is necessary in order to strengthen its knowledge in the area of ICT and also to further expand the ever-evolving technological infrastructure which is facilitating all these activities.

Another objective is to maintain the UT's position as one of the "front-runners" regarding the use of ICT for its primary tasks, i.e. the support and improvement of educational activities; it is also seen as the university in the Netherlands with the best technological infrastructure.²¹

Working from the concept of the UT's becoming a totally wireless campus in the year 2003, a variety of projects are already being implemented, of which the University WAP Mobile Phone (WAP@UT) has had the greatest impact to date. In the year 2000, all students and staff were offered a mobile phone with WAP facilities; these phones were free for students, and staff had to pay a small amount. Almost all students and half of staff (a total of 6700) already have a WAP mobile phone. However, as the WAP phone project was meant to test and pilot the possible WAP applications (e.g., wireless access to the Internet and the course management system TeleTOP), the technology is still hardly used. One of the often-mentioned reasons for this limited use, is that connecting to – for example – the Internet takes a lot of time (about half a minute), and that it is difficult to read from the small screen. Another argument can be found in the fact that costs are high compared to normal mobile phone costs.

However, while writing this case study, several articles were published in the university's newspaper about two companies seeking to offer WAP facilities via the WAP

* The ARNO project is described on the SURF site <http://www.surf.nl/projecten/index2.php?oid=41>, but this is in Dutch. However, there is a link from that page to a description of ARNO in English at the University of Amsterdam Library site <http://www.uba.uva.nl/arno>. There it is described as a collaborative project between the UT, the University of Amsterdam, and Tilburg University.

† And several other universities. Helsinki was singled out because this university is described in the other half of this study; see chapter 6 on Finland. For a taster of developments at Helsinki see <http://www.helsinki.fi/lehdet/uh/101i.htm>.

mobile phone project. One of the companies, Maptive,^{*} wants to offer more “personalised software tools” to the user (e.g., via preliminary selection and mailing of Internet links directly to the WAP phone, so that users have more personalised information). Another company, DutchWireless,[†] wants to offer a “Student Menu” (an overview of best places to go, e.g., bars, concerts, and the like, tailored to the city in which students are studying) on the WAP phone. These two companies really do see the advantages of WAP facilities, as seen in the following quote: “SMS was not that popular in the beginning of its existence and nowadays almost everybody is sending SMS messages, so maybe the WAP facilities will be a success in the near future”.²² Also, during the academic year 2001/2, the UT decided to start with the WAP2@UT project. Contrary to the WAP@UT project started last year, the phones are not delivered by KPN Telecom, but by Telfort Mobiel BV.[‡] All first-year students will receive a free mobile phone with WAP facilities and in the new contract the phone tariffs for using the WAP facilities are decreased. In 2000/1 it was 47.8¢[§] (1p) a minute, and in 2001/2 it decreased to 14.3¢ (4p) a minute.

Besides this WAP concept, another pathway can be distinguished relating to the wireless campus concept: the Wireless Local Area Network (WLAN) project, in which wireless technology is used to facilitate access to the local area network (CampusNet) anywhere on the University of Twente campus. Contrary to the WAP project, this project will not be tested and piloted throughout the whole university, but will be introduced step by step. The first steps taken concern a pilot at one of the faculties. At this moment, 10 students are experimenting with their wireless laptops’ having access to the local area network. Further experiments can be expected in the coming years (<http://www.utwente.nl/wireless-campus/en/>.)^{**}

* Maptive still has a Web site, <http://www.maptive.nl/>, but there is no sign of recent activity.

† DutchWireless has a Web site is at <http://www.dutchwireless.com/>. This gives the company name now as MoMac and appears to be a duplicate of the site at <http://www.momac.nl/>. The company seems active on several fronts.

‡ Telfort Mobiel was a joint venture between BT and Dutch national rail company Nederlandse Spoorwegen (each company held a 50% share). BT bought out the Dutch partner in 2000, and folded it into the MM O2 operation; finally MM O2 sold it to private investors in July 2003, at which point the name was changed back to Telfort. Their Web site is at <http://www.telfort.nl/>. The article http://www.theregister.co.uk/2003/04/14/mmo2_sells_dutch_ops/ gives an eloquent picture of the difficulties of mobile operators in the small Dutch market.

§ There were 100 cents in a guilder.

** This is the UT Wireless Campus Web site. In July 2003, the UT announced a massive expansion: 650 access points covering the whole campus. This generated much excited press comment – e.g., at <http://www.inquirerinside.com/?article=10055>. A more reflective article is at http://www.thes.co.uk/current_edition/story.aspx?story_id=2012432 (this was written 6 months later).

4. The Initiation and Institutionalisation of the Course Management System (TeleTOP)

4.1 Introduction

In the year 2000, the course management system TeleTOP, developed by the Faculty of Educational Science and Technology (TO), has been implemented throughout the university (<http://www.teletop.nl/teletop.nsf/home/en/>). The goal of the TeleTOP project is to systematically support the professional development of staff in terms of potential applications of telematics in their teaching, and to further support the redesign of all courses so that they become more efficient, more enriched and more flexible via innovative and appropriate applications of telematics (particularly Web-based tools and environments). At this moment, about 700 courses have been implemented under this system. In the following sections an overview is given of the development of the TeleTOP project from the initiation phase at the Faculty TO, to TeleTOP's institutionalisation in the entire university.

4.2 Historical Background

The use of new forms of ICT applications in education at the UT has been studied in both the social and technical sciences for many years. These applications often relate to the Internet (Web pages and e-mail), but video-conferencing and computer-based training are also used to support education. The Faculty TO is internationally recognised as one of the front-runners in the development and use of new forms of ICT. Since the early 1980s several pioneers within this faculty began using telematics applications in their teaching and learning, and since March 1994, enthusiastic instructors have been using Web-based environments to support their regular courses. In these courses the instructor was not less present or less involved with the students, but was empowered by the Web-based tools to do more than before.

In 1997, after more than four years of extensive development of Web-based applications in many of its courses, the dean of the Faculty TO took an innovative step with the initiation of the TeleTOP project ("TeleLearning" is coupled with the initials of the Faculty TO; P stands for project). On the basis of prior experiences, detailed market research into available course-support systems, and participation in an international evaluation of such systems, the Faculty TO came to the conclusion that none of the commercial products met all of their requirements (for further details on TeleTOP, see appendices A and B). The Faculty TO wanted to proceed quickly and therefore designed their own course management system.²³

The year 1997 is important not only in terms of the start of faculty-wide implementation of the TeleTOP project, but also because it can be seen as the year in which the central level of the university took the first steps towards the initiation of a central policy concerning the development of the use of technology applications. First of all, in 1997, the university decided to establish a Telelearning chair at the Faculty TO, filled by Professor Betty Collis. Furthermore, "Telelearning" was the focus of the university's "birthday celebration" and the new chair was asked to deliver a keynote speech.

Furthermore, to address the needs of all faculties with regard to the available applications, and to bring the use of new forms of ICT in the university to an even higher level, the rector formed a task force, "Telematics Applications in Education", at the end of 1997. Its role was to develop a vision of the use of ICT in education that could be communicated throughout the university. As part of this vision, the UT would emphasise (as stated above) that it did not aim to become a virtual university; face-to-face contact between teacher and student would still be regarded as essential. One of the most important characteristics of ICT at the UT is that computers are not intended to replace teaching staff ("empowering, not replacing"); also, that ICT is used primarily in initial higher education. Personal contact, the oral transfer of knowledge, communication between teachers and students, and the interaction between students all remain essential for proper academic training.²⁴

4.3 Central Policy

A central policy plan was written²⁵ based on the views of the task force regarding stimulating the implementation of ICT in education. One of the main aims of this policy paper was to promote the application of ICT to make the first year more flexible, as this is part of the major-minor concept. It states that ICT should be integrated in education as a means for improvement of the personal guidance of the student; that ICT should be a tool to increase the possibilities for students, as well as to enrich the learning process; and that ICT should be used to focus on new customers, such as part-time and foreign students (in this way ICT could be combined with exchange programmes, which were high on the university's agenda too). The use of new forms of ICT should thus support a move towards permanent individual guidance for the student. Just-in-time contact between instructor and students, and among students themselves, is a key factor in this way of thinking about ICT in education. The policy document explains that the instructor's role will change from that of *lecturer* in a traditional classroom situation to that of *guide*. ICT will play a facilitating role and enable the instructor to give feedback when needed. It also offers the opportunity to cater to the educational needs of different groups of students.²⁶

In 1998, the TeleTOP project of the Faculty TO was seen as one of the most promising large-scale projects of the university and had already received national and international recognition. It also attracted the attention of other faculties and departments within the university; the first department which started to use TeleTOP was that of Telematics, and soon the Faculty of Electrical Engineering and the Faculty of Public Policy and Administration followed. To address the needs of all and to show the outside world the relevance and probably the uniqueness of these successful developments, the central level of the UT decided that ICT would be an important aspect of the profile and mission of the university. Because of the successful implementation of TeleTOP at several faculties, the university board decided in 1999 to choose TeleTOP as the course management system for the entire university and gave the task of this multi-year implementation to the central support office (DINKEL Institute). The objective of the university board is to have all courses implemented in TeleTOP by the year 2002.²⁷

As of August 2001, more than 700 courses offered at the University of Twente have been implemented in TeleTOP and all faculties have decided to participate in the TeleTOP implementation process:²⁸

- Two faculties have already implemented the TeleTOP system.
- Four faculties run more than 75% of their courses with TeleTOP.
- Five faculties are halfway through a large-scale implementation process and have approximately 50% of their courses using TeleTOP.
- Three faculties are still in the pilot phase (with approximately 25% of courses using TeleTOP).

4.4 C@mpus+ Approach

During the 1999/2000 academic year, a plan for a more general digital learner support environment that would include the TeleTOP system, but extend it with other services, was formulated.²⁹ The task of realising this plan was also given to the DINKEL Institute. This general digital learner support environment is being called *C@mpus+*. *C@mpus+* aims to develop an integral, comprehensive digital learning environment for the University of Twente, offering integration of TeleTOP, an electronic study guide (VIST), assessment administration, a virtual library (see for a description subsection 3.5.4), and other yet-to-be defined features. Furthermore, the plan states that this development has to be integrated with already-existing ICT developments at the faculty level and in coherence with the already and further to be elaborated technical infrastructure (Campusnet). Another aim is to further develop research into the use of ICT in higher education at the Faculty TO.

To guide and stimulate the institution-wide implementation of the *C@mpus+* approach, several groups have been formed:³⁰

- The *Steering Group* is responsible for overall policy relating to the *C@mpus+* system. This group receives reports from the Implementation Group and the Advice Group Innovation.
- The *Advice Group Innovation* has the task of advising the Steering Group on future developments important for the evolution of the *C@mpus+* system. On the basis of this advice, the Steering Group must decide what instructions to give to the Implementation Group, as well as what policy to suggest to the central administration.
- The *Implementation Group* is responsible for the current implementation of the *C@mpus+* system throughout the university.
- The (implementation) *Project Team* consists of TeleTOP consultants from the DINKEL Institute that give support to instructors while integrating their courses into TeleTOP.

Furthermore, TeleTOP is also used at various higher education institutions inside the Netherlands (for example, the University of Leiden and the University of Amsterdam) and within business and industry (for example, Shell and Phillips). Also, a Memorandum

dum of Understanding between the University of Twente and IBM has been signed to market the TeleTOP system worldwide as “TeleTOP powered by Lotus”^{31*}

4.5 Implementation Strategies

The considerable telematics development within the traditional universities does not usually evolve out of university policy, but rather from grassroots initiatives related to in-house courses. Collis observes that the bottom-up use of telematics in an institution provides a context conducive for a top-down strategy for telematics to develop.³² This is exactly what happened at the University of Twente. It all started with a bottom-up approach at the Faculty TO and is now fully centralised, which has institutionalised the use of new technologies. To describe this process of change, we make use of the following phases: the *initiation* phase, the *implementation* phase and the *institutionalisation* phase.

4.5.1 Implementation at the Faculty Level

As is stated in the former paragraph, the initiation of many new forms of ICT at the University of Twente, and especially TeleTOP, started in the Faculty TO. The Faculty TO had the following motivations: despite its many achievements, it was faced with problems related to funding and to student numbers; also, the location of the UT in the relatively rural eastern part of the Netherlands is seen as a disadvantage; finally, the TO Faculty was facing a reorganisation, because many traditional students had begun enrolling in the new Department of Communication Sciences. As most of the teaching is in the Dutch language, the Faculty TO did not have many offerings to compete internationally for first-year students.

In short, the Faculty TO faced a huge problem: more students were needed in the regular four-year programmes. There were two ways to find them: the first was to attract secondary school leavers who did not want to come to that “far-away” place in the eastern part of the Netherlands; the second was to attract working individuals who already had degrees from teacher-training or equivalent institutions but would like to have additional experience in educational technology.³³

To come to a faculty-wide initiation in the use of TeleTOP, the administration of the Faculty TO made the decision to be proactive. This meant that a move was made from the creation of a facilitating climate where the interested individual was able to make a transition to enrich his or her teaching with technology, towards a proactive position of putting forth a strategy (including funding arrangements), for stimulating managed change that encouraged this transition.³⁴ The TeleTOP project was a major tool in this

* In October 2002, the corporate arm of the UK Open University signed a Memorandum of Understanding with DINKEL (at the UT) to jointly promote TeleTOP. The UT is flagged as a “Strategic Partner” of COROUS at <http://www.corous.com/how/partners.cfm>.

TeleTOP became a spin-off company of the UT in 2003 – see the press release of 8 December 2003 on the corporate site <http://www.teletop.nl/>. In addition to the partnership with COROUS (who now handle sales in UK and Ireland) TeleTOP is an IBM Business Partner and has a hosting partner Virtu Secure Webservices (<http://www.virtu.nl/en/home/>). Among customers of TeleTOP the site notes “a business school in London” and “a medical college in Ireland”.

proactive strategy. One of the most important parts of this faculty-wide strategy was the fact that the faculty did not set up an “encouraged use” situation, but a “mandatory” situation: everyone had to be involved. This mandatory involvement was based on the following two basic goals:³⁵

- To empower and not replace the instructor with technology.
- To engage all instructors, irrespective as to both their individual computer skills and their personal level of interest in the use of technology in their own teaching.

Beginning in the autumn of 1998, the Faculty of Educational Science and Technology at the University of Twente offered its education in a new style called the C@mpus+ approach (which is different from the central C@mpus+ approach established later on). This style involved the best of old and new: maintaining good teaching, maintaining the positive experiences students have working collaboratively on design projects to solve real-world problems, but adding new flexibility, new technologies, and new pedagogies to accompany these old values.

In short, the C@mpus+ approach can be described as follows: an educational philosophy of extending the benefits of the good instructor and pleasant physical campus of the University of Twente beyond what can usually be experienced by students in regular physical attendance, as well as by those only occasionally or non-physically attending. The key to realising this is to increase communication between instructors and students and among students themselves, and to develop a learning approach based on *active participation* rather than *passive listening and reading*.³⁶

Key Principles

Information and Communications Technology is a key facilitating tool. In particular, TeleTOP is used in the preparation of the education (organising information about the courses and course activities, and providing convenient ways for students, wherever they are, to communicate with others in the course); in the preparation and guidance of self-study and collaborative activities; and for testing and developing portfolio-type collections of student work. The key components of the C@mpus+ approach are as follows:

- There will be a “common day” every second Friday, when all students come together physically on the campus. On those “super Fridays”, a co-ordinated effort will be made to render the experience as valuable as possible for the students. Each new course will have an introductory group session of approximately one hour, to allow the instructor to efficiently communicate his or her views on the course, so that the students can better visualise him or her when receiving electronic communications.
- While the general types of assignments will be the same for all cohorts, students will be able to choose between group projects and individual activities, between various approaches to a general assignment, and with variations in the way in which communication and submission of coursework occurs.

- Instead of using traditional lectures, the instructor will focus on guided self-study, primarily through the use of the Web site and techniques such as fill-in forms for structured communication and reflective activities. Interactivity and communication between instructor and students will occur on a weekly basis, primarily with the support of Web sites so that the place from which a student, or the instructor, participates in discussions or online activities becomes irrelevant (as long as an Internet connection is available).
- Collaborative group activities, supported by tools for real-time communication, will be emphasised for the younger students in the regular programme, on campus and at a sister campus in the northwest of the country. To facilitate this real-time collaborative work, two interactive classrooms have been opened, one in each location, featuring advanced video-conferencing (both full room and desktop) integrated with high-speed network access so that students can make common use of Web-based tools such as shared workspaces as they discuss their work with each other.
- Students who are not present at the real-time collaborative sessions can “catch up” by studying the results of the sessions via the course Web sites, and can enter their own comments and responses asynchronously, via the UT Web sites.

Central Implementation Strategies for TeleTOP

In 2000, the university-wide implementation of TeleTOP started on a voluntary basis, meaning that all technical facilities were supplied by the university and a team of instructional designers was available for educational support; but it was up to the faculties to decide if, and to what extent, they wanted to join the TeleTOP implementation.³⁷ A special working group was initiated to discuss the possibility of implementing TeleTOP as the campus-wide course management system; this resulted in an implementation plan in which the DINKEL Institute was made responsible for the integration of TeleTOP throughout the university. Part of the implementation strategy is having a strong team to carry it out. Therefore DINKEL is provided with support from the TeleTOP team of the Faculty TO. This team is responsible for the implementation aspects of the C@mpus+ approach. This TeleTOP team requires not only five full-time instructional designers, but also the part-time services of several senior faculty members in leadership positions; the active involvement of 30 faculty members whose courses' didactics are in the process of being redesigned; and many of the TO students, who are involved in a variety of ways. As many people in the TeleTOP Team have a lot of experience, and know how to implement an integrated approach strategy (and, moreover, receive useful feedback during the implementation process), they play a major role in the institutionalisation of TeleTOP, and do cooperate with DINKEL. The TeleTOP team have also developed TeleTOP Decision Support Tools, which are used to get all faculty involved in using the course management system.

Faculties are not allowed to implement their own electronic environments and decide upon the time-span themselves; the introduction of ICT must develop within a certain framework.³⁸ As the implementation strategy is not prescribed by the university board, but is chosen by each faculty itself, the way TeleTOP is being implemented at the var-

ious faculties differs. In general, three strategies for the implementation of TeleTOP can be distinguished:³⁹

- *Overall strategy.* TeleTOP is implemented in all study phases of the faculty. The faculty chooses to do an overall implementation and all instructors are expected to use TeleTOP to support their courses.
- *Phased strategy.* The implementation starts in the first year of the programme(s). Once the first year students are using TeleTOP, the system is gradually implemented into the other years of the curriculum.
- *Pilot strategy.* The faculty begins with a few pilot courses. Instructors can participate in these pilots on a voluntary basis. If the pilots prove to be successful, the implementation is expanded to one of the other strategies.

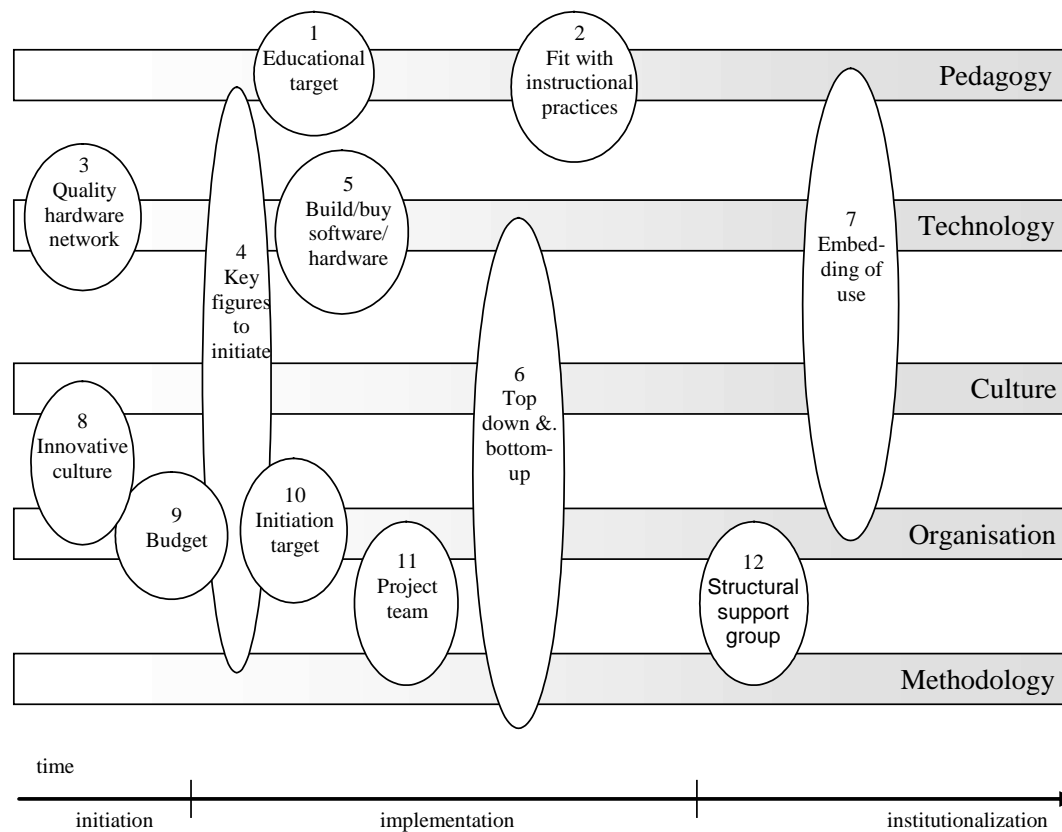


Fig. 2. Summary of the TeleTOP implementation process at the University of Twente. (Data from Betty Collis and Wim De Boer, "The TeleTOP Implementation Model", *Interactive Learning Environments* 9, no. 1 (2001).

5. The University of Twente and External Collaboration

5.1 Digital University

Participation of the University of Twente in the Digital University was considered a necessity by the University's senior management. Given its image and its activities in the area of ICT, the DU initiative was seen as compatible with Twente's ICT strategies. Initially the participation of the UT was received with some scepticism by the University Council and the faculties. This was due mainly to the investments required and the fact that the specific future tasks of the DU were not adequately defined. The central level decision-makers have now announced a "consultation round" with all the persons involved in order to take away the scepticism and to enthuse staff to become engaged in the joint projects.

5.2 EUNITE

5.2.1 Background and Rationale

In January 2000, a Memorandum of Understanding was drafted for the founding of the European University Network for Information Technology in Education (EUNITE).^{*} This was a strategic alliance between eight universities: Aalborg Universitet (Denmark); Universidad de Granada (Spain); FernUniversität Hagen[†] (Germany); Helsinki University of Technology (Finland); Katholieke Universiteit Leuven (Belgium); Lund University[‡] (Sweden); Universiteit Twente (the Netherlands); and Università di Bologna (Italy). In the course of the take-off phase, Università di Bologna withdrew and the University of Strathclyde (Scotland) joined the strategic alliance. The general goals for EUNITE, as stated in the Memorandum, were:

- To promote the use of ICT as tools for improving teaching and learning in higher education.
- To capture the market for lifelong learning on a university level.
- To enhance and develop the co-operation of the EUNITE universities in these fields.

^{*} For those "instant surfers" among our readers, the URL for EUNITE is *not* <http://www.eunite.org/>. This is the URL for the European Network on Intelligent Technologies for Smart Adaptive Systems. Our EUNITE is at <http://www.eunite-online.org/> – the final text of the Memorandum of Understanding (28 October 2000) is at <http://www.eunite-online.org/submenu1/MoU/>.

[†] FernUniversität Hagen is the main open university in Germany; long-established but moving fast into e-learning. Their main Web site is <http://www.fernuni-hagen.de/> – information in English is at http://www.fernuni-hagen.de/VERWALTUNG/englisch/fernuniversity/dez24_01950.html.

[‡] Lund University is the original home of LUVIT, a project started in 1997 which became an innovative LMS supplier; they are analysed in chapter 16, "e-tools (1)". See <http://www.luvit.com/> – there is material in English linked from the main page. Note that LUVIT is part-owned by the UK company FutureMedia plc (<http://www.futuremedia.co.uk>).

To achieve these goals, co-operation would concentrate on the innovation potential of ICT for on-campus education, as well as on finding new avenues for open and distance learning. Furthermore, inter-university co-operation would be established in the provision and development of courses and learning materials. The main rationales behind the strategic alliance are related to quality and scale. Major advantages are to be achieved in the range and the quality of offerings that each individual institution can offer to its students. The economics of scale are also a major driving force, since it is recognised that the stated goals can be achieved only under conditions of sufficient scale and mutual support.

5.2.2 Activities and Organisation

In order to shape the future activities of EUNITE, a steering committee – consisting of one member for each of the participating universities – co-ordinated the activities in this take-off phase. In March 2000, task forces started working on five different themes, which should provide the basis for a final Memorandum of Understanding to be signed later that year. The themes are:

- Digital learning platforms and digital campus (technical and pedagogical aspects). In this theme an inventory of digital learning platforms being developed or in use at the partner universities is to be compiled, with a special focus on compatibility between the various platforms. It will also provide a list of prioritised technical requirements for the European Virtual Campus, or EVC (e.g., minimal bandwidth, different concepts according to expected evolutions in bandwidth, solutions for the problem of maintaining quality, databases with reusable materials) and develop concepts for technical support of teachers and learners.
- European Virtual Campus: concept and policies for co-operation. This theme will concentrate on the viable concepts and models for the EVC as a digital teaching and learning environment, and as a distributed database of teaching and learning materials. It will also address issues such as internal and external target groups, policies and guidelines for course development and delivery, access conditions and policies, and accreditation of courses and quality standards.
- Pilot programmes and courses. This theme focusses on available programmes, courses and teaching/learning materials, and the participants' interests and priorities for joint programmes/course development. Ultimately this task force will design and develop concrete pilots of joint development of programmes and courses.
- Web site implementation. This theme focusses on designing the EUNITE Web site and defining accessibility rules and guidelines. The Web site will be creat-

ed in close co-operation with EuroPACE 2000* for design and subsequent maintenance.

- Research and development. Within this theme, an inventory of relevant research within the EUNITE partner universities (focussed on the use of ICT in teaching and learning) will be made. Possible co-operation efforts (research projects, workshops and seminars for exchange of experience) will be investigated.

The reports of the five task forces were submitted in August–September 2000, after which the final Memorandum of Understanding was signed in Leuven by the eight rectors of the participating universities. Current activities of EUNITE are the continuation of the task forces on the one hand and the actual start of the EVC on the other. The continuation of the task forces should eventually lead to an action plan and budget proposal for the five different themes, which should be concluded at the end of 2001. In the meantime, the EVC has made a start through the EUNITE Web site (<http://www.eunite-online.org/>).

In this early stage, the EVC is mainly a portal wherein the faculties and departments of the participating universities can provide links to programmes offered in the fields of social sciences, humanities, law and technology. The initial target groups of the EVC are master's students, PhD students and students in specialised postgraduate programmes and courses for continuing professional development (CPD).

The EUNITE Board and the Executive Committee are the main elements in the governance structure of EUNITE. The EUNITE board consists of two representatives of each constituent university; one is the rector[†] and the other is a senior academic or manager responsible for ICT policy. Daily management is a task for the Executive Committee, consisting of four persons. One chairs the committee; the other three are responsible for teaching and learning, technical expertise and administration. The Executive Committee will report to the Board and it will prepare and execute Board decisions. The committee is also responsible for the co-ordination of the task forces, for the preparation and submission of new funding applications from EUNITE and for the preparation of the budget.[‡]

5.2.3 Composition and Evolution

EUNITE evolved mainly out of members of EuroPACE, a European network of universities and other parties in education and training (i.e. private enterprises, regional and professional organisations and public authorities). Approximately 60 member organisations (45 of them universities) participate in this network. Five of the EUNITE members are also members of this network, including the University of Twente. In the

* EuroPACE, <http://www.europace.org/>, has a catchphrase of “Towards a Virtual University for Europe”. It names EUNITE as a strategic partner (http://www.europace.org/strat_part/index.html).

[†] Vice-chancellor, in UK terms (more or less).

[‡] However, note that the text of the MoU on the Web site at <http://www.eunite-online.org/submenu1/MoU/>, mentions only a steering committee, with one representative per institution (but with others allowed at the meetings).

initial phase of EUNITE, two other universities, the Università di Bologna (as discussed above) and the University of Cambridge, were involved in discussions, but withdrew before the Memorandum was signed. The future composition of the alliance is rather unclear, but an expansion of the network is foreseen. New members or associate members can be accepted. For membership, approval from a two-thirds majority of the Board is required.*

5.2.4 *Financing and Distribution*

The financing of the EUNITE activities is not yet fully arranged. For the preparation phase, the participating universities have each funded their own investment in human resources for the task forces. In due course, the principles for membership contributions will be established (in the course of 2001), on the basis of the task force budget proposals. In the future, project proposals can be submitted to the Board in order to be evaluated for EUNITE funding. The exchange of courses within the EUNITE network will in principle be free of charge, on the basis of the idea that efforts and benefits will be evened out. At a later stage, courses and programmes will become commercially available to universities outside the network.†

5.3 ECIU

In 1997, the European Consortium of Innovative Universities was established by Aalborg Universitet (Denmark), Technische Universität Hamburg (Germany), Universidade de Aveiro (Portugal), Universitat Autònoma de Barcelona (Spain), Chalmers University (Sweden), Universität Dortmund (Germany), Joensuu University (Finland),‡ University of Strathclyde (Scotland), Universiteit Twente (the Netherlands), University of Warwick (England) and Université de Technologie de Compiègne (France). In the Charter signed in Dortmund, these universities committed themselves to a consortium which would co-operate closely with business, industry and government and promote co-operation between science parks. It would also be active in the field of international continuing education and lifelong learning. Internally it would establish criteria for the certification and validation of ECIU courses and the exchange of credits. In 1999, this Charter was refined, resulting in the ECIU Strategic Plan 2000–2002. In this plan they stated that their main objective is “to manage a European universities consortium which appears as a coherent and dynamic unity within areas

* This eventuality is not covered in the published MoU; and in fact the current members are the same as the original signatories – see again the MoU.

† At the original time of writing, it seems that several issues with EUNITE were not finalised. However, from November 2001 EUNITE became a partner in a large European Commission project cEVU (Collaborative European Virtual University), co-ordinated by EuroPACE, which ran until November 2003. This has a Web site, which has a good overview of the project – see <http://www.cevu.org/home.html>. There were many (publicly available) reports as deliverables of the cEVU project. After the cEVU era, there are signs of less activity on the EUNITE Web site, especially in parts of the Virtual Campus area. However, recently EUNITE became involved in the preparation and running of “Virtual Erasmus Week” of 3–10 May 2004 (<http://www.eunite-online.org/submenu1/erasmus/>), for which EUNITE prepared a presentation and at which several EUNITE members raised questions after Commissioner Liikanen’s speech (see the site for the links).

‡ In Finnish, *Joensuun Yliopisto*.

such as education, research, IT, permanent education, social benefits, regional impact and service functions. A consortium which is innovative in respect to both content and functions^{39, 40}.

The consortium has grouped its plan into four broad categories: co-operation in education, co-operation in research, co-operation in regional development and co-operation in institutional research. Co-operation in education is seen as a core activity for ECIU. In this area ECIU concentrates on delivering programmes with a focus on innovative areas as well as on implementing innovative methodologies and means. Co-operation in research will be complementary to the variety of networks in which the partner universities already co-operate. ECIU will therefore focus its attention on areas that are seen as of strategic importance, as well as on activities that stimulate integration with the fields of education and regional development. Although co-operation in education and in research are rather common in such international arrangements, regional co-operation is seen as the distinctive field in the international arena and a field in which all ECIU partners have a good reputation. Co-operation in the field of institutional research will emerge in the form of exchanging ideas and experiences, taking into account the entrepreneurial character of the participating universities.

The activities that will be undertaken within the ECIU framework are specifications of the four themes identified in the Strategic Plan and cover a wide range of subjects. Part of the concrete activities is related to the use of ICT. In the sphere of education, for instance, proposals will be developed for the investment in joint ICT facilities, combining virtual and physical mobility and co-operation with respect to the use of ICT in programmes. In the future, ECIU will also establish connections with HEIs, alliances and private parties in territories outside Europe. The consortium membership, however, will remain confined to the current members.*

5.4 EUNICE

While the networks discussed above were all rather comprehensive in nature (covering multiple disciplines), the European Network of Universities and Companies in Information and Communication Engineering is explicitly focussed on teaching and research in the field of ICT. This disciplinary network is made up of both universities (or the departments engaged in ICT-related education and research) and companies involved in the field of ICT. This network is not so much involved in the use of ICT in the education process, but has been created to foster the mobility of students and

* There have been some changes to ECIU. The consortium Web site is now <http://www.eciu.org/> although the original site at <http://www.eciu.auc.dk/> is still active (in Danish) at Aalborg University, who run the secretariat. There appears to be no strong focus now on IT or e-learning. The membership has changed slightly, in that Linköping University has joined and Chalmers University has left; and the status of Joensuu University is not clear (July 2004). In addition, ECIU has added Monterrey Tech (Mexico) as an overseas associate partner. Often referred to as ITESM, it has an impressive competence in e-learning – see in particular its Virtual University site (in Spanish) at http://www.itesm.mx/sistema/donde/f_uv.htm and the Blackboard case study (in English) at <http://www.blackboard.net/about/cc/itesm/index.htm>.

faculty members working in the field of ICT in general and to promote educational and research co-operation between its member institutions.*

5.5 University Network of Innovative Student Centered Education (Uniscene)

Uniscene is a network of seven so-called “Northwestern European” universities. This network, founded in 1996, focusses on the promotion of student-centred education. Considering that developments in information technology make students more independent of what their local university offers, universities can collaborate to develop ICT learning environments and exchange programmes which encourage students to study with fellow learners from various countries. The participating universities try to develop a learning environment in which the process of learning, along with new instructional approaches and assessment procedures, stimulates their students to become active, self-directed and internationally oriented learners. The use of ICT in this process should be seen as one of the issues emphasised in this network, next to pedagogical issues and institutional strategies related to the improvement and promotion of student-centred education.†

6. Financial Analysis

A distinctive feature of the Dutch education system is that it combines a centralised education policy with a decentralised administration and management of higher education institutions. This applies not only to the relationship between central government and higher education institutions, but also inside the higher education institutions themselves. Financial policies are developed at the central level, but lump-sum budgets are decentralised to all faculties/departments. This means that faculties do have a certain level of autonomy in allocating these budgets. This also implies that it is difficult to provide a total financial analysis of ICT policy within the University of Twente, as financial information for the faculties cannot be provided. Therefore one has to take into account that the information presented below does not include the budgets available within the faculties for ICT activities, projects or consulting.

6.1 At the Central Level⁴¹

One of the first centrally funded projects concerning the use of ICT was the telelearning project, which started in 1996. The aim of this project was to integrate the concept

* The Web site of EUNICE is at <http://www.eunice-forum.org/>. (The site <http://www.eunice.org/> is a consortium of schools in the southern USA.) It has a mission statement and all the usual appurtenances. There are 17 members, normally represented by their IT or electronics departments, including two in the UK (University of Sussex and University College London) and one in “nearer Russia” (St Petersburg). There is an annual summer school on an IT-related subject. The links to e-learning might seem a bit thin, but it is reported that in order to “examine the issues on implementing an exchange of learning resources, the CANDLE project was conceived in 1999 by the EUNICE network” (<http://www-jime.open.ac.uk/2003/1/reuse-19.html>). or CANDLE see <http://www.candle.eu.org/>. Further insights into the links between EU research and operational e-learning are explored in chapter 16, “e-tools (1)”.

† Uniscene (sometimes spelt UNISCENE) appears to have left rather limited spoor on the Web, existing perhaps mainly as a human network. The former Web site at <http://www.unimaas.nl/uniscene> is not now functional.

of telelearning in teaching and research at the University of Twente with the existing technical and organisational infrastructure. Part of this project was the aim to establish dial-in connections. Over the period 1996–1998 the total central budget was NLG 770,000 (£220,000), originating from the so-called CSOW funds. At the central level, this fund has been set up to stimulate and fund innovation in education, including projects concerning the developments on ICT. UT's policy of innovation in the field of education was given an important boost when 37 of the 38 innovative projects (year 1997) submitted by the UT in the second round of the Ministry's Quality Fund were approved, resulting in a NLG 4.5 million (£1.3 million) grant from this fund.⁴² Some of the projects concerning the development of ICT were part of this total of 37.⁴³

As was described in the former paragraph, the rector of the university established a task force responsible for the development of the university's vision on the use of new forms of ICT in education in 1998. The total budget for the task force (mainly to cover the costs of the full-time secretary) were NLG 108,000 (£51,491) annually for a period of three years (1998–2000). The institutionalisation of the course management system TeleTOP has been financed by the central level of the university, through the matching principle of the SURF Foundation.

The central funding of the C@mpus+ approach accounted to about NLG 1 million (£286,000) and this sum has been allocated to the DINKEL Institute, which is responsible for the implementation of both TeleTOP and the C@mpus+ approach. For the year 2001, at the central level, an amount of NLG 360,000 (£103,000) has been made available for funding of projects within the framework of Professional Working and Learning Environment (PLW).

6.2 SURF Budgets

The SURF Foundation and especially SURF Education has been very important for the stimulation of innovation inside HEIs. Like many other Dutch HEIs, the University of Twente took part in the first call for tenders in 1999 with a tender for the further institutionalisation of TeleTOP. This project has been granted a subsidy of NLG 1 million (£286,000) from SURF Education. However, this amount had to be matched by the university itself; but, because there is co-operation with the University of Leiden, the University of Twente has to match just NLG 500,000* (£143,000). Half of this amount is funded by the participating faculties and the other half, NLG 250,000 (£71,500), is funded by the central level of the university. Following up the tenders of 1999 and 2000, SURF Education on 31 January 2001 issued a tender for the Educational Innovation Projects 2001. Via this tender, SURF Education wanted to stimulate the redesign of parts of curricula. Again the University of Twente, together with the Erasmus University Rotterdam, was subsidised with NLG 1 million (£286,000) for a project. Furthermore, like all HEIs, the University of Twente has to pay a yearly contribution of about NLG 2 (57P per student to the SURF Foundation).

* Half of the SURF subsidy of NLG 1 million (£286,000).

6.3 Digital University

As stated above, higher education institutions participating in the Digital University have to pay an annual amount of about NLG 3.5 million (£1 million). Furthermore, projects being carried out under the umbrella of the DU have the same matching principle as the SURF subsidies: half of the costs have to be covered by the HEI and the other half will be eligible for DU funding. At this moment the first round of proposals is being carried out.*

6.4 Summary of Central and External Funding of ICT Projects at the University of Twente

TABLE 3 Central and external ICT funding at the UT (thousands of Dutch guilders [and British pounds sterling])

	Time period	Total central funding	External funding (SURF)
		NLG	NLG
Teleleren	1996–98	770.0 [£220.0]	-
Task force	1998–2000	324.0 [£92.7]	-
Other ICT	1998	100.0 [£28.6]	-
TeleTOP	1999–2001	250.0 [£71.5]	1,000.0 [£286.0]
C@mpus+ approach	2000	869.0 [£248.6]	-
Other ICT projects	2000	131.0 [£37.5]	-
SURF contribution	annual	15.0 [£4.3]	-
PLW	2001	360.0 [£103.0]	-
Project simulation	2001–03	250.0 [£71.5]	1,000.0 [£286.0]
MultiVLA	2001–03	250.0 [£71.5]	1,000.0 [£286.0]
Digital University	2001	3,500.0 [£1,001.0]	-

6.5 Financial Arrangements for Both Students and Staff

Important in the development of the advanced technological infrastructure is providing access to new technologies for both students and staff. As already indicated in the above, both students and staff on campus do have unrestricted access to the university network (and therefore to e-mail and the Internet). All staff at the university are in possession of either desktop or laptop machines that are linked to the internal network, Campusnet. Students have access to this network via the computer labs on campus (some faculties are open 24 hours a day). And, although it is not required,

* A list of current DU projects is accessible from the DU site <http://www.du.nl/digiuni/>.

most students do have their own desktop or laptop computers at home. This is made possible by the centrally driven “private PC” projects at the UT.

The university’s computer shop (located within the CIV) provides not only computers with the necessary hardware and software, but also subscriptions to the telephone network (with special offers for first-year students). Three times a year there is a special PC promotion, in which students can buy a computer for NLG 3500 (£1,000). When purchasing a computer, students can make use of an interest-free loan (NLG 2000, or £570) that they must then pay back within 24 months. Furthermore, the university has a help desk where students can gain free support and advice when needed. Manuals for installation can be found on a Web site. In addition to this, there is a carry-in service: students can bring their computers to a help desk where staff members will install everything correctly. Courses on computer use are also available, ranging from basic courses such as MS Word and Excel to programming in C++. The costs to the students for these courses are low.⁴⁴

Apart from these centrally driven PC projects, several faculties have their own policies. For example at the Faculty TO, the supposition is that students either are or wish to be in possession of high-quality computers at home. Therefore, the Faculty TO offers each student a PC. Like the centrally driven private PC projects, students can borrow NLG 2000, or £570 (interest-free loan) from the university and repay this amount in 24 months, but the Faculty TO also makes it possible to turn NLG 1500 (£430) of this into a gift to the students. If the students gain at least 42 of the 84 credit points (part-time students 28) during the first two years of their studies, they do not have to pay back NLG 1500 (£430) of their total loan.⁴⁵

7. Future Perspectives

7.1 Introduction

One of the latest central developments within the University of Twente is the introduction of the Professional Working and Learning Environment concept, which is the central focus of the most recent central ICT policy.⁴⁶ The aim of the PLW is to create a single-log-on portal for all the existing information systems. The central objectives of this policy are (DINKEL 2000):⁴⁷

- More flexibility of education, in terms of time, place and content.
- An increase in access for traditional undergraduate students.
- Expansion of traditional undergraduate new entrants (part-time, distance, international students).⁴⁸
- Development of an “advanced studies” centre, centrally located on the campus of the university.
- Improvements in the quality of education.

- Integration of ICT use into the educational concepts of both the major-minor and the bachelor's-master's degree system.

Further development of the PLW is concentrated along three main tracks:⁴⁹

- a) Development of research facilities.
- b) Development of facilitating services (implementation of the C@mpus+ approach, further institutionalisation and scaling up of TeleTOP and the wireless campus project).
- c) International co-operation between higher education institutions.

The PLW concept is a further expansion of the C@mpus+ approach, in which the integration of TeleTOP with the already-existing technical infrastructure has been the central point. The PLW concept intends to further integrate all existing information systems (both administrative and research-based) into the TeleTOP course management environment and to combine this with the concept of the wireless campus. Important in the PLW concept is an emphasis on the further digitisation/virtualisation of both the satellite and central library facilities⁵⁰ and the integration of these with the other information systems (like the administrative systems and TeleTOP).

In this respect the centralisation of the faculty libraries plays an important role. Because of the increasing digitisation of materials, and complete online electronic access for both students and staff, the UT has decided to establish one central library, instead of the current branches available in many of the faculties.

7.2 Future National and International Co-operation

As stated above, co-operation with other higher education institutions will be one of the universities' focal points with respect to the further development of the PLW concept. The University of Twente is already engaged in several national and international arrangements, some explicitly focussed on ICT, with others using ICT as a means to accomplish a network's or consortium's objectives. The various arrangements differ from each other in many ways. Some basic variables are given in table 4.

TABLE 4 The University of Twente, ICT and External Collaboration

Network or consortium	Members	Target group	Role of ICT
Digital University	9	Traditional students and CPD	Central
EUNITE	8	Master's level, PhD level and CPD	Central
ECIU	11	Traditional students of participating universities, with an emphasis on PhD students	Means to achieve objectives
EUNICE	22	Undergraduate and postgraduate students in ICT studies	Discipline
Uniscene	7	Teaching staff and university management	Means to achieve objectives

In the case of external relations in the field of ICT, the University of Twente seems to give most priority to the national DU consortium. In this external network the investments are substantial, exceeding those in other networks. Furthermore, future activities and opportunities for returns on investment are more specifically defined than in other arrangements. In the most recent arrangements – DU and EUNITE – the University of Twente seems to pursue a strategy aimed at the market for CPD. In the more traditional segment (bachelor's-master's and PhD level) the UT grants a preliminary supporting role for ICT.

Becoming an “Internet university” or providing distance education in the form of full programmes is not part of the strategies of the UT. The use of ICT in the traditional segment is intended to make the teaching process more efficient and of higher quality. Commercial exploitation is foreseen mainly in the area of professional education and through the development of ICT-related learning materials.

8. Summary and Conclusion

In the vision of the University Twente, it is emphasised that the university will not aim to become a virtual university. As stated previously, face-to-face contact between teacher and student is regarded as essential to develop academic knowledge and skills. One of the most important characteristics of ICT (or telelearning) at the UT is that computers should not replace teaching staff and that ICT is used primarily in initial higher education. Personal contact, the oral transfer of knowledge, communication between teachers and students, and interactions between students all remain essential for proper academic training. From this vision it becomes clear that the University of Twente focusses now, and will focus in the future, on the traditional teaching of undergraduate students. Furthermore, ICT has to be seen as a complement to the teaching and research processes, not a replacement for these processes.

This vision, defined at the central level, traces back to the first central policy in 1998. At that time there was a desire to show the outside world the relevance and the (probable) uniqueness of TeleTOP; it was decided that ICT would be an important aspect of the profile and mission of the university. So one can state that one of the main motivations for introducing TeleTOP throughout the university has been the further expansion of the UT as an entrepreneurial university (this distinctive concept has been

one of the main features of the UT to the outside world since the early 1980s). Furthermore, at the central level, many were aware of the fact that there was a need for more a more flexible mode of education, especially with respect to the major-minor concept and, nowadays, the bachelor's-master's concept.

Several internal measures have been taken to achieve the aforementioned vision. First of all, one of the defining features of the University of Twente has been its advanced technological infrastructure. Because of the early existence (by the early 1990s) of this technological infrastructure (for example, the CampusNet), both staff and students became accustomed to using a variety of new forms of ICT, e.g., the latest developments in both the hardware and software (especially for accessing e-mail and the Internet). Because of the early existence of the advanced technological infrastructure and the embedding of use of this technology for both students and staff, there has been hardly any resistance to implementing (for example) TeleTOP. Until 2000 there was no central, integrated policy concerning the implementation of TeleTOP, as TeleTOP has developed from a bottom-up approach, starting at the Faculty TO. Because of the successful implementation in this faculty, other faculties within the university were extremely interested in implementing TeleTOP. Some of these had noted the shortcomings of their existing modes of delivery, but were also responding to changes in the internal and external environment of the university.

Therefore, when the university decided to implement TeleTOP throughout the whole university, it was not exactly implementing a change, but supporting the on-going developments within the various faculties.

Important in this process of implementing TeleTOP within the faculties (and at a later time, throughout the whole university) has been the recognition that the most critical factor would be the instructor. In the UT policies it is noted that ICT has to empower the instructor with technology, not replace the instructor. Furthermore, the engagement of the instructors has gained special attention, due to wide variations in their computer skills as well as a wide variety of levels of interest in the use of technology in teaching.

The decision to implement TeleTOP throughout the whole university has been based on a variety of reasons. The first and most important one has been the very well-known (inter)national reputation of the Faculty TO. This Faculty can be seen as very important in the development of both TeleTOP and ICT at the university. Long before the institutionalisation of TeleTOP, many members of the Faculty TO were involved in the use of new forms of ICT applications. The year 1997 can be characterised as one of the most important years in the development of ICT use at both the Faculty TO and at the central university level, as 1997 marks both the dean of the Faculty TO's decision to implement TeleTOP throughout the faculty and very importantly, to make faculty budget available for this implementation. At the central level, the university decided to establish a Telelearning chair at the Faculty TO. Furthermore in this year, the subject "telelearning" was the university's focus for its "birthday celebration", and the new chair of Telelearning was asked to deliver the keynote. One of the last things to happen in 1997 was the establishment of the task force "Telematics Applications in Education".

A second element relating to the institutionalisation of TeleTOP deals with the question of why the university decided to further develop this self-made course manage-

ment system rather than implement a standardised system, such as Blackboard or WebCT. One obvious reason is, of course, the Faculty TO's prior experiences with TeleTOP; another is a belief within the university that TeleTOP is a good product with better applications than the other systems. Here also the concept of the "entrepreneurial" university could have been of influence.

With the development of TeleTOP, a commercial product has been established, as described above.

Looking at the external partnerships of the University of Twente, one can expect that co-operation with the Digital University will be of particular importance in the coming years. The university pays a yearly contribution of about NLG 3.5 million (£1 million) and this has to be earned back. Central university policy indicates a trend towards categorising most on-going and future projects as being within the framework of the Digital University (for example, further expansion of TeleTOP and developments for the PLW projects). Additionally, co-operation within the EUNITE framework will be extended. As for other future directions, one can first of all conclude that although a variety of new target groups have been mentioned (adults, international students, part-time students), the aim at the central level will still be to attract traditional (18–24 years) undergraduate on-campus students. Furthermore the development of the PLW is a concept for which the development of a single-log-on portal will be of importance in the coming years.

One last conclusion concerns ideas about the *efficiency* and *effectiveness* of the chosen technologies. One can conclude from this case study that these terms are hardly mentioned, neither in the policy documents examined nor in interviews held. When asked specifically about these terms, individuals often answered that efficiency and effectiveness were not the key words or aims of the University of Twente. The UT introduced ICT mainly as a tool to improve the quality of education and to offer more flexible education, and not for efficiency or effectiveness reasons.

8.1 Preliminary Thoughts on the Success and Failure Factors

Below a number of success and failure factors are briefly mentioned. They should not be taken as the "definite" factors that follow from our analysis, leading to a kind of recipe for implementing ICT in higher education. Rather they are striking elements of the particular situation at the University of Twente, which may be helpful to those in higher education (re)thinking their strategies regarding ICT.

8.1.1 Success Factors

- Empowerment, not replacement.
- Faculty engagement within the TO Faculty was mandatory, not voluntary!
- High level of faculty incentives.
- Faculty administration official involvement, including incentives.

- Establishment of a central co-ordinator, with financial power (DINKEL).
- High proportion of both internal and external networking: going to conferences, conventions and seminars, both within the Netherlands and internationally (also, within the university).
- Very strong support by the TeleTOP Team, sharing their expertise and showing instructors the possibilities of the course management system.
- Establishment of a project team, in which all kinds of people are involved.
- Student incentives/regulations for purchase of computers.
- Integration (with the TeleTOP project at TO) of a new cohort of students – part-time, adult, working and distance learning – with the regular students in virtually all of the TO courses; and integration of TO's master's courses for international students with the regular courses.
- Remarkably short time frame: a period of five years is common, though some programmes are established in a shorter period.
- Availability of computers for students has been of great importance to the university. By 1994 measures were taken to offer discounted computers to both students and staff.
- Linking of all the strategies – for technical infrastructure, using ICT in teaching and learning, administrative systems and research facilities – into one “single-log-on” portal. Important is the linking between the various subsystems.
- Regular evaluation: both students and instructors are being asked to record the amount of time spent on different aspects of the course, e.g., using the course support environments as well as many other aspects relating to the quality of the course experience.

8.1.2 Failure Factors

- Establishment of too many committees. For example during the telelearning project there were too many committee meetings and much overlap between the work of the committees.
- Too much centralisation of ICT policy means that there is less engagement at the faculty level. There is a danger of resistance among the staff. Previously, the staff was always involved in the establishment of ICT in their faculty and were seen as the experts. Recently, the Executive Board decided to centralise much of the ICT policy, funding it all through the central support staff (DINKEL). Especially with the partnership in the DU, staff engagement was very low. This is now solved by having new kinds of communication structures, with a great variety of people within the organisation to explain the move towards the DU. It is necessary to explain that there is no need to fear

the competition or loss of expertise. The UT management is now on a promotion tour within the university, to regain engagement.

- Regarding some projects (e.g., wireless campus), the technology is moving so fast that institution-wide, one cannot keep up with it.
- Although for the 6,000 students there is a standard e-mail programme, there is a lot of fragmentation of software within the faculties. For example, regarding the e-mail facilities, there are 60 different programmes in use. The UT wants to bring this back to two at most, but this is a difficult process.
- The advanced technical infrastructure is being kept up-to-date. But this does not necessarily mean that putting in the latest and most advanced technologies, and providing access to this technology for all parts of the university community, will automatically result in innovative teaching applications (or even in any use of the technology). The WAP mobile phone was a huge success; however, it appears that both students and staff use the phones only to communicate with each other, and that there is hardly any use of other WAP possibilities. This seems to be one of the features of the UT as a front-runner: as a test case for all kinds of new innovative experiments, it is often successful as a pioneer, but is sometimes confronted by the failures of the novice.

Appendix A: Requirements for the Decision to Use TeleTOP⁵¹

- 1) To make the threshold of use as low as possible for the instructors, so that the WWW environments are as easy for them to handle as a word processor, without having to have a special training course. The instructor should be able to choose the features he or she desires to support the course, and only has to type into various fill-in forms to organise the notes and other materials that are to be put into the WWW sites, as well as the feedback to be given to students.
- 2) Students must also be able to use the system without instruction, and with no more support than a short manual. Once they are familiar with the interface of one course support environment, they should have a consistent interface in all their other courses, reducing the need to learn to handle new environments with each new course. The environments are to be accessed through familiar WWW browsers: no new packages to learn, and nothing that requires them to come to the computer laboratory to use it. (E = ease of use)
- 3) Similarly, the instructor must be able to do everything he or she wishes with the course through an ordinary WWW browser: no special authoring software, no special client. An instructor travelling out of the country can work on his or her course wherever there is access to the Internet via a standard browser without needing to have access to the server. (E = ease of use; E = effectiveness, short-term pay-off – efficiency)
- 4) By the principle of *extending the good instructor*, instructors must be able to choose for themselves the way that a WWW site will be used to support their course (Lesson: *Offer something for everyone.*) There is no standard pedagogical model that all are expected to follow. With this in mind, there should be a decision support tool available to the instructor that offers examples of what fellow instructors have done with the large number of options possible in a course WWW site. A system must allow the instructor to be the decision-maker about the course site, but these decisions should be alterable over time, as the instructor gains more experience. (E = environment; E = engagement)
- 5) The course support sites do not replace the text-books in the courses or make lectures unnecessary (Lesson: *After the core, choose more.*) Instead, the course support sites help the instructor add extra opportunities for student reflection, for communication, for student contribution of additional learning resources, for peer interaction and peer evaluation, and to add a “preparation for” and “follow-up from” activity to each face-to-face session. Thus we conceptualised our course-support environments as social collaboration environments as well as information-communication exchange environments, which were also coupled with other information systems of the faculty, such as the office responsible for student issues and administration. (E = effectiveness, learning; E = environment)
- 6) The course support environments must be capable of supporting a large variety of different types of instructional approaches, from courses focussed on reading and

written assignments with classic final examinations, to courses with complicated approaches to group work and project-based education (Lesson: *Offer something for everyone*). Tools to support any instructional approach must be available, including shared workspaces, test banks and discussion boards. (E = effectiveness, learning; E = environment; E = engagement)

- 7) The system must work with all other WWW products, for example Java applets and plug-ins. (E = effectiveness, learning; E = ease of use)
- 8) The instructor must be able to put in and take out whatever is necessary in the course site without needing direct technical support. Uploading and downloading attachments of a variety of types is particularly important. (E = ease of use; E = effectiveness, short-term pay-off – efficiency)
- 9) The course sites must help instructors organise the information streams within a course; instead of student messages coming to the instructor's e-mail address, for example, they can be posted directly into the course site, either as private (only for the instructor to see) or public (for all in the course to see) or public (for all to see). Feedback from students or the instructor must follow the same principle (Lesson: *Be aware of the price tag.*) Also, there should be easy-to-set-up ways for messages to be sent to a group of students, or all the students in the course, or other groupings within the course, all from the same WWW environment. (E = Effectiveness, short-term pay-off – efficiency)
- 10) Access to the system must be organised on the basis of in-log data, which are used by the system database to tailor what can be seen and not seen by each individual. Also, it must be easy to leave the system and go to an external site on the WWW and then return to the system, without leaving the browser.
- 11) The author of an item should be able to decide him- or herself who has rights to a submitted item. (E = ease of use; E = effectiveness, learning; E = effectiveness, short-term pay-off – efficiency)
- 12) The system must be efficient to maintain, thus consisting of no labour-intensive handmade HTML pages, but rather of pages generated dynamically out of a database. (Lesson: *watch the four Es.*) (E = ease of use)
- 13) The system must handle multimedia resources the same way as text resources. Video and audio must be streamed over the bandwidths available to the students. (Lesson: *Watch the four Es.*) (E = effectiveness, learning; E = ease of use)

Appendix B: About TeleTOP, the Digital Learning Environment at the University of Twente⁵²

TeleTOP is a unique course management system on the Internet, developed by the faculty of Educational Science and Technology at the University of Twente. By 1998/9 TeleTOP had already supported all the first-year courses at this faculty. By 2000/1 all faculties in the university were using the TeleTOP system to support most of their courses.

Features*

The features of a TeleTOP site are divided into the following categories: organisation, communication, resources and collaboration (i.e., the core activities of a course). Instructors can easily choose and change options within these categories at any time, even when the course is running. The most frequently used features are:

- News, such as information about the availability of feedback on assignments.
- Course Info, about the content, objectives, organisation and instructors of the course.
- Roster, indicating which activities are planned, what preparations or assignments will be expected from the student at which time, etc. The Roster has important built-in facilities:
 - For students to submit assignments electronically, and afterwards to look at the feedback the instructor has given.
 - For instructors (and other students, if the instructor allows this) to have an overview of the submitted assignments, to read them and to give feedback.

What is most innovative about the Roster is its flexibility. The instructor can easily add rows, make different rows available for different groups of students, adapt the columns, and integrate resources from the Resource areas of the site. The instructor is the architect.

More sophisticated features of TeleTOP are:

- A discussion section, where students can discuss (scientific) issues.

* Readers should note that this appendix has *not* been updated (in line with the editors' usual policy for appendices). For a list of current features in TeleTOP check the TeleTOP company Web site at <http://www.teletop.nl/teletop.nsf/home/en> – in the Products & Services area, there is a description of the features of the current release, 5.3.

- A shared workspace, where students can work as a group, to share files and communicate.
- A question-and-answer section, where students can pose questions for the instructors to answer.
- Tools that allow students to contribute resources to the course environment, such as the “presentation area”, which can be used to highlight their final projects.

To support instructors, a decision support tool and a support site have been developed. How instructors use TeleTOP differs from faculty to faculty and from course to course. Some course sites consist only of the basic features; others make use of the more sophisticated ones. Some additional features have been developed to address the specific needs or ideas of an instructor.

Database

The TeleTOP environment is based on Lotus Notes and the Domino database. This page describes why and how the database is used.

Possibilities of a Database

The use of the database makes it possible to store and retrieve information related to all aspects of course design and creation in a structured way. The stored information can be later retrieved by students, or edited and restored by instructors. The use of databases can be seen as “write once, read many, change if necessary” in an already-structured environment. The design of the database is essential for the storage and retrieval of information. The information can only be stored and retrieved in the way that is defined in the designed structure of the database. In the TeleTOP setting, the most common and general components that are used in courses are already built. These components are stored in a database. The elements that are chosen in the decision support tool by the instructors can thus be retrieved and easily recombined to a “self-designed” environment that suits the wishes and needs of the instructor for a particular course.

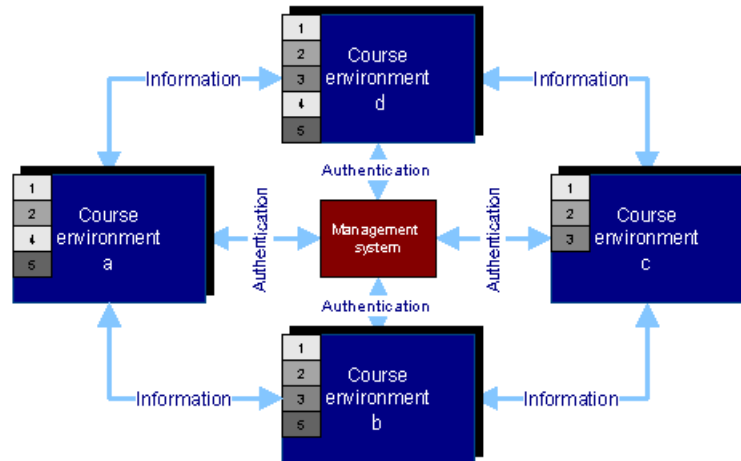


Fig. 3. Information flows in TeleTOP.

This environment is a selection of the general components and their elements (see numbers 1–5 in the picture above). The components are thus transformed into templates. A template offers a fill-in structure that makes it possible to create a course-specific environment. If an instructor is not able to adequately express his or her creativity in terms of these already-structured templates, it is always possible to modify the templates by adding pure HTML directly into fill-in forms available in the environment to extend the possibilities in the WWW site beyond those already categorised in the database.

Technical Implementation

The TeleTOP system is designed with a Lotus Notes Domino database. The use of this database gives the option for full Internet access. This means that the database is accessible with a simple Internet browser (like Netscape Navigator or Microsoft Internet Explorer) from anywhere in the world.

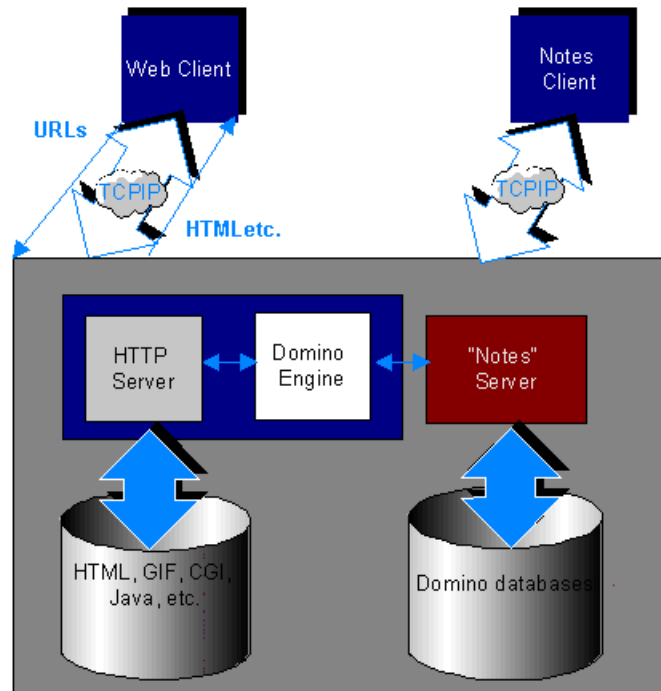


Fig. 4. Architecture of TeleTOP.

In this picture, the Internet browser is presented as a “Web client”. This Web client communicates to the database via the HTTP server, Domino engine and Notes Server. In this way, users (instructors and students) are able to store and retrieve content from the database. Only the designers of the TeleTOP environment have to use the Notes client. The Notes client interacts with the Notes Server. This client is used to design the database and the TeleTOP environment that is based on the database.

Notes

Because the appendices to this report have endnotes of their own, we have collected the endnotes at the end of the whole chapter, rather than after the main text as is more normal.

¹ Ministerie van Onderwijs, Cultuur en Wetenschappen, *Research voor Beleid: ICT in het hoger onderwijs, Een quickscan naar het gebruik van ict en Elektronische leeromgevingen in het Nederlandse hoger onderwijs* (Leiden, 2001).

² Tom Dousma and Frans de Zwaan, “E-learning in Post-Secondary Education in the Netherlands” (presentation, 7th OECD/Japan Seminar on e-Learning in Post-Secondary Education, Tokyo, June 2001).

³ SURFdiensten bv is 100% the property of the SURF Foundation. The SURF Foundation is also the most important and, as from 1 January 2002, the only shareholder in SURFnet bv. Until 1 January 2002, the other shareholder of SURFnet bv is KPN Telecom.

⁴ Based on SURFnet, <http://www.surfnet.nl/en/surfnet-organisation/>.

⁵ Ibid.

⁶ Bas Cordewener, SURF Educatief (2001).

⁷ Open Universiteit, *Verandering in Continuïteit* [Change in Continuity], a report by the chairman of the Executive Board (Heerlen, 1995).

⁸ Initially the participation of the University of Twente was received with some scepticism by the University Council and the faculties. This was mainly due to the high investments and the fact that the specific future tasks of the DU were not adequately defined. The central level decision-makers have now announced a "consultation round" with all persons involved in order to take away the scepticism and to enthuse staff to become engaged in the joint projects. This scepticism within the faculties is also seen at the other participating HEIs. Very often support centre staff, individual instructors and even deans of faculty were not participating in this process of developing the consortium.

⁹ There is no private funding involved

¹⁰ Betty Collis and Wim de Boer, "Scaling Up from the Pioneers: The TeleTOP Method at the University of Twente", *Interactive Learning Environments* 7, no. 2/3 (1999).

¹¹ This section is based on H. de Boer's *TSER-Project Higher Education Institutions and the National Economy* (Enschede: CHEPS, The University of Twente, 1999). See also Burton R. Clark, *Creating Entrepreneurial Universities* (Oxford: Pergamon, 1998).

¹² Ministry of Education, Science and Culture, *Meer Flexibiliteit in Hoger Onderwijs door Introductie Bachelor-Masterstelsel* (Den Haag, 2000).

¹³ Advisory Council for Science and Technology Policy (AWT), *Virtueel Hoger Onderwijs: Naar een Nieuwe Bedrijfstak in Nederland* (AWT, 2000).

¹⁴ S. van Tongeren. *Telematica in het Onderwijs*, Beleidsnotitie, Intern document (Enschede: Universiteit Twente, 1998).

¹⁵ Betty Collis, *WWW-Based Rapid Prototyping as a Strategy for Training University Faculty to Teach WWW-Based Courses* (Enschede, 1998).

¹⁶ Technical and educational research are undertaken to ensure on-going improvement of ICT.

¹⁷ Petra Fisser, "Using Information and Communication Technology: a Process of Change in Higher Education" (PhD thesis, University of Twente, 2001).

¹⁸ K. Slotman, *Activiteiten die Bijdragen aan een Professionele Leer-en Werkomgeving* (Enschede, 2001).

¹⁹ Ibid.

²⁰ Ibid.

²¹ In an interview with a representative of the *Beleids Bureau* (central policy unit), it became clear that, at this moment, the wireless campus concept is not one of the top priorities of the central level. The top priority seems to be the further development and implementation of the Professional Working and Learning Environment (PLW).

²² *UT News*, October 2001.

²³ Ger Tielemans and Betty Collis, *Strategic Requirements for a System to Generate and Support WWW-Based Environments for a Faculty* (Enschede, 1998).

²⁴ Fisser, "Using ICT".

²⁵ Tongeren, *Telematica*.

²⁶ Fisser, "Using ICT".

²⁷ Collis and de Boer, "Scaling Up".

²⁸ Lisa Gommer and Gabriëlle Visser, "Implementation of a Digital Learning Environment: the Real Results" (presentation, Webnet World Conference, Orlando, Florida, October 2001).

²⁹ A.B.M. Koppen et al., *C@mpus+: Naar een UT Brede Elektronische Leeromgeving* (Enschede, 1999).

-
- ³⁰ See Fisser, "Using ICT". It is important to note that during the summer of 2001, in the draft central ICT policy plan it is stated that these steering committees will be replaced by one new central Steering Committee; see S. van Geffen, *Concept Notitie Informatie – en Communicatietechnologie in het Onderwijs* (Enschede, 2001).
- ³¹ See TeleTOP, <http://www.teletop.nl/teletop.nsf/home/en/>. The Memorandum of Understanding was signed in November 2000. At this moment the implementation plan is still under consideration.
- ³² Betty Collis, "The University of Twente: Leading and Managing Change via a Web-Based Course-Management System", in *Leadership for the 21st Century*, ed. C. Latham and D. E. Hanna (London: Kogan Page, 2001).
- ³³ Betty Collis, "Implementing Innovative Teaching across the Faculty via the WWW", in *Proceedings of the 9th International Conference of SITE (Society for Information Technology & Teacher Education)*, ed. S. McNeil, J. Price, S. Boger-Mehall et al., 2 (Charlottesville, VA: AACE, 1998).
- ³⁴ Ibid.
- ³⁵ Tielemans and Collis, *Strategic Requirements*.
- ³⁶ Betty Collis and E.M. Gommer, "Stretching the Mold or a New Economy? Part 1: Scenarios for the University in 2005", *Educational Technology XLI*, no. 3 (2001); and Betty Collis and E.M. Gommer, "Stretching the Mold or a New Economy? Part 2: Realizing the Scenarios for the University in 2005", *Educational Technology XLI*, no. 4 (2001).
- ³⁷ Gommer and Visser, "Implementation".
- ³⁸ DINKEL plays a central role in the formulation of conditions of the design of courses offered through ICT. However the content of the courses is still the responsibility of lecturers and faculties themselves; the DINKEL institute does not interfere with these matters.
- ³⁹ Gommer and Visser, "Implementation".
- ⁴⁰ See The ECIU, <http://www.eciu.auc.dk/>.
- ⁴¹ University of Twente, *Financiele Jaarverslagen 1994–2000* (Enschede, 2000).
- ⁴² University of Twente, *Annual Reports 1995–2000* (Enschede, 2000).
- ⁴³ This fund does not exist anymore.
- ⁴⁴ Fisser, "Using ICT".
- ⁴⁵ Collis, "Leading and Managing Change".
- ⁴⁶ Geffen, *Concept Notitie*.
- ⁴⁷ DINKEL. *Naar een Professionele Leer-en Werkomgeving (PLW), Beleidsplan Dinkel Instituut, 2001-2005* (Enschede, 2000).
- ⁴⁸ Expansion of traditional undergraduate new entrants via PLW can be achieved by offering ICT-based education to those in the "new" categories. For example, one can think of offering distance education using TeleTOP, offering international students access to the virtual library, etc. Through the integration of all systems into a single-log-on portal, the UT hopes to attract more students. One cannot predict whether this is really going to happen, as competition is high in these markets and until now there has not really been a cohesive strategy.
- ⁴⁹ DINKEL, 2000.
- ⁵⁰ By "digitisation" we mean the digitisation of various libraries' catalogues. However, some materials (like magazines) are already offered online and some related initiatives are being developed.
- ⁵¹ Betty Collis and Jef Moonen, *Flexible Learning in a Digital World: Experiences and Expectations* (London: Kogan Page, 2001).
- ⁵² Faculty of Educational Science, University of Twente, internal memo, 2001; see also TeleTOP, <http://www.teletop.nl/>.