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Models of Technology and Change

In Higher Education

An international comparative survey on the current and future use of ICT in Higher Education

Edited by

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Report

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Executive summary

The aim of this study is to investigate which scenarios are emerging with respect to the use of ICT in higher education and how future developments can be predicted and strategic choices can be based on that. It seeks to answer the following questions:

- What strategic responses do institutions make with respect to the use of ICT;
- Which external conditions and developments influence these choices;
- Which external and internal conditions and measures are taken in order to achieve strategic targets;
- What are the implications for technology use, teaching and learning processes and staff?

The study applies an international comparative methodology and is carried out in the Netherlands, Germany, Norway, the United Kingdom, Australia, Finland and the USA. Data were collected through Web-based questionnaires tailored to three different response groups: decision makers, support staff and instructors. In total 693 persons responded to the questionnaire. This implies that between 20 and 50 percent of the institutions in the various countries responded (institutional data were also gathered), with the exception of the USA where the response was much lower.

The main conclusions of the study can be summarized as follows:

General conclusion 1: Change is slow, and not radical

Overall it seems that higher education institutions do not expect revolutionary change as a result from or related to the use of ICT. In general, there is not really a concern about being forced to change by external forces or developments. Rather, a "business as usual" approach is taken, without anticipating any real dramatic changes in mission, profile or market position. Nevertheless, institutions are gradually "stretching the mould"; they change their procedures and models as a process of change from within. These changes, however, are gradual and usually slow and may comply with the slight changes in needs and demands as perceived by the institutions.
Small changes between countries, however, suggest that institutions that have a clearer view on their mission with respect to serving different target groups (e.g. lifelong learning or international students) with ICT and on their position in that/those particular markets demonstrate higher levels of use of ICT.

General conclusion 2: ICT in teaching and learning: Widespread but part of a blend

ICT use, in terms of e-mail, word-processing, PowerPoint, and the Web, has become standard as part of the teaching and learning process. But this has not radically affected the nature of this process; rather, ICT has become part of the blend of on-campus delivery. This trend is seen in terms of ICT policy and objectives relating to ICT, as well as in the way that ICT use has been implemented into practice. In particular, Web-based systems are seen as valuable and leading to more efficient practices. This second main theme emerging from the study is related to the first: ICT use, in terms of email, PowerPoint, word processing and Web resources, has become commonplace, but in a way that only gradually is stretching traditional on-campus practices. The lecture

remains the "core medium", the instructional form, which is most highly valued. However, ICT has clearly become part of the blend, serving as a complement to already existing instructional tools.

General conclusion 3: Instructors: Gradually doing more, but with no reward

The third theme regards the instructors' role in the use of ICT, how this relates to their views on teaching and learning and on their actual workload and job satisfaction. Also here the "stretching the mould" theme is recognized. Overall, the instructor is still there, but doing more with technology with no particular reward. Instructors are less concerned/interested in/hopeful about technology than those not on the "front line" (the decision makers and support staff). Instructors are not particularly concerned about ICT, and not actually changing their ways of teaching even though they use ICT in different ways. Thus, the instructor is also "stretching the mould" with ICT use as part of daily practices. While there are no serious concerns about this, and a generally positive feeling about ICT's effect on personal work conditions and efficiency, there also are little or no systematic rewards to move instructors to do more than the gradual "stretching".

The findings of this survey are by and large consistent with the outcomes of various other international studies (see chapter 9). The general picture is that in most cases institutions are now transferring from a period of rich and mostly bottom-up experimentation to a phase in which institution-wide use of ICT is being encouraged. In many cases the first stage of institution-wide ICT implementation, i.e. the establishment of institution-wide technological infrastructure, is now in place. However, the second stage, i.e. rich pedagogical use of this infrastructure, is in many cases still in development. The third stage, which could be labelled as strategic use of ICT with a view to the different target groups of higher education, has in most cases not been considered explicitly yet.

Furthermore, it was concluded that in general institutions are still by and large focused on their traditional target group (high school leavers). The main challenge for both institutions and governments is now to develop more strategic policies on how ICT can be used for the different target groups that higher education is expected to serve in the knowledge economy in the 21st century. These target groups include traditional learners as well as lifelong learners from both within or outside the country. It should be explicitly understood that especially the new type of learners constitute an attractive market on which higher education institutions will find themselves in competition from both national and international, traditional and new providers.

Explicit policies at both institutional and governmental levels will be required considering the challenges ahead. For enhancing the on-campus learning experience, institutions need to improve and extent the actual (richer) pedagogical use of ICT. In order to further enhance flexibility next steps need to be made in terms of system development, integration, accessibility, user convenience, etc. But in particular the strategic use of ICT for the diversity of higher education target groups will require explicit policy development.

More concretely, institutions should develop a strategic plan relating to the relative importance to the institution of the different types of learners in the post 2005 period and should consider the corresponding technological architecture, tools and functionalities. The key feature here is a database driven system that allows easy tailoring and adapting of (portions of) courses to serve the needs of different groups of students.

1. Research Design

The development and implementation of information and communication technology (ICT) forces today's universities and colleges to respond to societal trends that point to a transformation of our society into a so-called 'knowledge economy' (Manuel Castells, 1996).

Globalisation and ICT applications place new demands on higher education establishments and hold important implications for their teaching and research functions, especially in light of the growing importance placed upon lifelong learning and upon more flexible forms of higher education delivery." (CHEPS Research Program, 2000).

1.1 Introduction

Building on previous joint research in this area[1], CHEPS (the Centre for Higher Education Policy Studies) and the Faculty of Educational Science and Technology[2] of the University of Twente in the Netherlands decided in 2001 to launch an international comparative study on Models of Technology and Change in Higher Education.

The project was co-funded by SURF (the support agency for technology in higher education in the Netherlands), the Bertelsmann Foundation, Germany and the Norwegian Ministry of Education.

The research team consisted of Prof. Dr. Marijk van der Wende (project coordinator) and Prof. Dr. Betty Collis, drs. Petra Boezerooy, drs. Wim de Boer, and Gerard Gervedink Nijhuis MSc. Assistance in data-analysis was provided by Anneke Lub and Rien Steen.

The outcomes of this study are meant to be relevant for higher education leaders, managers policy makers at institutional and national level, national agencies, technical and pedagogical support units, and HRM managers.

1.2 Rationales

From our own and also from many external studies, it has become clear that:

- Due to their changing environment (growing and diversifying demand for higher education, increasing competition and globalisation) higher education institutions have to define clear and comprehensive strategies for ICT and have to make

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1 Collis, B. & M.C. van der Wende (eds). 1999. *The Use of Information and communication Technology in Higher Education. An International Orientation on Trends and Issues*. Enschede: University of Twente.
Boezerooy, P., E. Beerkens, B. Collis, J. Huisman & J. Moonen (2001). *Impact of the Internet Project: The Netherlands and Finland* (Study of the HEFCE-UK).
Fisser, P. (2001). *Using Information and Communication Technology. A Process of Change in Higher Education.* Dissertation. Twente University Press.

2 Since October 2002, the Faculty of Behavioural Sciences

considered choices about the markets they can and wish to serve and by which type of technology use.

- The actual influence of these external conditions, however, is determined by the way in which the internal actors perceive the changes in their environment and by their ideas about the future.
- Moreover, there is a gap between vision and reality. Or that the "Virtual University" works in theory but not in practice (Pollock & Cornford, 2002). Many institutions are still struggling to overcome the "pioneer" or the "1000 flowers blooming" phase, while trying to move into a phase of more mainstream engagement.
- In order to be successful, indeed, the commitment of some dedicated individuals will not suffice; the institution itself must make a commitment (i.e. for support, resources and personnel) and has to develop a targeted implementation strategy.
- Finally, in order to progress both internally (involving more staff) and externally (better serving current and new students), we need to know more about the implications of technology use.

Building on these insights, the purpose of this international comparative project is to study factors that influence current models relating to technology use in higher education and which predict how institutions are likely to evolve, given their current conditions. Consequently, it explores the way in which higher education institutions perceive their changing environment in relation to their ICT strategies - i.e., which external factors are actually influencing the strategic decision-making of institutions in this area - and how they respond to these challenges. Furthermore, the study reviews how strategic responses translate into internal policies and implementation plans and what effect they are perceived to have on teaching and learning practices.

1.3 Objectives

The objectives of the study are to:

- Gain a further *insight* in and understanding of the institutional, policy-based responses and initiatives with respect to the use of ICT in higher education.
- Further develop and *test* four scenarios on strategic choices of HE institutions with respect to the use of ICT in their education functions.
- *Predict* the different strategic pathways that higher education institutions may choose with respect to the use of ICT in higher education and the critical conditions and implications at various levels that are related to them.

1.4 Research Questions

The central question for this study is*: Which scenarios are emerging with respect to the use of ICT in higher education and how can future developments be predicted and strategic choices be based on these scenarios?*

Sub-questions are:

1. What strategic choices do institutions make with respect to the use of ICT in response to these external conditions and developments and how do they view their future missions, profiles and market positions (e.g. changing demand and target groups)?
2. Which external conditions and developments (changing environment, e.g. increasing competition) influence the choice of higher education institutions (HEIs) with respect to the use of ICT and how are these perceived and analysed by key different actors?
3. What role does external collaboration play in achieving the strategic objectives (esp. links with business and industry and international links)?
4. Which internal conditions and measures are being taken in order to achieve the strategic targets (implementation strategy, role of central and de-central support units, staffing policy, etc.)?
5. What are the implications of the various strategic choices / models for:
    - Technology use, including course management systems
    - View(s) on teaching & learning (knowledge production and dissemination) and specific pedagogical models and dimensions
    - Time, workload and satisfaction of staff?

2. Conceptual Framework

The conceptual framework of this study consists of a model predicting the variables that will have an impact on an institution's ICT and educational delivery approach. Section 2.1 gives an overview of the clusters of variables in the model. Section 2.2 shows the model, and Section 2.3 indicates how the model was used to generate items for the survey questionnaire.

2.1 Predicting ICT and educational delivery scenarios

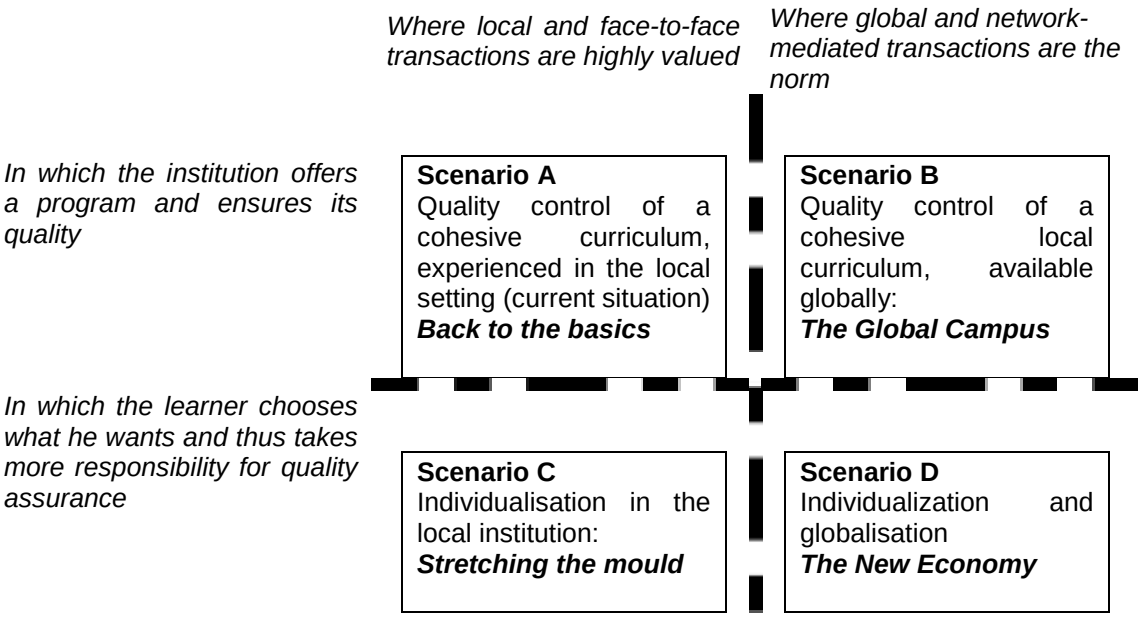
There are many variables involved in an institution's decision to offer its educational program in a certain way to its students. These variables form a complex system, where each variable has an influence on the others, and where new impulses are continually challenging the system to make new responses. Such a dynamic system is difficult to capture and study. For this research, variables will be looked at individually that in reality never appear in isolation but in combinations with other variables. A model to study variables that influence an institution's dominant approach to educational delivery and the use of technology in this delivery will be by definition incomplete and overly simplistic. However, key variables can be identified that repeatedly have been shown to have a major impact on policy, implementation, practice, effectiveness, and eventually on an institution's general approach. In this section, we begin with what we want to predict with such a model (the outcome variables), followed by five sets of variables that can be hypothesized to have some linear relationship with each other and with the general-approach outcome variables. Although this conceptual framework is based on literature, it will not be presented as a literature study. Except where a direct reference is specifically called for, individual references will not be cited in the text. Instead, a selected bibliography concludes the report, which can be used as a basis for exploring the rationale for the different sets of variables in the conceptual framework.

The outcome variables: ICT and educational delivery

Two main lines of change in educational delivery can be identified (Collis & Gommer, 2001; Collis & Moonen, 2001). One relates to the local vs. global issue. Should the university move toward strengthening itself as a home base for its learners, or move toward a future in which its students little or never come to the home campus, via strategies such as multinational partnerships, satellite campuses or distance education? What if the individual university decides to go alone? Can it compete? Will the big partnerships dominate client attention? Or will a swing *back to the basics* occur, as a backlash against failed attempts at globalisation if these should occur? A second line of development relates to the program and content to be offered. How should this be obtained, and offered to clients? As total programs? As individual courses? As portions of courses (modules, or learning events of different types) which can be combined in different ways? What if the *choose-your-own-combination* idea takes root, stimulated by competition for fee-paying professional clients? Can the local institution handle this sort of individualisation itself? Many different ways could be found to zoom in on key aspects of these developments and emerging contexts. Figure 1 gives one analysis (Collis & Gommer, 2001; Collis & Moonen, 2001).

Figure 1. Four scenarios for educational delivery (Collis & Moonen, 2001, p. 199)

Scenarios of the future in which flexible learning will be part of a setting …



Scenario A *Back to Basics* is the current dominant situation for many traditional post-secondary institutions. It is also the case that many universities are starting to experiment with distance participation in their established programs. This can lead to **Scenario B** *The Global Campus*. **Scenario C** *Stretching the Mould* relates to increased flexibility with or without changing the underlying pedagogical model within the institution. Many traditional universities are now moving toward some forms of *Stretching the Mould*, by offering more flexibility for participation within their pre-set programs. **Scenario D** *The New Economy* is the most radical; a systematic example of it does not yet seem to be available in most traditional universities and yet it is increasingly being seen as the way of the future.

These four scenarios have been studied in a variety of different contexts, including those of specific universities and also at the national and conceptual levels (see Collis & Van der Wende, 2002). It is useful to also apply them as dependent variables in the current research. They can be used as dependent variables for the current situation of the institution but also as predictions of where the institution is headed several years in the future, such as 2005. Although no institution will explicitly choose only one of the scenarios but rather will offer combinations of all of them in various degrees, it can still be useful to try to identify which scenario is most representative of the educational delivery in an institution, currently and in the future.

If the scenarios are taken as the product of many different pressures and decisions within the institution, what are main categories of such predictors?

Environmental conditions and settings

Every university operates in a particular environment. Features of this background can be taken as the baseline upon which any eventual decision about scenarios and educational delivery will take place. In terms of the institution, its history, its culture, and

its particular demographics have led it to adopt (perhaps implicitly) a particular mission for itself and a profile that distinguishes it from other institutions as well as markets it to its potential clients. The "mission and profile" of the institution will certainly be a key factor in its evolution toward one of the scenarios.

The profile of an institution is not only influenced by its history and demographics but also by its current leaders. Universities differ in the degree of centralized or decentralized leadership typical for decisions about ICT and educational delivery. Also, the unique characteristics of those in leadership positions in an institution have a clear impact on the operational scenarios. Thus "Leadership, internal power structure" is also an important background dimension in a university's change process with regard to educational delivery and ICT.

Students are the main clients of the university and directly or indirectly the main source of income. Their characteristics and needs steer the university in its programs and approaches. As more and more non-traditional students, such as working people, require new services from the university, their influence will be a substantial component on the change process. Parallel to them, the faculty in the institution are another critical variable affecting change. Instructors bring with them their own histories with respect to change and technology in teaching and learning which in turn influence their willingness or capacity to adopt new forms of educational delivery. Thus student and instructor characteristics both are critical baseline conditions for the choice of a dominant scenario for the institution, currently and in the future.

While the institution is shaped and constrained by its own characteristics, it is also directly influenced by the outside world. This can occur in many ways. The society in which the university is based will have its own standards and ideas relating to a "good education" which must be respected. The policy of the national government or of other agencies that accredit and fund the university form critical constraints on its operating decisions. Two main sets of external pressures are those (a) related to new competitors for the university in terms of its target market, its status, and its funding; and (b) also with respect to ICT, the general and unavoidable movement toward technology provision, such as via e-mail, Internet, and Web access, that is now becoming standard to society itself. All of these aspects: "Social aspects of good education", "Increasing competition", "Technology push", and "External policy" need to be taken as environmental conditions influencing the eventual choice of a dominant scenario for a particular university.

Policy/response

All of the aspects mentioned under "Environmental Conditions and Settings" come together in various ways to steer the current policy of the institution relating to educational delivery and ICT. Most institutions do not make an explicit policy decision relating to one of the four scenarios shown in Figure 1, but instead establish a number of intermediate policies relating to ICT. These intermediate policies relating to ICT can be based on increasing the efficiency of operations, increasing the quality or teaching and learning, enhancing the flexibility to various educational services and options for the students, enhancing cost-related payoffs, and increasing access opportunities to both traditional and non-traditional students. Together, this cluster of variables could be seen as "Type of Policy". We see it as a result of the environmental conditions in the institution.

Implementation
Given the environmental conditions of the institution, and the policies that reflect those conditions, the next step in moving toward a scenario can be called "implementation" aspects. These aspects relate to the provisions made available in the institution to support instructors and students in their use of technology. They also relate to incentives for instructors to embark on a technology-related change process. Policy dictates the sorts of technical infrastructure available, ranging from hardware access, software licensing, and network access to types of software applications available. The policy of the institution also dictates the types of flexibility in participation that can be offered to students. On another scale, the policy and environmental characteristics of the institution determine the sorts of new and external partnerships that the institution may commit to in order to carry out its mission and associated policy. Together these implementation aspects, taken as a consequence of environmental conditions and policy, suggest at least six "Implementation" clusters that will influence any eventual scenario for the institution. These clusters can be called "Instructor support", "Student support", ""Staff-related policies", ""New partnerships", "Software, hardware, and network infrastructure", and "Types of flexibility in terms of participation offered by the institution".

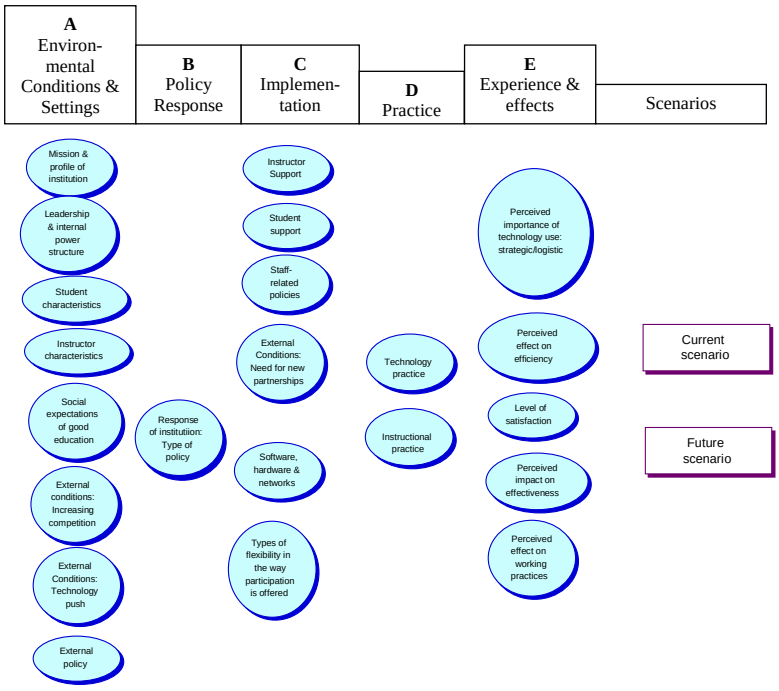
Practice
Even though an institution establishes various support structures or partnerships, it does not mean that they are all taken up into daily practice. Technologies may be available but little or never used. Instructional practice may or may not make use of technologies even if the institution supports these. Clearly, the combination of environmental characteristics, policies, and implementation support form an important precondition for use in practice, but use in practice is not an immediate consequence. Two clusters of variables related to use in practice, relating to technology practice and instructional practice, should also be included in a model predicting delivery scenarios.

Experiences and effects
The combination of environmental characteristics, policy, implementation support, and actual use in practice of technologies for educational purposes will lead to a perceived or verified set of results in the institution. These experiences and (perceived) effects will have an impact on the eventual commitment to a delivery scenario. A variety of different types of effects can be involved, such as the perceived importance of technology use on the strategic goals of the institution, the perceived effect on efficiency, the level of satisfaction, the perceived effect on institutional effectiveness, and the perceived effect on working practices. All of these should be taken into account.

2.2 The research model

Figure 2 combines the aspects discussed in Section 2.1 into a model that predicts clusters of variables that will have an influence on the current and future scenarios for ICT and educational delivery in an institution. The model should be seen as cumulative, from left to right. This means that the clusters in Column A are expected to predict those in Column B; the clusters in Columns A and B predict those in Column C; the clusters in Columns A, B, and C are expected to predict those in Column D; the clusters in Columns A, B, C, and D are expected to predict Column E; and finally all of the clusters in Columns A-E are expected to predict each of the variables in the Scenarios column.

Figure 2. Hypothesized model, clusters of variables predicting current and future scenarios for ICT and educational delivery



Data from a survey questionnaire will be gathered (Chapter 3) and used to test this model (Chapter 8). The data will also address the research sub-questions (Questions 1-4, primarily in Chapter 4; Question 5, primarily in Chapters 5 and 6) and to consider international comparisons based on the model (Chapter 7).

3 Methodology

3.1 Selection of countries, population and research instrument

The study applies an international comparative methodology, and aimed to include the following range of countries: the Netherlands, Germany, the United Kingdom, the United States of America, Australia, Sweden and Finland. The study applies a multi-level and multi-actor approach, addressing the various actors active at various levels within the higher education institutions (i.e. decision-makers, instructors, and support staff).

Given the model in Figure 2, a questionnaire was developed. Each of the clusters of predictor variables was analysed in order to determine a set of items that could identify different aspects of a cluster. In most cases, these items were asked in terms of two points of reference--current practice and predicted practice in the year 2005. In addition, items were developed for the dependent variables relating to the four scenarios for change shown in Figure 1. For each of the four scenarios, respondents were asked to describe the degree to which the scenario was like their own institution, currently and in the year 2005. The complete set of items was organized into three Web-based questionnaires (http://www.bsk.utwente.nl/cheps/ictsurvey/index.html), one for each of the three main actor groups focused upon in the research (decision makers, support staff, and instructors, see Appendices 3-5). Each of the three questionnaires contained a core set of common items relating to the nodes in the model shown in Figure 2. In addition, extra questions were added per questionnaire to reflect particular issues of interest to the individual target groups. These extra questions were not used in the model testing, but were used for investigation of the research sub-questions.

In principle, all higher education institutions in the various countries (including both university and non-university types of higher education institutions) were addressed. Only in the USA, was just a sample of (200) institutions approached. The institutions in the various countries were approached with the help of national contact persons or organizations (see Appendix 1). The addresses of institutional contact persons (usually ICT coordinators) were provided by the national contact organizations

The URL for the Web-based questionnaire was sent along with an introductory letter to these institutional ICT coordinators. In this letter, the institutional ICT coordinators were asked to:

- Provide general information on the institution (basic data).
- To distribute the questionnaire and the instruction letter for individual respondents to representatives of the three categories of respondents within their organization (i.e. decision makers, instructors and support staff).
- For decision-makers, they were advised to disseminate the decision-maker questionnaire to members of the executive board, and to all deans and directors of departments.
- For the instructors and support staff, they were encouraged to send the respective questionnaires to a random sample of 10% of these types of actors. Support staff included both educational support services and technical support services relating to ICT in teaching and learning.

3.2 Response

In total, 693 respondents submitted responses to the questionnaire. Their distribution over actor groups and countries was as shown in Tables 1-3:

Table 1: Distribution of respondents over actor groups

Actor groups	Number of respondents	Percentage of total response
Instructors	349	50.4
Decision makers	190	27.4
Support staff	154	22.2
Total	693	100.0

Table 2: Distribution of respondents over countries

Countries	Number of respondents	Percentage of total response
Germany	364	52.5
Norway	86	12.4
Australia	76	11.0
Netherlands	57	8.2
Finland	52	7.5
United Kingdom	31	4.5
USA	24	3.5
Miscellaneous	3	0.4
Total	693	100.0

The response analysis shows that instructors are the largest response group, which can be explained by the fact that coordinators were asked to disseminate the instructor questionnaire within their institution to approximately 10 instructors. On average, 2 instructors, 1.1 decision-makers and 0.9 support staff responded per institution. In total almost four people per institution. Furthermore more than half of the total number of respondents is German. As no precise number of the total population (per country) can be given, it is in terms of representativeness more interesting to look at the institutions at which the respondents work. In total these respondents represent 174 higher education institutions, which are spread as follows over the various countries (see also Appendix 2):

Table 3: Distribution of institutions over countries

Countries	Number of institutions	Percentage of total response
Germany	64	36.8
UK	27	15.5
Netherlands	26	14.9
Norway	17	9.8
USA	17	9.8
Finland	16	9.2
Australia	7	4
Total	174	100

This means that approximately 25% of the German institutions, 50% of the Dutch institutions, 20% of the Australian universities, 30% of all Finnish institutions, 50% of all

Norwegian institutions and 27% of the UK universities responded to the survey. As for the USA less than 1% of all institutions responded and only 8% of those addressed.

Apart from the USA, and looking at the diversity in the type of institutions that responded, this means that either the whole higher education sector or the university part of it is reasonably to well represented, except for the USA and Australia.
Obviously, the differences in the size of respondent groups, their spread over countries and the representation of the institutions per country have been taken into account when comparing between actor groups and countries (via weighted means). In chapter 7, where country comparisons will be made, it will be specified if certain statements concern the entire higher education sector or only the university sector of the country concerned.

3.3 Structure of the report

When the data were analysed, three main themes with associated conclusions consistently appeared in the results. The report will correspondingly present the outcomes of the study in a thematic way reflecting these three main themes and conclusions. In chapter 4-6, these main conclusions of the study are presented clustered around three themes:

(a) Change is slow, but moving toward more flexibility within the traditional campus-based setting (chapter 4);
(b) (b) ICT in terms of email and the Web are routinely used, including in traditional settings, as part of a new blend for teaching and learning, not as replacement for traditional ways of teaching and learning (chapter 5).
(c) (c) The instructor is working more because of ICT use, but with little institutional reward (chapter 6).

Chapter 7 addresses comparisons between countries and in chapter 8 the testing of the scenario model is presented. Finally, chapter 9 summarizes the main conclusions of the study and discusses them in terms of policy recommendations and questions for further research.

4. Change is slow, and not radical

The first overall conclusion that emerged from the overall data was the following

> Overall it seems that higher education institutions do not expect any revolutionary change as a result from or related to the use of ICT. There is not really a concern about being forced to change by external forces or developments. Rather, a "business as usual" approach is taken, without anticipating any real dramatic changes in mission, profile or market position. Nevertheless, institutions are gradually "stretching the mould"; they change their procedures and models as a process of change from within. These changes, however, are gradual and usually slow and may comply with the slight changes in needs and demands as perceived by the institutions. But the question is whether the perception of the institutions is adequate in all respects…

Below we will present the key data that illustrate the answers to the questions relating to the conclusions presented above.

4.1 Typical learning settings, educational norms and mission

Respondents were asked to indicate to what extent various typical learning settings occur in their institution at present and what they expect this to be in the year 2005. This question relates directly to the four choices of the scenario model (see chapter 2). Table 4 shows the overall results.

Table 4: Extent to which typical learning settings occur now and in the future

Typical learning setting (N=690)	**Now**	**Future**
	Mean (SD)	**Mean (SD)**
On-campus settings for course activities (“Back to the Basics”)	4.55 (0.75)	4.26 (0.80)
Many variations in where and how students participate in courses, but campus-based settings remain the basis (“Stretching the Mold”)	3.34 (1.21)	3.96 (0.95)
Many students are attending at a distance (“The Global Campus”)	2.05 (1.16)	2.80 (1.19)
Students use the home institution as a base but pick and choose their courses from many locations (“New Economy”)	1.85 (0.98)	2.81 (1.10)

1=little or none, 3=some, 5=very much the case

Table 4 shows that, in the eyes of the respondents, on-campus is and will remain the dominant learning setting. It also shows that campus-based variations are moving up to being somewhat the case. A modest amount of change is predicted to occur related to more radical change (more distance learning students and students taking courses from other institutions), but only parallel to the on-campus mode, not replacing it. This confirms the "Stretching the mold" scenario and the combination of traditional and new settings ("blended models", see 5), rather than the scenarios involving ICT replacing existing practices or radically changing the traditional models and roles in the institutions (The Global Campus and the New Economy scenarios of the model).

These views seem to be motivated first of all by the ideas (norms and values) of the actors with respect to what constitutes good education. Table 5 shows that face-to-face contact and direct communication with students are indeed valued very highly.

Table 5: Aspects contributing to good education

Aspects contributing to good education (N = 682-684)	**Mean (SD)**
Face to face contact	4.57 (.67)
Contact with the instructor when needed by the students	4.30 (.76)
Communication among students	4.14 (.86)
Pedagogy related to group work	3.86 (.96)
Appropriate use of ICT for teaching and learning support	3.83 (.89)
Time and place independent learning	3.30 (1.06)
Individualisation for different student characteristics	3.26 (1.03)

1=very little, 3=some, 5=very much

Secondly, these views may be linked to how the institution perceives its mission. Table 6 shows that as for their teaching function, institutions generally focus on teaching the traditional student group (18-24 year olds) and less on new target groups such as international students and lifelong learners, who usually require more flexibility in learning settings and thus a more intensive use of ICT.

Table 6: The importance of various aspects in the mission of the institution

Importance for mission (N=690)	**Mean (SD)**
Teaching 18-24 year olds	4.66 (0.77)
Innovation in teaching and learning	4.09 (0.96)
Externally funded research	3.97 (1.16)
Teaching international students	3.69 (1.17)
Interaction with business and industry	3.66 (1.20)
Internally funded research	3.44 (1.24)
Providing lifelong learning	3.36 (1.26)

1=Low, 3=Moderate, 5=High

4.2 Changing student demand, choice and flexibility

This traditional focus in terms of scenarios for change is further confirmed by the moderate scores that respondents gave on the extent to which changes in student demand are currently affecting the institutions' ICT policies. Some more influence is expected for the future and institutions seem to be generally aware that lifelong learners and international students will need more flexibility. Again, the demand for more flexible access from traditional students for on-campus courses is expected to be of more influence. But more generally, the scores (no major differences in the level of increase predicted between now and the year 2005) seem to indicate that this would not imply a change in the mission or general strategic orientation of the institution, but would rather be part of the "Stretching the mold" approach. Table 7 summarises a key question relating to impact of student demand.

Table 7: Effect of changes in student demands on current and future ICT-related policy

Changing demand (N=690)	**Now**	**Future**
	Means (SD)	Means (SD)
Flexibility in locations of learning	3.30 (1.11)	3.83 (0.93)
Flexibility in delivery of education	3.27 (1.12)	3.79 (0.97)
Flexibility in pace of learning	3.07 (1.07)	3.69 (0.97)
Lifelong learning	3.04 (1.20)	3.79 (0.93)
International students	2.99 (1.18)	3.52 (1.04)
Increased access for traditional students	2.90 (1.17)	3.40 (1.05)

1 = very little, 3 = some, 5 = very much

In addition to flexibility relating to location of participation, flexibility has also to do with the second dimension of the scenario model that concerns the extent of choice that students have in the curriculum. Table 8 shows that institutions offer on average only moderate choice: programs are in principle fully planned and only once students have entered the program may they have some level of choice (a type of flexibility from within).

Table 8: Extent of flexibility (choice) offered now and in the future

Extent of choice for students in the Curriculum (N = 677 N=645)	**Now**	**Future**
Fully planned programs, but within many choices for Students	38%	38%
Fully planned programs, some individual choices for students	31%	19%
Flexible programs, students can choose from a range of combinations	21%	28%
Fully planned programs, little or no individual choices for students	5%	2%
Programs are highly flexible, students can choose more or less own combinations	3%	7%

In most areas a slight increase is expected (notably in the use of different languages and in time and pace of study), but decreases are expected in some others. Overall one does not seem to expect that offering extensive flexibility in choice related to curriculum or methods of instruction will occur. Table 9 shows perceptions of the amount of flexibility available to students in terms of course-participation aspects.

Table 9: Flexibility options offered to students in terms of course-related aspects.

Types of flexibility: Options for… (N=501)	**Now**	**Future**
	Mean (SD)	Mean SD
Learning resources	3.31 (1.01)	2.87 (1.10)
Times for submitting assignments and interacting within the course	2.69 (1.14)	2.95 (1.15)
Topics of the course	2.69 (1.11)	2.58 (1.04)
Ways in which the course is experienced (face-to-face; group, individual, combinations)	2.59 (1.18)	2.48 (1.20)
Assignments required for the course	2.45 (1.05)	2.96 (1.02)
Orientation of the course (theoretical, practical)	2.29 (1.02)	2.46 (1.07)
Assessment standards and completion requirements	2.16 (.95)	3.16 (1.21)
Times for starting and finishing a course	1.91 (.98)	2.41 (1.13)
Language to be used during the course	1.80 (1.02)	3.68 (1.04)

1= no flexibility, 3= some flexibility, 5 = extensive flexibility

Table 9 shows that at present there is little substantial flexibility in the overall picture for course-related aspects of participation. These are typically aspects that the instructor can influence. In addition, support for flexibility can come more directly from the institution itself. Looking at the extent to which the various forms of flexibility are currently supported in the institutions, it seems again that no radical changes have been made as yet. All are occasionally available, but none even to the "some" level (table 10).

Table 10: Extent to which various types of support for flexible learning are currently available to students

Types of support (N=154)	**Mean (SD)**
Information about variation	2.89 (0.87)
Technology support outside the institution	2.59 (1.10)
Support for participating in courses with persons from other cultures	2.58 (1.13)
Support for choosing a personalized program of study	2.47 (1.05)
Variation in time and location of courses	2.34 (0.92)
Support for participation in other courses at other universities via the Internet	2.13 (0.96)
Financial aid for flexible learning	1.79 (0.83)
Support for taking examinations outside the institution	1.54 (0.73)

1=not at all, 3=some, 5=major feature

4.3 The role of external competition and cooperation

Besides the changing demand from students, competition from other higher education providers (both traditional and new types) could be an external force driving the ICT policy of an institution. Respondents were asked various questions about their competitors as well as about their partnerships for cooperation in the area of ICT.

Table 11 illustrates that no radical increase in competition has been experienced over the last five years. And that as far as competition is experienced at present, it is especially competition from the traditional higher education institutions, mainly those in the country itself that is perceived. Competition is expected to have only slightly more impact on the future ICT policies of the institutions in the year 2005. The role of cooperation is seen as slightly less important than competition, and is also defined especially within the national higher education sector itself. In fact, 67% of the "most successful forms of cooperation for your institution" were bilateral or consortium arrangements with other higher education institutions in one's own country. The importance of cooperation is expected to increase somewhat in the future, but certainly not dramatically. Again, radical changes are not occurring, or feared.

Table 11: Influence and role of competition and cooperation in ICT policies (N=690)

	Competition change compared to five years ago	**Influence of competition on current ICT policy**	**Competition on ICT future policy**	**Role of cooperation in current ICT policy**	**Role of cooperation in future ICT policy**
Providers	Means (SD)	Means (SD)	Means (SD)	Means (SD)	Means (SD)
National higher education institutions	3.78 (0.77)	3.44 (1.08)	3.87 (0.93)	3.24 (1.05)	3.80 (0.92)
Foreign higher education institutions	3.42 (0.74)	2.84 (1.14)	3.18 (1.07)	2.57 (1.06)	3.32 (0.99)
National business and industry	3.20 (0.74)	2.44 (1.02)	2.81 (1.08)	2.50 (1.05)	3.10 (1.10)
Foreign business and industry	3.00 (0.71)	2.17 (0.99)	2.46 (1.08)	1.92 (0.91)	2.55 (1.02)

1= Not at all, 3=some, 5=Very much/intensively

Finally, respondents were also asked to indicate to what extent external actors influence the institutional policy for ICT. Their answers indicate that only national governments (or the state level governments in federal countries) have some influence (3.22 and 2.59). Supra-national organizations were ranked as less important (2.05).

Thus the overall picture that emerges is one of "business as usual" but with gradual "stretching" of traditional ways of operation. This dominant theme in the data is also supported when the ways ICT are used in teaching and learning are examined more closely. This occurs in the next chapter.

5 ICT in teaching and learning: Part of a blend

The second dominant theme in the responses is that ICT use, in terms of e-mail, word processing, PowerPoint, and the Web, has become standard as part of the teaching and learning process. But this has not radically affected the nature of this process; rather, ICT has become part of the blend of on-campus delivery.

> The general picture seems to be that there is much ICT in use, not to replace traditional on-campus settings, rather to complement them. "Blended learning" using ICT (especially Web-based systems) combined with lectures, books, and other traditional media and ways of teaching is already the norm.

This trend is seen in terms of ICT policy and objectives relating to ICT, as well as in the way that ICT use has been implemented into practice, the ways ICT is actually being used as part of a blend, and the perceived effectiveness of its contribution.

5.1 ICT policy and objectives

The fact that ICT use is common relates to the policy of the institutions. Respondents indicate that 97% of the institutions have a formally stated ICT policy. In 54% of the cases this is a combined bottom-up and top-down type of policy: there is an institutional wide-ICT policy that serves as a framework for faculty-specific plans. In 19% of the cases the policy is bottom-up: faculty or department-levels formulate the ICT policy with no link to the institutional-level decision-making. In only 9% of cases, is the policy characterized as only top-down: an institution-wide policy to be implemented in all faculties. In the remaining cases, respondents were not aware of the nature of the policy (15%) or there was no policy (3%).

As for the objectives of the ICT policies of the institutions, quality improvement is prominent. In addition, the main objectives are related to the status, reputation and competitive position of the institution and to increasing flexibility. The previous chapter showed that ICT policies are indeed somewhat affected by the changing student demand, but not too much. This is again confirmed here (Table 12), in terms of a rather weak focus on new target groups.

Looking at which activities in the institution actually involve the use of ICT at present, it seems that ICT is especially linked to innovation in teaching and learning, which may well be related to the main objective of quality improvement. Furthermore table 13 again confirms that both at present and also in the future, the institutions are mainly focused on teaching the traditional student group. However, in the future, more focus is on teaching international students and providing lifelong learning.

Table 12: Main objectives of the ICT policies

Objectives of ICT policy (N=690)	**Now**	**Future**
	Mean	Mean
Enhancing quality	3.97 (0.93)	4.25 (0.82)
Enhancing status and reputation of the institution	3.87 (1.02)	4.27 (0.82)
Enhancing flexibility	3.76 (0.96)	4.13 (0.84)
Enhancing competitiveness	3.67 (1.09)	4.07 (0.91)
Increasing efficiency	3.63 (0.92)	4.04 (0.85)
Widening access to traditional students	3.33 (1.11)	3.67 (0.98)
Enhancing cost-effectiveness	3.19 (1.10)	3.75 (1.04)
Creating opportunities for life long learning	3.17 (1.13)	3.70 (0.98)
Creating opportunities for international students	3.07 (1.14)	3.57 (1.04)
Generating institutional income	2.45 (1.20)	3.34 (1.15)

1=none or low, 3=some, 5=High

Table 13: Extent to which current and future activities involve the use of ICT

Activities which involve use of ICT (N=690)	**Now**	**Future**
	Mean (SD)	Mean (SD)
Innovation in teaching and learning	3.41 (1.07)	4.10 (0.83)
Externally funded research	3.22 (1.25)	3.73 (1.06)
Teaching 18-24 years old	3.16 (1.02)	4.12 (0.85)
Internally funded research	3.03 (1.20)	3.45 (1.13)
Interaction with business and industry	2.81 (1.21)	3.49 (1.12)
Teaching international students	2.72 (1.14)	3.61 (1.09)
Providing lifelong learning	2.68 (1.19)	3.77 (1.09)

1=Low, 3=Moderate, 5=High

5.2 Implementation: the role of leadership and communication

Both decision makers and support staff were asked to indicate to what extent they consider their institution as being successful with regard to the overall use of ICT. The responses show that this success can be seen as average (mean = 3.38, SD=0.90), although decision-makers value the success somewhat higher than the support staff.

The fact that ICT has become part of the blend in traditional delivery is also related to the way that ICT policy has been implemented in the institution. Various actors play a role in the implementation of ICT policy in an institution. The ways in which they interact, e.g. take responsibility, show leadership, divide tasks, and communicate with each other, are important for the success of implementation processes. Decision-makers indicate that in almost half of the cases rectors have the formal responsibility for the ICT policy; in all other cases this responsibility has been decentralized. They also indicate that in the actual implementation of policies the central level is much less important. This is confirmed by data concerning the leadership taken in the implementation process (table 14). According to the total group of respondents, instructors and support staff are the most important actors in this respect (table 15).

Table 14: Formal responsibility and importance in implementation of ICT policy (as reported by decision makers; percentages of sample reporting)

Roles of actors (N=184)	Formal responsibility	Importance in implementation
Rector	47%	16%
Heads of departments	20%	20%
Deans	14%	12%
Support centre	8%	17%
Individual prof/instructor		27%
Other	11%	8%
Total	100%	100%

Table 15: Leadership of actors in the development and implementation of ICT policy (as perceived by all respondents)

Extent of leadership shown by actors (N = 690)	Mean (SD)
Professors or instructors	3.91 (1.04)
Support centre	3.49 (1.21)
Heads of departments	3.27 (1.09)
Rector	3.08 (1.26)
Deans	2.83 (1.16)

1=weak, 3=moderate, 5=strong

5.3 Technology use, teaching & learning practice

ICT as part of a blend, gradually stretching the traditional ways of teaching and learning, is clearly established. The general level of technology infrastructure in the institutions is valued as between average and high. The available technology is used more often for organisational purposes (including course preparation) and outside classroom activities than for communication and in-classroom activities (table 16). Furthermore, it seems that the use of e-email and the use of Web resources is becoming a common phenomenon in the educational practice, whereas other ICT forms, such as wireless solutions and conferencing tools, are used little or in a much more limited extent (table 17).

Table 16: The extent to which ICT is used within the institution

Extent of ICT used (N=690)	Mean (SD)
Course preparation or organisational purposes	3.80 (0.98)
Via a Web environment used outside of classroom activities	3.63 (1.06)
For communication with and among students and instructors	3.07 (1.11)
In classroom activities	3.04 (0.95)
For a combination of classroom activities and Web activities outside classroom	2.83 (1.17)

1=rarely, 3=some, 5=extensively

Table 17: The extent to which technologies influence actual teaching practice

Influence of technologies on teaching practice (N=690)	Means (SD)
E-mail systems	3.94 (1.08)
Web resources	3.90 (0.96)
Web-based course management systems	2.53 (1.29)
Planning tools, such as network-accessible agendas	2.32 (1.15)
Externally available courses or modules, accessible via the Web	2.13 (1.09)
Conferencing tools (video, audio, chat)	2.00 (1.07)
Wireless solutions	1.77 (1.00)

1=very little, 3=some, 5=very much

Looking at the actual use of the various available tools and applications other than e-mail and Web resources (table 18) we can observe that most options are used only to a very limited extent (between "uncommon" and "somewhat"). Most popular (but only scoring just above "somewhat") are presentation tools (PowerPoint etc.), personal bookmark collections and database tools.

Table 18: The extent to which support staff estimate that the following technologies are being used within the institution

Tools used (N=132-148)	Mean (SD)
Information presentation tools	3.53 (1.19)
Personal bookmark collections	3.37 (1.37)
Database tools	3.08 (1.15)
Authoring tools	2.74 (1.15)
Course planning tools	2.63 (1.15)
Newsgroups	2.58 (1.13)
Course management systems	2.52 (1.26)
Instructional design tools	2.52 (1.21)
Testing tools	2.21 (1.01)
Tools for analysis and tracking student performance	2.20 (1.17)
Chat	2.19 (1.11)
Groupware	2.17 (1.10)
Whiteboards	2.13 (1.14)
Tools for on-line marketing	1.95 (1.01)
Desktop video conferencing	1.70 (0.86)

1=very uncommon, 3=somewhat, 5=very common

Table 19 shows that these types of rather basic use of available ICT options are usually focused on supporting the also basic processes of students writing reports, and instructors transferring knowledge (e.g. oral presentation or reading materials). All other instructional orientations are also used, but less often. It is interesting to see that the use of testing and other formal assessments still is not supported much through the use of ICT, although many software solutions are available on the market (table 19).

Table 19: The extent to which ICT is used to support certain orientations in a typical course

ICT used to support (N=347)	Mean (SD)
Students producing/creating reports and products using ICT tools	3.58 (1.32)
Knowledge transfer	3.57 (1.16)
Providing feedback on assignments	3.33 (1.30)
Skill development	3.23 (1.27)
Re-using materials made by someone else or found elsewhere (appropriate re-use, not plagiarism)	3.19 (1.27)
Connecting to prerequisite knowledge	3.19 (1.27)
Developing positive attitudes towards the discipline	3.05 (1.28)
Students planning their own learning processes	2.77 (1.28)
Giving guidance / Informally monitoring progress and effort	2.74 (1.30)
Motivating on-going participation	2.71 (1.30)
Offering access to course activities via the Web?	2.71 (1.30)
Giving feedback after formal assessments	2.65 (1.30)
Testing and other formal assessments	2.04 (1.15)

1=rarely, 3=some, 5=extensively

Table 20 confirms again that face-to-face interaction and direct communication between instructors and students and among students is still very important in the way in which instructors teach. ICT is used in a way that is complementary to this, but does not replace what traditionally has occurred in the teaching and learning process.

Table 20. Overview of how instructors teach their courses

Features	Mean (N=347)			SD
How much interaction with the instructor occurs in the course?	Very low amount	4.08	Very high amount	.89
How much interaction among the students occurs in the course?	Very low amount	3.73	Very high amount	.89
With what type of knowledge does the course deal?	Stable knowledge	3.07	Newly emerging knowledge	.90
How are the learning materials used in the course acquired?	All predefined/ acquired by the instructor	2.80	All found or created by the students	.94
Does the course involve the appropriate re-use of materials made by someone else or found elsewhere?	Not at all	2.78	Very much	.98
How does the student participate in the course?	individually	2.65	As part of a group	.86
How much of the course is Web-based?	None	2.54	Entire course is Web-based	1.19
How does the student communicate within the course?	face to face	2.22	Only via the computer	.85

5.4 Perceived effectiveness

The perceived effectiveness of the use of ICT to support teaching and learning is between neutral and positive (M=3.56, SD=0.76). There were no significant differences found between the actors in this perception. Instructors are generally quite positive about the freedom they have to make choices in the way they use ICT. They seem to feel quite comfortable and confident about their own use, but at the same time they indicate that there still is scope for improving the ways in which they use it. Table 21 summarises some aspects of instructors' perceptions. More are discussed in the following chapter.

Table 21: Perceived impact of ICT on learning effectiveness according to instructors

Perceived effectiveness (N=347)	**Mean (SD)**
I feel I can make my own choices with respect to when and how I use ICT in my teaching-related work.	4.07 (0.88)
I feel comfortable and confident about my use of ICT for teaching-related work.	3.93 (0.98)
The use of ICT is becoming a normal part of the way I do my teaching-related work.	3.74 (1.08)
Using ICT is facilitating new forms of learning in my courses.	3.57 (1.07)
My students are satisfied with the learning value of the use of ICT in my courses	3.46 (0.84)
I am satisfied with the results of using ICT in my courses	3.44 (0.97)
My students are satisfied with the ease of use of ICT in my courses	3.33 (0.90)
I am satisfied with the way I use ICT in my teaching	3.28 (1.04)

1=very negative, 3=neutral, 5=very positive

In conclusion**,** the second main theme emerging from the study is related to the first: ICT use, in terms of email, PowerPoint, word processing and Web resources, has become commonplace, but in a way that only gradually is stretching traditional on-campus practices. The lecture remains the "core medium", the instructional form that is most highly valued. However, ICT has clearly become part of the blend, serving as a complement to already existing instructional tools. This notion of core and complementary media (Collis & Moonen, 2001) relates to the idea of blended learning, with ICT now clearly part of the blend.

Table 21 showed instructors to be generally neutral to somewhat positive about some aspects of their ICT use. In the next chapter, the instructor perspective is examined more closely.

6 Instructors: Gradually doing more, but with no reward

This chapter is concerned with the questions regarding the instructors' role in the use of ICT, how this relates to their views on teaching and learning and on their actual workload and job satisfaction. The "stretching the mould" theme is also seen in these responses.

Overall, the instructor is still there, but doing more with technology with no particular reward. Instructors are less concerned/interested in/hopeful about technology than those not on the "front line" (the decision makers and support staff). Instructors are not particularly concerned about ICT, and not very much changing their ways of teaching even though they use ICT in different ways.

6.1 Available experience and support

Instructors were asked how much experience they have in using ICT in their teaching. They indicated that on average this is somewhat occasional (M=3.60, SD=1.10). Instructors also said that the use of ICT in their teaching had led to some change in their teaching (M=3.31, SD=1.08)[3].

Instructors, the ones actually using ICT in their teaching and learning, consistently view ICT-related aspects less positively than those not on the "front line" (decision makers and support staff. This can be seen in perceptions of how much support is available. The overall results for types of support offered to instructors are displayed in table 22. However, when analysed separately for each of the three sets of respondents, instructors have a significantly less positive view than the other two groups. The level of support for instructors with respect to the use of ICT for teaching purposes in the institutions is valued as average (M= 3.03, SD=1.06), where instructors are a little more critical (M=2.92, SD=1.08) than managers and support staff (M=3.1) about this level of support. These differences in perception between the instructors and the others are statistically significant ($p<.05$).

Table 22: Extent to which various types of support are available for instructors

Available types of support (N=503)	**Mean (SD)**
An ICT technical unit or help desk	3.64 (1.13)
Materials made available via the Web	3.54 (1.01)
Short courses or workshops	3.35 (1.17)
Handbooks for self-study, or other printed reference material supplied by the institution	3.17 (1.11)
A pedagogical-support unit	3.05 (1.40)
Special projects to stimulate ICT use	3.07 (1.23)

1=not at all, 3=some, 5=major feature

[3] As in the previous chapters, all results are based on responses to a five-point scale, with 1 being least positive and 5 most positive.

6.2 Efficiency

All response groups were asked to indicate how they perceive the impact of ICT use on the efficiency of teaching activities in their institution. In addition, instructors were asked to what extent ICT has increased their personal efficiency in the performance of various tasks.

The overall impression of the respondents about the impact of ICT on the efficiency of teaching activities is positive (M=3.63, SD=.85). However, for the support staff (M=3.73) and decision-makers (M=3.71) the impact is valued as significantly more positive compared than the opinions of the instructors (M=3.54, t=-2.20).

As shown in table 23, instructors perceive that they have become more efficient in all tasks, especially in finding resources, via their use of ICT.

Table 23: Extent to which instructors have become more efficient by using ICT (instructors' perceptions)

Tasks (N=326-331)	**Mean (SD)**
Finding resources to use in my courses	4.16 (0.85)
Managing administrative data about my students	3.79 (0.96)
Doing routine tasks relating to my teaching	3.75 (0.96)
Doing tasks relating to planning and managing my agenda in general	3.57 (0.96)
Giving feedback	3.50 (0.96)

1= much less efficient, 3=neutral, 5=much more efficient

6.3 Satisfaction and work load

Respondents indicate that the level of satisfaction among personnel in their institution with respect to their working conditions related to the use of ICT is slightly positive (M=3.23, SD=.95, N=656). There are no significant differences between actors in this perception. Respondents also indicate that the impact of ICT on general working practices in their institutions over the last two years is rather positive (M=3.73, SD=.77, N=654). All actors value the impact at a positive level and there are no significant differences between actors in this perception.

Instructors were asked to indicate how they feel about the amount of time they need to perform specific (ICT-related) duties in their current situation and in the near future. Table 24 shows their responses for both the current and the expected future situation. It seems that instructors are more or less neutral about most issues. However, feelings of annoyance are still predicted in terms of being bothered by technical problems, even in 2005. Again, the perception is of a generally non-complaining level of feeling.

Table 24: Feelings about the amount of time to perform typical instructor's duties

Duties	**Current**		**2005**	
	N	Mean	N	Mean
Dealing with e-mail	326	3.56 (1.25)	301	3.42 (1.35)
Learning to use new technology	324	3.21 (1.07)	300	3.30 (1.06)
Using a course-management system	295	3.02 (0.90)	292	3.33 (0.97)
Responding to unexpected interruptions	307	2.73 (0.99)		
Solving technical problems	323	2.65 (1.14)	299	2.97 (1.11)

Note. Future feeling about 'responding to unexpected interrupts' was not asked.
1=I am very annoyed by the time needed, 3= Neutral (or not applicable), 5=I am very satisfied about the time needed.

6.4 Staffing policy

Staffing policy in an institution can play an import role when introducing and using ICT in education. When instructors know that using ICT counts towards promotion and tenure or that using ICT is an integral part of regular staff assessment then these will be strong incentives for them to use ICT or to use ICT for more than complementary support for traditional core practices. External quality assurance exercises can also force the use of ICT in education. Management can influence the use of ICT in education by using ICT competencies as criteria for selection and recruitment of new staff, by forcing professionalisation in ICT competencies, by financial incentives, and by declaring ICT use in education mandatory. In table 25 an overview is given of the responses of the various actors about the presence of such policy incentives.

Table 25: The role of ICT in staffing policy, compared by actors' views

Role of ICT use in staffing policy	**Overall (N = 632-659)**	**Decision makers (N = 174-183)**	**Instructors (N=324-328)**	**Support staff (N=141-147)**
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
ICT competencies are systematic criteria for selection and recruitment of new staff	2.60 (1.16)	2.85 (1.12)	2.50 (1.19)	2.51 (1.11)
ICT use in education is part of regular external quality assurance exercises	2.23 (1.14)	2.32 (1.15)	2.17 (1.16)	2.26 (1.08)
ICT use in education is an integral part of regular staff assessments	2.04 (1.11)	2.06 (1.06)	2.02 (1.17)	2.05 (1.05)
Professionalisation of staff in ICT competencies is mandatory	1.94 (1.13)	2.02 (1.13)	1.86 (1.12)	2.01 (1.14)
ICT use in education counts towards promotion and tenure	1.93 (1.08)	2.00 (1.06)	1.84 (1.06)	2.06 (1.14)
Financial incentives to individual staff are provided for development of ICT use in education	1.91 (1.13)	2.14 (1.21)	1.73 (1.08)	2.04 (1.08)
ICT use in education is mandatory	1.85 (1.18)	1.96 (1.26)	1.77 (1.16)	1.89 (1.11)

1 = Not at all, 2 = a little, 3= some, 4= much, 5= very much

In general it shows that ICT use plays only a modest role in institutions' staffing policy (M<=2.6) and is often only valued as having little to no (M<=1.94) role. This result shows that using ICT in education is not a major issue in staffing policy in most institutions and consequently that the necessary incentives and reward for staff are lacking.

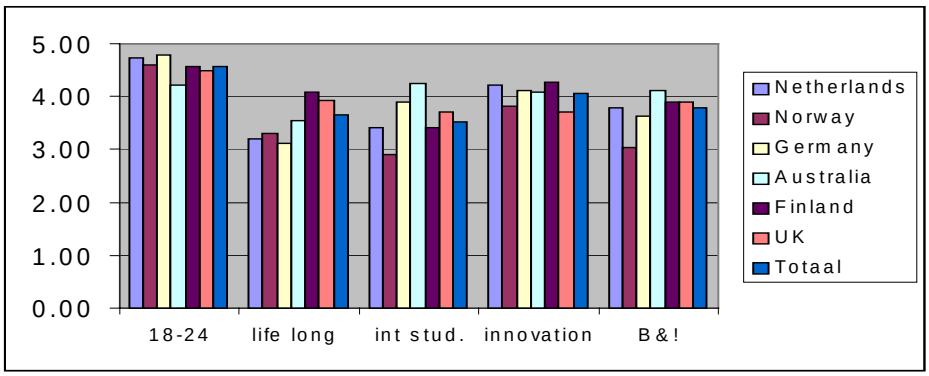
It should also be noted that to all questions except the one on the effect on promotion and tenure, decision-makers are significantly more positive than support staff and instructors in terms of perception of policy incentives for ICT use. To all questions the instructors are significantly more negative than decision-makers and support staff.

Thus, the instructor is also "stretching the mould" with ICT use as part of daily practices. While there are no serious concerns about this, and a generally positive feeling about ICT's effect on personal work conditions and efficiency, there also are little or no systematic rewards to move instructors to do more than the gradual "stretching". Also, instructors--the ones on the front line of actual ICT use--are less impressed about it than those not on the front line. Consistently, instructors have significantly lower perceptions than the decision-makers and support staff in their institutions as to the support and incentives for ICT use. This will be further shown in Chapter 8. Next, however, a comment about country comparisons on these three main themes of the results will be given.

7 Comparisons between countries: More alike than different

Throughout the responses, and particularly in terms of the three main conclusions of the study, the *differences between the countries are generally minimal*, which probably can be explained by the selection of countries. Although sometimes the differences may be statistically significant, the country scores generally cluster quite closely around the overall mean. For example, Figure 3 illustrates how little countries differ with respect to the missions of their higher education institutions. In all countries the mission statements mainly focus on the traditional student body, with some variation for instance for Australia in the area of international students. These differences should not be over-interpreted, however; the overall similarities are more dominant than the between-country differences.

Figure 3: The importance of various aspects in the mission statements of the institutions



1=low, 3=Medium, 5=High

From our preliminary analysis of country differences is has also become clear that there are *no* general trends in terms of certain countries being consistently higher or lower across *all* variables. Therefore, we looked at whether countries score substantially (within 0,5 SD of the lowest and the highest country score) higher or lower than others within certain clusters of variables.

This method of analysis produced a set of approximately 20 variables on which substantial differences occurred. An overview of the highest and lowest scores of the various countries on these variables was carried out. The general picture is that Germany, Norway and the UK most often demonstrate the lowest scores. The Netherlands and Australia have a more mixed profile of both low and high scores. Finland and the North-American institutions that responded consistently demonstrate the higher and highest scores on the variables for which substantial differences could be determined. These results will be worked out below in the form of country profiles.

Germany

On many variables for which substantial differences between countries could be determined, Germany demonstrates the lowest score, or is among the lowest. This refers first of all to the current use of ICT options and tools, the extent to which ICT influences the general teaching practice and the support that is available for instructors in doing so. Second, this applies to the flexibility that is currently offered to students. Moreover, German institutions have among the lowest expectations with respect to the effects that

changing student demand will have on the necessity to offer more flexibility in the future. Third, in Germany distance learning is seen least as the typical learning setting now and in the future. Fourth, Germany is among the countries that score lowest on the importance attached to serving lifelong learners now and in the future and the effect that this type of demand may have on ICT policy. The difficult situation in German institutions is further explained in terms of deteriorating overall conditions and uneven and mostly re-active rather than pro-active change in the report on the specific German analysis (Lütke-Entrup *et al*, 2003).

Norway

Norway demonstrates the lowest scores on the use of ICT in typical courses, on the extent to which ICT influences the general teaching practice and on the flexibility that is currently offered (apart from flexibility in teaching language on which score are among the highest). Furthermore, Norwegian institutions are among the most sceptical concerning the contribution that an appropriate use of ICT can make to good education. They are also quite sceptical about the effects on ICT policy that changing demands from lifelong learners and international students may have. This is consistent with the low scores on the importance of serving these two target groups as part of the current mission of the institutions. With respect to lifelong learning, this is surprising considering the national policies that strongly linked ICT use to this clientele. The Norwegian case studies carried out in the context of this study indeed pointed to a gap between policy intentions and policy outcomes in this area (Maassen & Stensaker, 2003). In terms of their mission, the Norwegian institutions have the highest score on the importance of internally funded research and score lowest on interaction with business and industry. Probably related to the latter, they also present the lowest score on the expectations for the role of national cooperation in the area of ICT.

The United Kingdom

The UK institutions report comparatively high scores on the use of ICT in typical courses, although the actual range of ICT options and tools used seems relatively low. Scores for various types of flexibility offered (including teaching language) are among the lowest and there are no very high expectations for the future in this respect. This seems to be related with the low scores on the effects expected from changing student demand (lifelong learning or international students) and of the contribution that appropriate ICT use can be make to good education. It is well understood that international students are an important target group of UK institutions, but apparently this is perceived as an on-campus activity in traditional face-to-face learning settings, rather than by using ICT or distance learning options. Finally, the UK institutions are among the least concerned about foreign competition and thus demonstrate among the lowest scores on the effect of this on their ICT policies.

The Netherlands

The Dutch institutions have comparatively high scores on the extent to which ICT influences general teaching practice and the support that is provided to instructors in using ICT. The main motivation seems to be the quality rationale: a high expectation concerning the contribution that appropriate use of ICT can make to good education. The low scores with respect to the role of distance education as a typical learning setting at present and in the future indicate that this quality perspective is confined to the face-to-face learning setting. The amount of flexibility offered at present is moderate (except from teaching language flexibility), but one expects this to increase in the future. A strategic orientation on diverse target groups for whom ICT could be useful is still weak.

The Netherlands has among the lowest scores for the importance of serving lifelong learners in the current mission of institutions and on the effect of lifelong learner demand on current and future ICT policy. Using ICT for serving international students is only moderately important at present, with somewhat higher scores for the future.

Australia

Australian institutions have among the highest scores for the extent to which ICT influences general teaching practice, with a highest score on the actual range of ICT options and tools that are used. However, there are no substantially high or low scores concerning the flexibility offered, expect for low flexibility with respect to teaching language. But with English as the lingua franca this does not hinder the Australian institutions in having an extremely explicit international orientation in their ICT policies. Teaching international students has the highest score (way above all other countries) in terms of the importance that it has for the mission of the institutions. Australia also has the highest score on the effect of the international student demand on current ICT policy and among the highest scores for this effect in the future. Furthermore, the Australian institutions have among the highest scores for the role of foreign cooperation in the current and future ICT policy. Lifelong learners as a target group that could benefit from ICT options is much less pronounced: among the lowest scores for now and the future.

Finland

Finnish institutions present the highest scores on the largest range of variables. First with respect to the extent to which ICT influences general teaching practice, on the actual use of various options and tools and on the support offered to instructors. Second, highest scores are found on different types of flexibility offered (including teaching language) and on the increase in these for the future. This seems related to the high scores on the expected effect of changing student demand on required flexibility in the future. Third, highest scores were found on the extent to which distance education is seen in Finland as a typical learning setting now and in the future. Fourth, lifelong learning and ICT seem closely related concepts in Finland. Highest scores are reported on the importance of teaching lifelong learners in the mission of the institutions and on the current and future effects of their demands on ICT policy. Finnish institutions do not have a strong mission with respect to international students, but are most aware of their international context. Highest scores were found for the effects of foreign competition in the future and for the role of foreign cooperation in both current and future ICT policies.

USA

Unfortunately, the number of institutions that responded from the USA is far too limited to allow for any general conclusions in terms of a country profile (see also section 3.2). The few institutions that responded indicate a picture that is to a large extent comparable to the four clusters of high scoring variables that were reported above for the Finnish institutions: High levels of use, support, flexibility, high acceptance of distance education and a strong commitment to lifelong learning. They are, however, very different from the Finnish profile with respect to their international orientation. Foreign competition is not feared and international cooperation is not seen as important at all (but national cooperation is). In contrast to the Australian institutions, the American institutions report that teaching international students is not important. This is surprising, as the USA is the main importer of foreign students in the world. This odd fact may be related to the particular profile of the few responding institutions, or to the possibility that ICT use is not associated with serving foreign students (a low effect is indeed expected from their

demand on ICT policies). Foreign students may just be expected to take part in the on-campus experience (like in the UK).

Notwithstanding the fact that the countries included in this study demonstrate in general more similarity than difference and that the differences between high and low scores are usually quite small, the country profiles based on clustered high/low scores provide some additional and useful insights into the accents that countries put on certain aspects of their ICT policy and in the ways they differ in their orientations on the ICT agenda.

A general conclusion that can be drawn from these profiles is that a crucial difference seems to exist between the countries with higher scores and those with lower scores related to their views and expectations with respect to the diversifying student population. Institutions in countries with comparatively higher scores related to change and ICT use have a clearer view on their mission with respect to serving different target groups (e.g. lifelong learning or international students) with ICT and on their position in that/those particular markets than the institutions in countries with lower scores. The fact that the former are aware of and responding to changing demand from these new target groups and that they have a strategic commitment to being successful in these markets seems to be a major drive for change in these institutions.

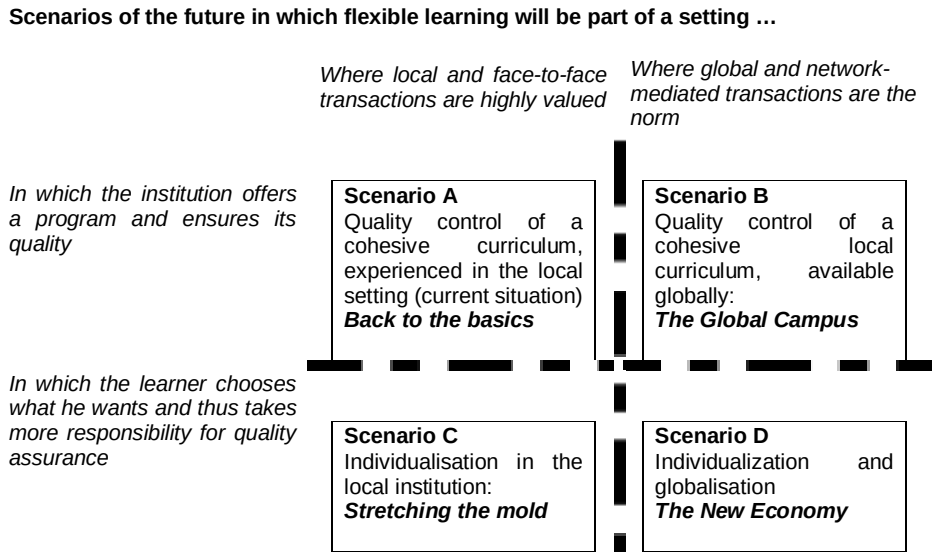
A more elaborate context to these “snapshot profiles” can be found in country reports that were produced in parallel, some as a part of this project. These will be published early in 2003 (Van der Wende & Van der Ven, forthcoming).

Obviously, much larger differences could be found if the countries included in this survey, which all belong to the forefront developers of network-supported-learning, were compared for instance with developing countries (Bates, 2001). Results of a recent survey on online learning in Commonwealth countries illustrate these much more diverse profiles (Observatory of Borderless Education, 2002). Still, the general conclusions of this survey do certainly not refute the overall findings of the Borderless Education study (Middlehurst, 2003) (see also chapter 9).

8 Testing the model: From Basics, to a Gradual Stretching the Mould

Chapter 2 presented a model showing the variables most likely to predict the current and future scenario for an institution relating to its educational delivery (Figure 1, repeated here for reference).

Figure 1. Scenarios for change



The dependent variables in the model were four scenarios for the current time: Back to Basics, Stretching the Mould, the Global Campus, and the New Economy; and the same four scenarios for the future. How well was that model supported by the questionnaire data? To answer this question, a series of statistical analyses took place. First, factor analysis was used to reduce the number of variables in the model and replace them with new variables based on factors, or patterns of relationships within the data. The new factors and their relationship to the original model are described in Section 8.1. After this, a number of regression analyses took place in order to see which combinations of the factors were the strongest predictors of the dependent variables. The results of these tests are described in Section 8.2. The analyses showed that the scenarios are an appropriate way to consider models of change, and that the Stretching the Mould scenario is only one where respondents expect a significant change between now and the year 2002. The chapter ends with a discussion of the implications of the model testing.

8.1 Reducing the number of variables

Factor analysis is a technique used to identify a small number of factors that explain the variance observed in a larger set of variables. These factors not only present a more concise way to represent a set of variables but also can identify new combinations of the original variables that relate closely to each other even if the researchers originally thought they should be in different groupings. In the original model, there were five categories of predictor variables--Environmental conditions and settings, Policy/response, Implementation, Practice, and Experience and effects. Together these were expressed by 22 clusters of variables and a total of 144

individual variables. In addition, the dependent variables were represented by two clusters ("current scenarios" and "future scenarios") with a total of eight variables. Each of these six categories (five of predictors and one of dependent variables) underwent a factor analysis for simplification of its component clusters and associated variables. The results are summarised in Sections 8.1.1- 8.1.6.

8.1.1 Component a: *Environmental conditions and settings*

In the original model, eight clusters of variables were predicted for environmental conditions and settings. Seven were obtained from the factor analysis, representing similar sets of clusters but with some recombinations of variables. Table 26 shows the original and new clusters for Component A, gives the number of variables involved with each cluster, and indicates the variable loading most highly on each new cluster in order to give an indication of the types of variables in the new cluster. Note that the new and old variables are not presented in a matching order in the figure. For the old variables, the order is used that was given in Chapter 2. For the new factors, the order relates to the importance of the variables in the factor analysis, with Factor A1 listed first (accounting for the largest amount of the variance in the overall set of variables, eigenvalue = 13.094, 18% of the overall variance), ranging down to Factor A7 (eigenvalue = 2.147, 3% of the overall variance).

Table 26: Original clusters and obtained factors for Component A of the model: Environmental conditions and settings

A. Environmental Conditions & Settings (original clusters)	**Factor-A. Environmental Conditions & Settings**	**Variable loading most highly on new factors**
A1 Mission & profile institution (21 variables)	F-A1 Teaching with technology in the traditional setting, (13 variables)	In your view to what extent does teaching 18-24 year old students involve the use of ICT in your institution?
A2. Leadership, internal power structure (7 variables)	F-A2. Influence of the government & educational sector, (9 variables)	In your opinion, how much is the internal ICT-related policy of your institution influenced by (policies of) the national ministry of education?
A3. Student characteristics (12 variables)	F-A3. ICT policy related to research, (6 variables)	In your opinion, to what extent does internally funded research involve the use of ICT in your institution?
A4. Instructor characteristics (2 variables)	F-A4. Flexibility in time, location, pace, (6 variables)	In your opinion, to what extent will your institution's ICT-related policy be affected by student demands for more flexibility in times of learning events in the year 2005?
A5. Social aspects of good education (1 variable)	F-A5. Life-long learning related to business needs, (8 variables)	In your view, to what extent will providing continuing education to persons in the workforce involve the use of ICT in your institution in the year 2005?
A6. Increasing competition (8 variables)	F-A6. International students, (5 variables)	In your view, to what extent will your institution's ICT-related policy be affected by demands from international students in the year 2005?

A7. Technology push (1 variable)	F-A7. New competition, commercial/foreign providers, (7 variables)	In your opinion, to what extent has competition from foreign commercial educational providers changed compared to five years ago?
A8. External policy (8 variables)		

Thus the 60 variables in the original clusters were reduced to seven factor scores per individual, Flexibility of time, place, and pace is seen more in terms of students once they are already in the institution rather than as a key drive for bringing foreign students in. Instructor characters and technology aspects load together onto the factor that explains most of the variance, a factor relating to technology use in the (traditional) teaching and learning process.

Differences between Actor Groups?

A comparison of the mean scores for each of the three main actor groups (decision makers, instructors, support staff) on these factors showed that there were significant differences among the actor groups on five of the seven factor scores in the Environmental Conditions component (on all but F-A2, Influence of the government, and F-A6, International students). In four of the five cases where there was a significant difference among the actor groups, the Decision Makers were significantly ($p<.005$) more positive than the Instructors or Support Staff. In each case in which there was a significant difference between Instructors and another of the actor groups, the instructors were significantly less positive (<.005) than the other groups.

8.1.2 Component B: *Policy / response*

It was predicted that environmental conditions and settings would have a direct impact on the type of policy in an institution with respect to ICT. Twenty variables, ten relating to current policy and ten to future policy, were taken as a single cluster, "Type of policy," in the original model. Factor analysis of these 20 variables showed a more complex mix. Table 27 shows the original clusters and obtained factors. .

Table 27 Original clusters and derived factors, policy / responses

B. Policy /response	**Factors-B Policy/response**	**Highest loading variable**
B1. Type of policy (20 variables)	FB-1 Policy relating to future market and quality, (3 variables)	In your opinion, to what extent will enhancing flexibility be a major objective in ICT-related policy in your institution in the year 2005?
	FB-2 Policy relating to cost- and efficiency aspects, (4 variables)	To what extent is enhancing cost-effectiveness an objective of ICT-related policy in your institution?

In these factors, "Policy" relates primarily to measures for attracting more students and to the effectiveness and efficiency of internal operations.

Differences in Actors on the policy factors?

Comparisons of mean scores on the factors among the actor groups shows that there were significant ($p<.005$) differences on the first of these B-factors but not on the second. For the F-B1 factor, instructors were again significantly less positive than either the Decision-makers or the Support Staff.

What environmental factors predict these policy factors?

The model allows testing of relationships within the model, not just the relationships associated with the dependent variables representing the scenarios. In the model, two of these subsidiary hypotheses relate to the policy/response factors. These hypotheses are:

> Hypothesis FB-1: The institution's policy relating to future market and quality is predicted by its environmental factors (FA-1, teaching with technology; FA-2, the influence of the national government and educational sector; FA-3, ICT policy related to research; FA-4, flexibility in location and place; FA-5, lifelong learning related to business needs; FA-6, international students; and FA-7, new competition).
>
> Hypothesis FB-2: The institution's policy relating to cost- and efficiency aspects is predicted by its environmental factors (FA-1, teaching with technology; FA-2, the influence of the national government and educational sector; FA-3, ICT policy related to research; FA-4, flexibility in location and place; FA-5, lifelong learning related to business needs; FA-6, international students; and FA-7, new competition).

These hypotheses were tested using regression analysis, with the results as shown in Table 28.

Table 28. What environmental factors predict institutional policy? (X = significant predictor, p<.05)

Outcome factors	**Predictors, Environment factors**						
	F-A1	F-A2	F-A3	F-A4	F-A5	F-A6	F-A7
F-B1 Policy relating to future market and quality R^2 = .484	x			x	x		
F-B2 Policy relating to cost- and efficiency aspects R^2 = .156		x		x	x	x	

The environment factors in the new model are good predictors of the policy of the institution with respect to future market and quality, but have relatively little predictive power with respects to ICT policy related to costs and efficiency. It is noteworthy that the factors related to ICT policy for research (FA-3) and new competition (FA-7) are not predictors of either type of policy, while an institution's level of flexibility relating to location and place (FA-4) and its level of concern for lifelong learning relating to business needs (FA-5) are significant predictors of both types of policy. Thus the more an institution values being able to offer flexibility to its (traditional) students and values being able to respond to the needs of the workforce for lifelong learning, the more likely it will be to have well developed policy relating to ICT. The relationship is probably two-way: when there is policy about ICT it is likely to be related to flexibility and lifelong learning related to business needs, and not so much likely to be related to other environmental factors such as demand from international students or government policy.

8.1.3 Component C: Implementation

In the original model, six clusters of variables related to ICT support and stimulation, collectively called "implementation", were hypothesized as resulting from the environmental conditions and policy of an institution. Table 29 shows the original and new clusters.

Table 29 Original clusters and retained factors, Implementation

C. Implementation	**Factors- C Implementation**	**Highest loading variable**
C1. Instructor support (1 variable)	FC-1 Staff-related policy, (6 variables)	To what extent is ICT use in education part of your institution's personnel policy?
C2. Student support (1 variable)	FC-2 New partnerships, current, (4 variables)	In your opinion, to what extent does your institution cooperate with foreign for-profit partners with respect to ICT-related activities?
C3. Staff related policies (6 variables)		
C4. New partnerships (8 variables)		
C5. Soft- and hardware, networks (1 variable)		
C6. Types of flexibility: participation offered (2 variables)		

In contrast to the situation in Component B, where an initial single cluster turned out to be more complex, in Component C the six initial clusters reduced to two retained factors. One related to staff-related policy and the other to the current importance of new partnerships.

Differences in Actors on the implementation factors?
In comparing the three actor groups on these two retained factors, the instructors were again significantly ($p<.005$) less positive than the other actor groups.

What environmental and policy factors predict implementation?
The model hypotheses that implementation is predicted by environmental factors and policy factors.

> Hypothesis FC-1: An institution's level of staff-related policy is predicted by its environmental factors (FA-1 through FA-7) and its policy factors (FB-1 and FB-2).
>
> Hypotheses FC-2 The degree to which an institution is currently forming new partnerships is predicted by its environmental factors (FA-1 through FA-7) and its policy factors (FB-1 and FB-2).

Both of these hypotheses were significantly supported ($p<.001$) when regression analyses were carried out. But what particular factors play the major role in predicting implementation? Table 30 shows the significant predictors.

Table 30: What factors predict implementation? (x = significant predictor, p<.05)

Implementation outcomes	**What environmental and policy factors are predictors?**								
	F-A1	F-A2	F-A3	F-A4	F-A5	F-A6	F-A7	F-B1	F-B2
F-C1 Staff-related policy R^2 = .284	x	x				-x			
F-C2 New partnerships, current R^2 = .444	x	x		-x	x	X	x	-x	

The environmental and policy factors are better predictors of the tendency to be forming new partnerships than they are of the degree of staff-related policy. The level of ICT policy related to research (FA-3) and the level of ICT policy related to costs and efficiency are not predictors of either of these implementation factors. The story told by the significant predictors is more complicated because some of the factors are negative. This means for example that the new an institution provides flexibility for its traditional students (FA-4) the less likely it is to be involved in new partnerships with other institutions. This could imply that partnerships, rather than stimulating more options for traditional students, instead lead the institution to pay more attention to international students (FA-6) or lifelong learning related to business needs (FA-5). The national government and other sister institutions in the same country (FA-2) are significant predictors of the level of both staff policy and new partnerships.

8.1.4 Component D: Practice

The next column in the model relates to actual practice with ICT, given the environmental conditions, policies, and implementation support available in the institution. Table 31 compares the original clusters and the retained factors.

Table 31. Original clusters and retained factors, Practice

D. Practice	**Factors- D. Practice**	**Highest loading variable**
D1. Technology practice (3 variables)	FD-1 Current computer use, (3 variables)	In your opinion, to what extent is studying via a Web-based environment common in your institution?
D2. Instructional practice (5 variables)	FD-2 Social uses of technology, (2 variables)	In your opinion, to what extent is ICT being used in your institution to support communication between instructors and students?

Although the number of original clusters and retained factors were the same, the interpretation somewhat differed. The first factor includes variables relating to both Web and non-Web computer use. The second factor involves the use of technology to support communication and group work. This second factor was not seen as an explicit cluster in the original component.

How do the actor groups compare on their perceptions of actual practice relating to ICT?

In comparing the actor groups on these factors again the Instructors are significantly ($p<.005$) less positive than either of the other groups. Instructors do not see ICT use as being as common, for either studying or communication, than the decision makers and support staff think it is.

What environmental, policy, and implementation factors predict use in practice?

The model suggests that use in practice is predicted by environmental factors, policy, and the way implementation is carried out. These predictions were tested:

> Hypothesis FD-1: The level of computer use to support studying is predicted by environmental factors, policy, and implementation support.
>
> Hypothesis FD-2: The level of computer use to support communication is predicted by environmental factors, policy, and implementation support.

Both of these hypotheses were significantly supported when tested with regression analysis ($p<.001$). But as before, which of the specific factors were most important? Table 32 shows the environmental, policy, and implementation factors that significantly predict use of ICT in practice.

Table 32. What environmental, policy, and implementation factors are the most important predictors of use of ICT in practice? (x= significant (p<.05) predictor)

What predicts ICT use in practice?	**Which environmental, policy, and implementation factors are most important?**										
	F-A1	F-A2	F-A3	F-A4	F-A5	F-A6	F-A7	F-B1	F-B2	F-C1	F-C2
F-D1 Current computer use $R^2 = .544$	x			X						x	x
F-D2 Social uses of technology $R^2 = .360$	x		x		x						

What is most noteworthy here is that governmental policy and the influence of sister institutions in the institution's own country (FA-2) do not predict what an institution actually does with ICT in its educational practice. Similarly, pressures from international students or from new competition are not what are currently pushing higher levels of ICT use. Institutional policy, most remarkably, is also not directly related to what actually happens in practice on the user edge. Only the factor relating to teaching in traditional ways with traditional students predicts what is actually happening within the institution with regard to ICT use for teaching and learning. What we are seeing appears to be a bottom-up use of technology: gradually using technology (as part of a blend) with traditional students, decided upon by individual instructors, not institutional policy.

8.1.5 Component E: Experiences and effects

Five clusters of variables were indicated in the original model for the component "Experiences and effects". In the factor analysis, there was only one dominant factor retained. This factor in turn was dominated by only one variable. Table 33 compares the original clusters and the retained factor.

Table 33. Original clusters and derived factors, Experiences and effects

E. Experiences and effects	**Factor E: :Experiences and effects**	**Highest loading variable**
E1. Perceived importance of ICT use for the quality of education (1 variable)	F-E1 Perceived importance of ICT for the quality of education (1 variable)	In your view, to what extent is the use of ICT important for the quality of education programmes and services in your institution?
E2. Perceived effect on efficiency (1 variable)		
E3. Level of satisfaction (1 variable)		
E4. Perceived impact on effectiveness (1 variable)		
E5. Perceived effect on working practices (1 variable)		

It is interesting that the one variable in the retained factor was enough to capture nearly all of the variance in the other four original variables.

How do the actor groups differ in terms of their perceptions of the importance of ICT for the quality of education?

In terms of this one variable, the actor groups again showed the same pattern: no significant difference between the Decision Makers and Support Staff, but with the Instructors significantly ($p<.005$) less positive than either group. Those who are actually doing it are less convinced than those not actually involved. And since the instructors are the ones making the decisions about what to use and do in their own courses (see Table 32), their perceptions about the importance of ICT are critical for real change relating to ICT to take place in their own institutions.

What factors predict the level of perceived importance of ICT for the quality of education?

The model suggested that all of the environmental, policy, implementation, and use in practice factors would all be important in predicting the level of perceived importance of ICT for the quality of education. This was stated in the hypothesis:

> Hypothesis FE-1: The perceived importance of ICT for the quality of education in an institution is predicted by environmental, policy, implementation, and use in practice factors.

As before, this hypothesis was significantly supported by a regression analysis ($p<.001$). But which particular factors have the most to do with the perception of the importance of ICT for the quality of education? Table 34 shows these factors.

Table 34. What factors predict the perceived importance of ICT for the quality of education? (x=significant predictor (p<.05)

Perceived importance of ICT for the quality of education	**What environmental, policy, implementation, and usage factors predict the perception of the importance of ICT for the quality of education?**												
	F-A1	F-A2	F-A3	F-A4	F-A5	F-A6	F-A7	F-B1	F-B2	F-C1	F-C2	F-D1	F-D2
F-E Perceived importance of ICT for quality of education R^2 = .539	x			x				x				x	x

Here it is clearly what is actually happening in practice that makes the major impact on the perception of impact. External forces and even implementation support within the institution (FA-2, FA-5, FA-6, FA-7, FC-1, and FC-2) do not predict the perception of impact. Making traditional teaching more flexible (FA-1 and FA-4) are also important, as is policy actually relating to educational quality. But this impact and quality improvement seems to be happening from within existing practices, not related to new directions for the institutions.

This last statement leads to the final set of analyses based on the model. This final set relates to prediction of the scenarios, now and in the future, within the institution.

8.1.6 Dependent Variables: Scenarios

The original two clusters of variables relating to the dependent variables (current and future scenarios) realigned to five factors. Participants grouped the variables by scenario, not by current or future aspects. Only the "stretching the mould" scenario was split among two factors, showing that to be the only scenario on which respondents felt a significant change to be likely to occur between now and 2005. Table 35 shows the scenario clusters and retained factors.

Table 35 Original clusters and derived factors, Scenarios

DV. Scenarios	**F-DVs: Scenarios**
	F-DV1: Global campus, (2 variables, current and future)
DV1 Current scenario (4 variables)	
	F-DV2: Back to the basics, (2 variables, current and future)
DV2 Future scenario (4 variables)	
	F-DV3: New economy, (2 variables, current and future)
	F-DV4 Stretching the mould, current, (1 variable)
	F-DV5 Stretching the mould, future, (1 variable)

For the final model testing, the five factor scores will be used as dependent variables.

How do the actor groups compare on their perceptions of the scenarios for their institutions?

In terms of differences among the actor groups on these factors scores, there was much more agreement than was the case with the predictor factors in the model. On only two comparisons was there a significant difference between groups (F-DV1 and F-DV4) and in both of these cases, the Instructors were significantly less positive than the Support Staff. Table 36 shows the scores per actor group on the five Scenario variables.

Table 36 Comparison of mean factor scores by actor groups, Scenarios

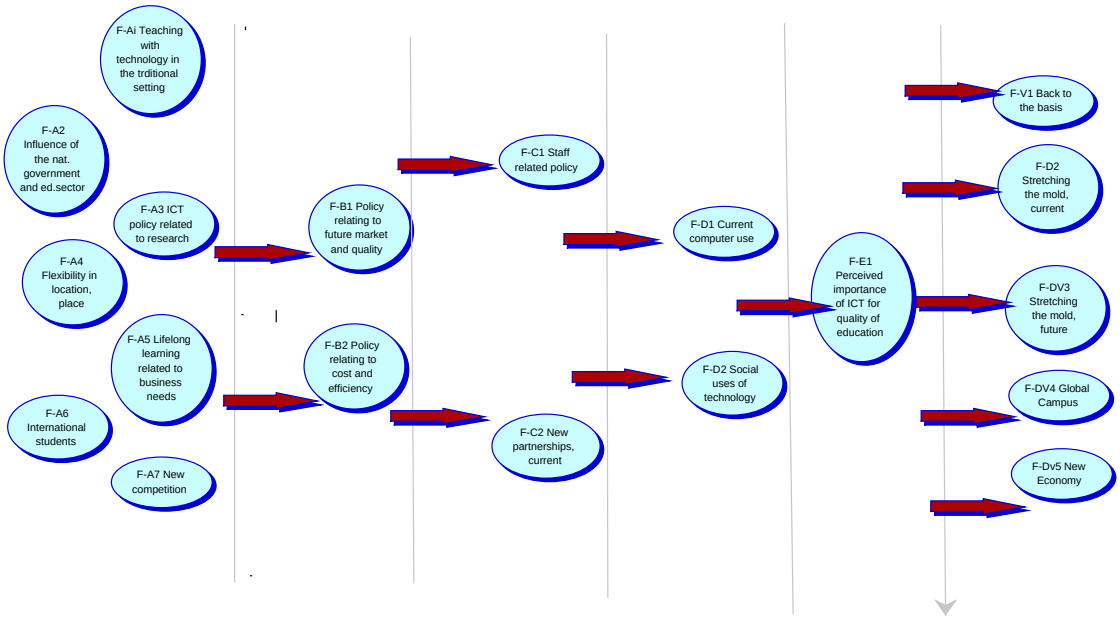
Factors	Decision makers	Instructors	Support staff	Significant differences?
F-DV1: Global campus	2.50 (1.15)	2.31 (1.00)	2.59 (1.05)	F=4.620 (.010) SS > Ins (.019)
F-DV2: Back to the basics	4.38 (.66)	4.43 (.66)	4.37 (.57)	
F-DV3: New economy	2.36 (.85)	2.32 (93)	2.31 (.84)	
F-DV4 Stretching the mould, current,	3.34 (1.23)	3.25 (1.24)	3.58 (1.10)	F=4.072 (.017) SS > Ins (.018)
F-DV5 Stretching the mould, future	4.07 (1.02)	3.88 (.92)	3.99 (.90)	

Clearly, for all three actor groups "Back to the Basics", both now and in the future, is the most likely scenario for their institutions. "Stretching the Mould" however, is predicted to grow in popularity over the next few years. There is little view of the institutions in terms of the other scenarios, either now or in the future.

8.2 New model

Thus, based on the factor analyses Figure 4 is a simplification of the model:

Figure 4 Simplification of the model, based on the derived factors



8.3 Which factors predict which scenarios?

Regression analysis was used to test the implied relationships of the new factor scores with the scenario factors. Table 37 shows the results of the regression analyses for each of the scenario factors as dependent variables. Stretching the Mould, Current and Stretching the Mould, Future were tested separately while the other three scenarios used the factor scores representing the combined current and future situations, based on the factor analyses (see Table 35).

Table 37: Results of regression analyses for scenario factors as dependent variables

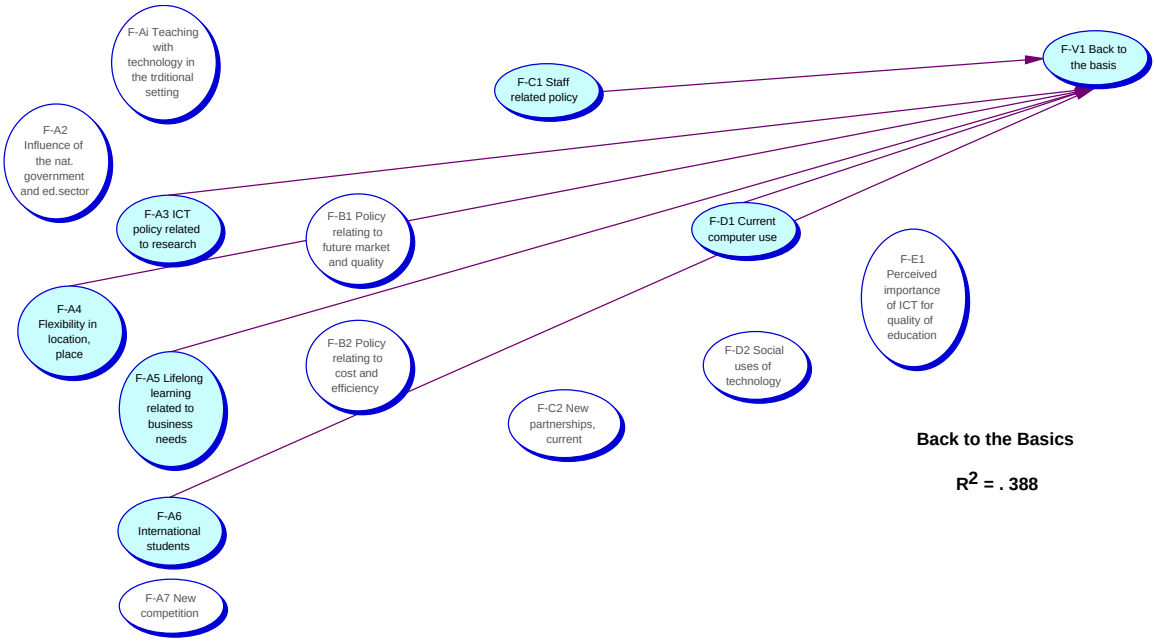
	F-A1	F-A2	F-A3	F-A4	F-A5	F-A6	F-A7	F-B1	F-B2	F-C1	F-C2	F-D1	F-D2	F-E
F-DV1 Global Campus $R^2 = .541$			x	x	x	x	X	x				x		
F-DV2 Back to the Basics $R^2 = .388$			x	x	x	x				x		x		
F-DV3 New Economy $R^2 = .375$	x			x	x									
F-DV4 Stretching the Mould, current $R^2 = .336$				x	x		X					x	x	
F-DV5, Stretching the Mould, future $R^2 = .298$			x	x				x	x					
Total times a factor predicts a scenario	1	0	3	5	4	2	2	2	1	1	0	3	1	0

Note: "x" indicates that the factor was an independent variable retained in the model produced by the regression analysis, $P<0.05$.

From Table 37 it can be seen that the factors representing the scenarios as dependent variables in the overall model were reasonably well predicted by the model (with all R^2 s significant, $p<.000$). Factor A1 (teaching with technology) is not a strong predictor while F-A4 (Flexibility in time, location, pace) remains important to all dependent variables. F-A5 (Lifelong learning related to business needs) also emerges here as a significant predictor of the scenario factors, being involved in predicting four of the five scenarios.
What is just as interesting are the variables in the new model that are not involved as significant predictors of the scenarios. Three of the variables do not appear at all. They are Factor A2 (Influence of the government & educational sector); Factor C2 (New partnerships, current); and Factor E1 (Perceived importance of ICT for quality of education). Four others only appear as predictors for one of the scenarios. Table 37 also shows that, after the common presence of Factor A4 and Factor A5 and the common absence of Factors A2, C2 and E1, there are different combinations of the factor scores that best predict the different scenarios. These different combinations are visualised in Figures 5-9.

Figure 5 shows the factors predicting (and not predicting) the Back to the Basics scenario, now and in the future.

Figure 5. Factors predicting the Back to the Basics scenario, now and in the future



The factors that predict the Back to the Basics scenario include several that could be expected, given their relationship with current, "business as usual" operations in the university. These include ICT policy related to research (FA-3), current levels of ICT use (Factor D1) and staff-related policy about ICT use (Factor C1). It is interesting that Factor A1 (teaching with technology in the traditional setting) is not a significant differentiater. Perhaps this is because the uses of ICT (email, PowerPoint, Web) are already uniformly high and thus no longer serve as a way to differentiate among institutions? It is also interesting that the influence of the government or other institutions in the institution's own country (Factor A2) or abroad (F-A7) or both (Factor C2) are not predictors. "Business as usual" appears to be an internal affair, not stimulated much from outside.

The patterns of factors involved in the Stretching the Mould scenarios, both current and in the future, differ from the Back to the Basics in a number of ways. Figure 6 and Figure 7 show the factor scores predicting (and not predicting) the Stretching the Mould scenarios, current and future.

Figure 6. Factors predicting the Stretching the Mould scenario, current situation

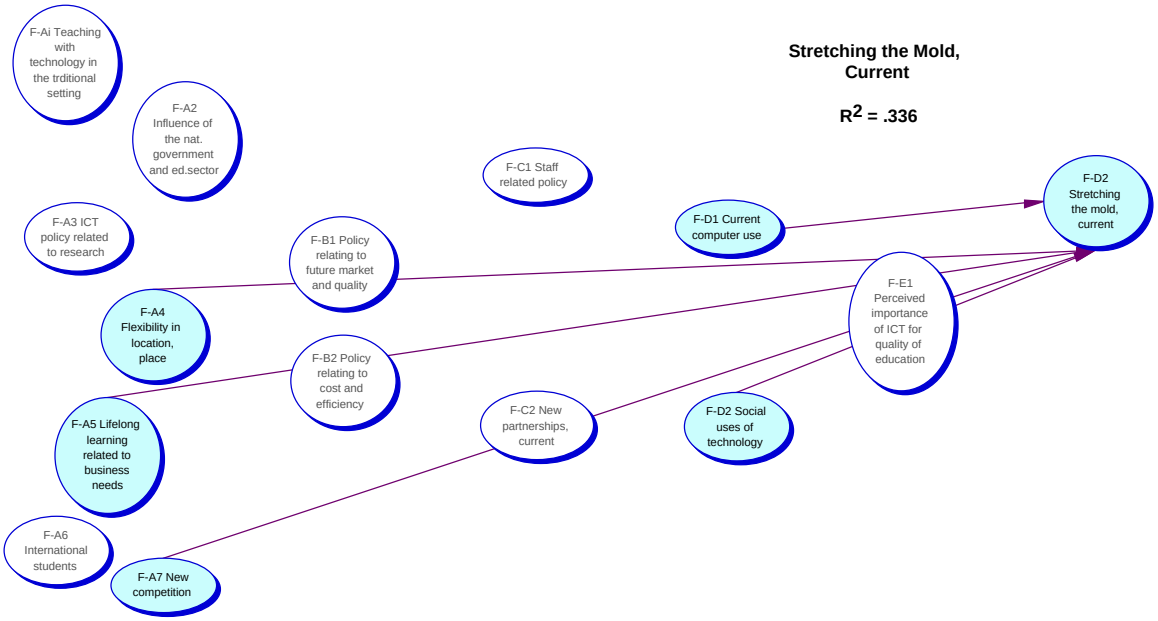
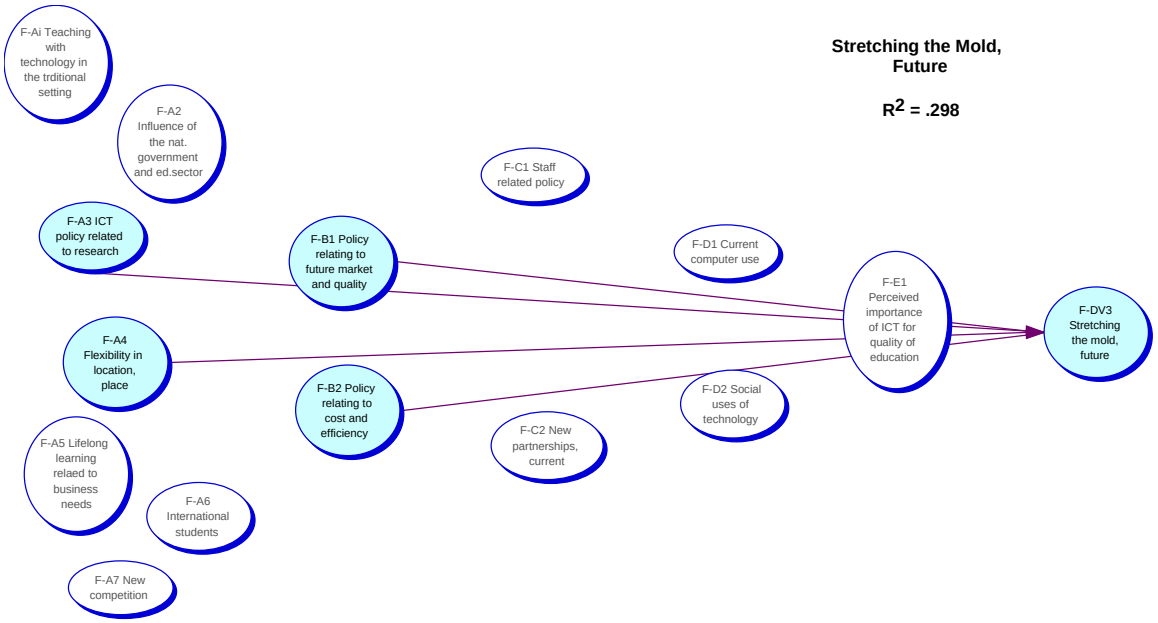


Figure 7. Factors predicting the Stretching the Mould scenario, future

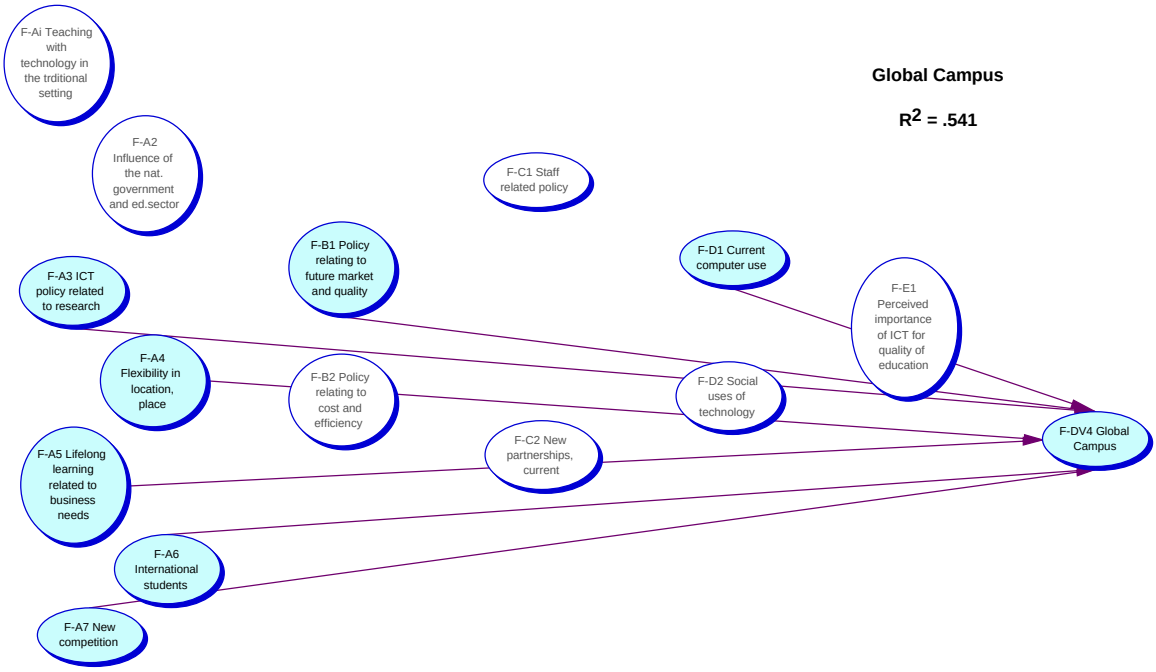


The Stretching the Mould scenario is the only one of the scenarios that the respondents see as significantly changing in its characteristics over time. The different combinations of factors that predict the scenario in the current situation and in the future also show an interesting evolution. In the current situation, factors related to the current level of computer use in the institution (Factor D1) and to social uses of that technology (Factor D2) are both significant predictors, but this is not predicted to be so for the future. Perhaps the respondents see technology use as becoming so ubiquitous that it will no longer serve as a meaningful differentiate among universities? For the current situation, where variability in technology use is still the case, these factors are important differentiators in the capacity of a university to "stretch its mould" in terms of how it serves its on-campus students. Another noteworthy difference between the current and future scenarios is that the policy variables (Factor B1, Policy relating to future market and quality, and Factor B2, Policy relating to cost- and efficiency aspects) are not seen as yet operating as predictors for Stretching the Mould, but are seen as important for the future. This suggests that the current stretching the mould impulses in universities are not occurring as a result of systematic policy but rather in a more evolutionary way, outside of policy directives. However, in the future, universities should move to more systematic policy and vision relating to stretching the mould for its on-campus students; thus the factors are seen as significant predictors for the future situation.

It is interesting that six of the factors are not predictors of either the current or future Stretching the Mould. These include teaching with technology (Factor A1), influence of the government or other universities (Factor A2), demand from international students (Factor A6), staff-related policy (Factor C1), new partnerships with other institutions (Factor C2), or perceptions about the importance of ICT for the quality of education (Factor E1). This again strengthens the perception that stretching the mould is and will continue to be an internal affair of the individual institution, not much influenced by government directives or other institutions, either as partners or competitors. The fact that staff-related policy does not serve as a predictor either now or in the future may relate to the acknowledgement that enlightenment is not likely to occur with respect to the need for incentives for instructors to move beyond the status quo in terms of effective or innovative uses of ICT for learning support. There are few policy incentives now, and, alas, the respondents do not expect there to be much change in this in the future. Stretching the Mould will continue to evolve, with some central policy support (Factors B1 and B2, for the future scenario), but these policy incentives will not yet move to the level of the individual instructor.

Figure 8 shows the factor scores predicting (and not predicting) the Global Campus scenario.

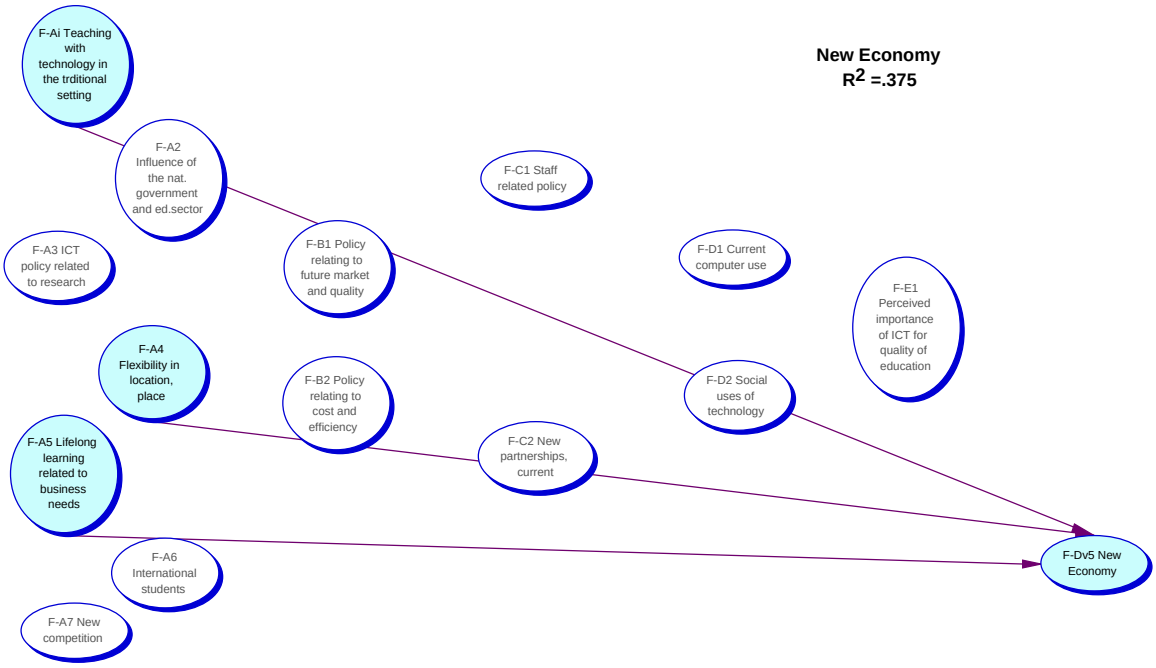
Figure 8 Factors predicting the Global Campus scenario, now and in the future



In the Global Campus scenario, the influence of international students (Factor A6), of new competition from commercial and foreign providers (Factor A7) and of policy related to future market and quality (Factor B1) are all important predictors. These factors do not appear in combination in any of the other scenarios. This suggests that concerns about competition from a worldwide, changing educational supply and demand situation motivate universities to consider distance education and satellite campus options but on the other hand are not concerns that have much impact on on-campus developments (the Back to the Basics and Stretching the Mould scenarios) or on the more-visionary New Economy scenario.

Figure 9 visualises the factors predicting (and not predicting) the New Economy scenario.

Figure 9 Factors predicting the New Economy scenario, now and in the future



The New Economy appears to be motivated by two different sets of impulses. One relates teaching with technology (Factor A1) and the other to lifelong learning related to demand from the business world (Factor A5). Both of these demands relate to the other significant predictor, flexibility in time, location, and pace. The motivations for relating teaching with technology to the New Economy scenario may represent two different impulses. One may be that the New Economy is stimulated by those with a visionary view of teaching with technology for the educational value involved. The New Economy can maximise individualisation for the student and best allow him or her to find just the fit of learning experiences for the personal situation. Time, location, and pace of learning can be optimally tailored to the individual learner if that learner can pick and choose from a worldwide palette of possibilities. In the business context (Factor A5), the desirability of close tailoring of the learning experience is likely to be motivated by different impulses. In the corporate context, time spent on a course is time not being spent on work. As much as possible, the course experience should minimise time disruption and maximise the relevance of the learning to the needs of the business. Thus the New Economy is related to sensitivity to the individual learner more than any of the other scenarios, but the motivation for this sensitivity may be based on the desire for good teaching and learning or the desire to maximise the efficiency and relevance of learning for economic reasons. What is particularly interesting is that this is the only scenario, current or future, in which the factor relating to teaching with technology (Factor A1) is a significant predictor.

8.4 Conclusions from the model testing in relation to the three main conclusions of the study

The model testing has served two functions. It has produced a simpler model in terms of predicting scenarios for change and shown Stretching the Mould to be the model as predicted to substantially grow in influence between now and in the future. Secondly, the model testing has further supported the three main sets of conclusions of the study.

With regard to Theme 1, the analysis has again shown the dominance of the traditional, campus-based model, but with Stretching the Mould gradually gaining in importance and also changing in its characteristics between now and the future. While the current level of Stretching the Mould appears to be evolving without deliberate plan or policy and also is sensitive to the level of computer use that is common in the institution, in the future central policy will be in place to steer the stretch. Only the Global Campus scenario is influenced by pressures from foreign competitors or international students; for the rest of the scenarios these have little impact. The three actor groups are generally in agreement with respect to the scenario factors. All tend to see their institutions as "Back to the Basics" both now and in the near future. However, "Stretching the Mould" is predicted to significantly gain in importance. The other scenarios are not seen as likely to be representative of the respondents' institutions, either now or in the future.

With regard to Theme 2, the model testing brings out the specific importance of Web-related use, particularly Web-based systems, more clearly than the more general "ICT". ICT (in particular, Web-based systems) are seen as valuable and leading to more efficient practices, but not replacing traditional ways of teaching and learning.

Theme 3, in relationship to the differences between the instructors and others in the institution, is also clearly seen in the model testing. For 13 of the 19 new factors, there was a significant ($p<.005$) difference among the means of the actor groups. In general, the Decision Makers and the Support Staff agreed on the factors. It is the Instructor group that is consistently and significantly different, and always in the negative sense compared to the other groups. The Instructors, who also are closer to the "front line" in terms of educational delivery and technology use than the other two groups, are also significantly less positive than the other groups on the majority of the factor scores. The only deviation relates to the scenario factors; here all three groups are generally in agreement on their perceptions.

9 Conclusions, discussion and recommendations

Our main research question was focused on the scenarios that are emerging with respect to the use of ICT in higher education. These scenarios are also used as the basis for describing models of change and predicting future developments and strategic choices. Within this context we were interested in the ways in which higher education institutions perceive the changes in their environment and whether and how this influences their strategic choices with respect to ICT use. Furthermore we looked at how ICT policies are implemented and to what changes they lead in the actual teaching and learning practice and in the way instructors perceive their roles. We identified three major sets of conclusions. In this chapter we summarise the overall conclusions, discuss them, and make a series of recommendations.

9.1 Conclusions

General conclusion 1: Change is slow, and not radical

Overall it seems that higher education institutions do not expect revolutionary change as a result from or related to the use of ICT. In general, there is not really a concern about being forced to change by external forces or developments. Rather, a "business as usual" approach is taken, without anticipating any real dramatic changes in mission, profile or market position. Nevertheless, institutions are gradually "stretching the mould"; they change their procedures and models as a process of change from within. These changes, however, are gradual and usually slow and may comply with the slight changes in needs and demands as perceived by the institutions.
Small changes between countries, however, suggest that institutions that have a clearer view on their mission with respect to serving different target groups (e.g. lifelong learning or international students) with ICT and on their position in that/those particular markets demonstrate higher levels of use of ICT and influence of ICT on general teaching practice. Awareness of and response to changing demand from these new target groups and a strategic commitment to being successful in these markets seems to be a major drive for change in these institutions.

The survey data, as well as other research (Collis & Gommer, 2001; DEST, 2001) show that stretching the mould is not an all or nothing process within universities, but evolves alongside of traditional (“Back to the Basics”) approaches as well as along with some examples of “global campus” opportunities.

For students with less experience in a discipline and less background in taking responsibility for aspects of their own learning, “stretching the mould” evolves along side of traditional practices; in some courses only the traditional practices will pertain. For other groups of learners, however, particularly those with more experience in the discipline and the need to balance work, home, and study, stretching the mould will be a necessary dominant approach, with some additional options of “global campus” and even the “New Economy” becoming regular practice. Figures 10 and 11 show highly schematic views of the current level of “stretching the mould” and the expected level in the year 2005 based on this analysis.

Figure 10. "Stretching the mould", current status (from Collis & Moonen, 2001, p. 201). For experienced learners, the "stretch" into Sector C is more pronounced, as is to a lesser degree, the stretch into Sector B ("global campus")

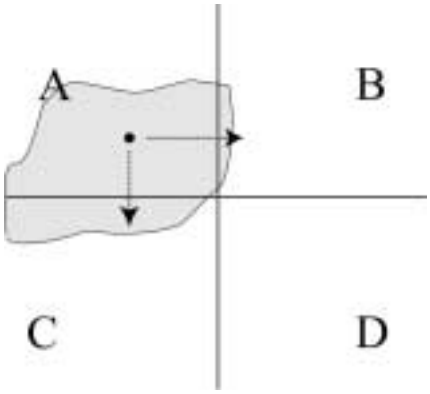
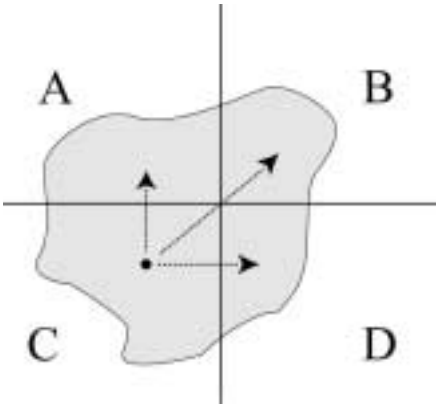


Figure 11. "Stretching the Mould" in the year 2005 (from Collis & Moonen, 2001, p. 201) For more-experienced learners, the amount still in "Back to the Basics" will be reduced. For entry-level learners, the amounts in Sectors B and D will be less.



General conclusion 2: ICT in teaching and learning: Widespread but part of a blend

The second dominant theme in the responses is that ICT use, in terms of e-mail, word processing, PowerPoint, and the Web, has become standard as part of the teaching and learning process. But this has not radically affected the nature of this process; rather, ICT has become part of the blend of on-campus delivery. This trend is seen in terms of ICT policy and objectives relating to ICT, as well as in the way that ICT use has been implemented into practice. In particular, Web-based systems are seen as valuable and leading to more efficient practices. This second main theme emerging from the study is related to the first: ICT use, in terms of email, PowerPoint, word processing and Web resources, has become commonplace, but in a way that only gradually is stretching traditional on-campus practices. The lecture remains the "core medium", the instructional form that is most highly valued. However, ICT has clearly become part of the blend, serving as a complement to already existing instructional tools. This notion of core and complementary media (Collis & Moonen, 2001) relates to the idea of blended learning,

with ICT now clearly part of the blend. Web technology in particular is associated with "stretching the mould" but not with radical change of practice**.**

General conclusion 3: Instructors: Gradually doing more, but with no reward
The third theme regards the instructors' role in the use of ICT, how this relates to their views on teaching and learning and on their actual workload and job satisfaction. Also here the "stretching the mould" theme is recognized. Overall, the instructor is still there, but doing more with technology with no particular reward. Instructors are less concerned/interested in/hopeful about technology than those not on the "front line" (the decision makers and support staff). Instructors are not particularly concerned about ICT, and not actually changing their ways of teaching even though they use ICT in different ways. Thus, the instructor is also "stretching the mould" with ICT use as part of daily practices. While there are no serious concerns about this, and a generally positive feeling about ICT's effect on personal work conditions and efficiency, there also are little or no systematic rewards to move instructors to do more than the gradual "stretching". Also, instructors--the ones on the front line of actual ICT use--are less impressed about it than those not on the front line. Consistently, instructors have significantly lower perceptions than the decision-makers and support staff in their institutions as to the support and incentives for ICT use.

9.2 Discussion

In this section we will discuss the outcomes of this survey from two partly overlapping sources and perspectives. First by comparing with the results of other recent national and international research. And second by reporting on a discussion which was held at the occasion of the first presentation of the preliminary outcomes of this study during a special seminar organized as part of the conference "The new educational benefits of ICT" in Rotterdam, 2-4 September 2002. This seminar brought together a wide range of international experts from all countries addressed in this survey (and some more) and from international organizations active in the field of ICT in higher education (e.g. ICDE and EDEN).

In general, it can be said that the outcomes of the present study were confirmed by and large by the international experts at the seminar as well as from other research. As one of the experts at the seminar stated: "The data presented fits very much some 'global trends' of implementing the new ICT in various places, and it seems that a quite stable state of the art in this field is starting to be defined".

No radical change and blended models
The fact that change is slow, and not radical is first of all validated by another recent international survey, which was carried out in both developed and developing countries (Observatory of Borderless Education, 2002, Middlehurst, 2003). This survey was conducted with the aim to test the widespread perception during the so-called "e-education bubble" between 1997 and early 2000 that online learning would quickly and fundamentally rupture the conventional campus-based model of higher education. The conclusion from this survey is that online learning has had only relative impact on campus and on distance education. Change has been relatively rapid as for modest online components and for institution-wide learning platforms. But a fundamental move away from on-campus provision has not materialized.

For the Netherlands in particular, a recent national report also confirms that although Web-based learning platforms are now widely used, no large-scale educational re-design has occurred (WRR, 2002).

The fact that ICT is mainly used to enhance on-campus learning, without substituting either the teacher or the classroom and thus becomes part of a blend is also well recognized from other sources. The same survey as cited above (Middlehurst, 2003) reports comparable data on the priority areas of institutions in their ICT policies: enhancing on-campus teaching and learning (94%) and to improve flexibility for on-campus students (92%).

Bates (2001) agrees with the fact that these ICT-practices do not replace previous practices but instead complement them: “Computers are now commonly used for PowerPoint presentation to deliver lectures and the Internet is now being used more and more to access Web sites to support lectures. Technology used in this way does not replace either the teacher or the classroom. Using technology to supplement classroom teaching does not radically change teaching methods. It merely enhances what would be done in the classroom in any case” (p. 17).

Bates distinguishes between technology-enhanced classroom teaching; distance learning; and distributed learning. He describes distributed learning as a mix of deliberately reduced face-to-face teaching and on-line learning (for instance one face-to-face lecture or seminar a week, with the rest of the teaching and learning done on-line). According to Bates, distributed learning rather than distance education will become the dominant paradigm for higher education. Bates’ concept of distributed learning, which is in other contexts sometimes described as “mixed mode” or “flexible learning” coincides with our concept of blended learning, especially when understood in the context of the “stretching the mould scenario”.

Responding to the changing demands for higher education: ICT and lifelong learning

Bates further argues that this type of e-learning is an ideal mode of delivery for lifelong learners and that in knowledge-based economies lifelong learning has become critical for economic development. He estimates that the lifelong learning market for formal university and college courses in knowledge based economies is at least as great as the market for students leaving high school for university and college. He acknowledges that lifelong learners are a market that has become extremely attractive to the private sector. However, there are areas of the lifelong learning market that need input from the public sector as well (e.g. access to the latest research and developments in professional fields) and that the knowledge required would rest largely with universities and colleges. And he finally states that in knowledge-based economies the question of how best to encourage lifelong learning and how best to determine and regulate the role of private and public sectors in e-learning are major challenges for government (p 26).

From our survey we concluded that in general institutions are still by and large focused on their traditional target group (high school leavers), but also that institutions that do have a clearer view on their mission with respect to serving different target groups (e.g. lifelong learners or international students) with ICT and on their position in that/those particular markets, usually demonstrate higher levels of use of ICT and influence of ICT on general teaching practice. Institutions in many countries, however, lack a strategic

view on using ICT for these new target groups. And more generally, the development of institution-wide ICT strategies is still weak (Middlehurst, 2003; WRR, 2002).

Similarly, for the Netherlands it was for instance reported that institutions do in principle indicate that they perceive lifelong learners as an interesting new market, but that in practice there are hardly any signs that they actually engage in addressing and serving this market. The report further stated that the physical infrastructure for ICT in Dutch institutions is by and large in place. The question however is whether institutions are also sufficiently equipped for the competition that is introduced by this. A further question is whether in the future higher education should still be perceived primarily in terms of educating the high school leavers, or that it should be considered more in terms of developing an educational and training infrastructure for learners of all ages (WRR, 2002).

Does policy matter?

The above discussion indicates that the main challenge for both institutions and governments is now to develop more strategic policies on how ICT can be used for the different target groups that higher education is expected to serve in the knowledge economy in the 21st century. These target groups include traditional learners as well as lifelong learners from both within or outside the country. It should be explicitly understood that especially the new type of learners constitute an attractive market on which higher education institutions will find themselves in competition from both national and international, tradition and new providers (Middlehurst, 2003).

From the discussion during the international seminar it occurred, however, that in many institutions the move towards an institution-wide policy with a strategic focus has not been made as yet (see also Floor, 2003). In most cases institutions are now transferring from a period of rich and mostly bottom-up experimentation to a phase in which institution-wide use of ICT in being encouraged. In many cases the first stage of institution-wide ICT implementation, i.e. the establishment of institution-wide technological infrastructure, is now in place. However, the second stage, i.e. rich pedagogical use of this infrastructure, is in many cases still in development. The third stage, which could be labelled as strategic use of ICT with a view to the different target groups of higher education, has in most cases not been considered explicitly yet.

From our scenario testing analyses (chapter 8) the question emerged whether policy matters in implementing ICT. During the seminar this question was extensively discussed. It was concluded that policy *does* matter, especially with a view to the next stages that need to be achieved (see above). In the previous phase of experimentation, the role of policy may have been perceived as minor, in the sense that many initiatives were driven by direct technology pushes (especially by innovators and early adopters) or by technology becoming more widely available (more often by late adopters). This may explain why the factor “policy” loaded relatively low in the scenario testing analysis. Nevertheless, policies that have made the use and availability of new technologies possible have thus been indispensable, but people may not have perceived the fact that technology (hardware, software and network infrastructure) became rapidly more available as an effect of specific policies. Yet it is clear that this would not have happened without the major investments that both governments and institutions have made in this area.

As said before, the international group of experts agreed that policy does matter especially considering the challenges ahead. For enhancing the on-campus learning experience, institutions need to improve and extent the actual (richer) pedagogical use of ICT. In order to further enhance flexibility next steps need to be made in terms of system development, integration, accessibility, user convenience, etc (see 9.3). But in particular the strategic use of ICT for the diversity of higher education target groups will require explicit policies at both institutional and governmental levels.

Seminar participants noted that such policies are crucial for institutions as to define what will be their next stage of development, where they want to go in terms of market positioning and how to get there. Various fundamental questions that need to be answered in the context of developing such policies are listed by Bates (2001, p. 27), in the following way:

- On what target group should e-learning be focused (e.g. high school leavers, working adults, lifelong learners, international students, etc.)?
- How should the mix of face-to-face teaching and e-learning vary, dependent on the target group?
- For what teaching and learning goals should we use face-to-face sessions and for what should we use e-learning?
- What do we need a campus for?
- What kind of space use do we need on campus?

Further governmental policies should be focused on optimising the pedagogical use of ICT, and should encourage and enable institutions to develop a strategic vision and to position themselves in the market, including those of new types of learners. Furthermore, it was stressed that ICT is clearly there to stay. This does not only emphasize the importance of mainstreaming its use, but raises also the issue of maintaining infrastructure in times of growing financial constraints for the higher education sector. In formulating policies, governments should consider in this respect the major influence that other policy decision and concerns may have on the ICT agenda. Notably changing costing arrangements, direct budget cuts and staff shortages may provide direct threats. Funding, as a policy instrument is crucial: funding systems should instead provide the real incentives for change. Obviously these types of incentives cannot be seen in isolation from incentives coming from market forces and competition.

As stated by Bates (2001), the dynamics in the area of e-learning (e.g. technological development, changing social and economic demand, competition from the private sector, institutional behaviour, etc.) suggest significant new and important roles for governments. Among the new roles being assumed by government in managing technological change in post-secondary education and training are the following (p. 29):

- Deregulator and streamliner of planning and oversight processes;
- Stimulator of “best practice” and “choice”;
- Enabler, funder and broker of partnerships;
- Creator of “utilities” or technological networks;
- Informer and protector of consumers;
- Strategic investor on behalf of the state and its under-served customers.

It is interesting however that in the model testing in the current study (Chapter 8) the role of the national government did not emerge as a significant predictor of any of the four

models of change. Thus, Bates' suggestions, although representing appropriate opportunities for government support, are not yet seen as having a substantial impact on the eventual scenario and use of ICT.

9.3 General recommendations

From learners and profile blends to scenarios
Each institution should develop a strategic plan relating to the relative importance to the institution of the different types of learners in the post 2005 period.

In The Netherlands, higher education has been traditionally oriented around the entry-level learner evolving to a transitional level while within the system. "International Masters" programmes have been emerging as service to lifelong learning and international learners (although some require entry-level support), and when the Bachelor-Masters structure becomes formalized the organizational door will be opened to more of a Stretching the Mould blend. In several other countries, such as Canada and Australia, the orientation of the system has already shifted to an equal or even predominant focus on experienced learners. The "elite universities" in the United States and Australia make their reputations based on their "graduate schools", representing their focuses on experienced learners. In these countries, among others, the predominant profile blend is already a mixture of Back to the Basics, Stretching the Mould, and Global Campus. If the New Economy occurs it is via individual contracts between a fee-paying client (an employer for some group of employees), usually negotiated by an office with a name such as *Continuing Education*. These activities are generally not seen as part of the general organizational or financial streams of the institution, but are periphery activities. They are not represented in its mainstream organizational and budgetary procedures.

Technologies for the scenario: Integrated information systems
Institutions should now look to integrating their various information and management systems in order to support more flexibility in the future.

Every higher-education institution now has a number of complex information systems running on different technical platforms, many with legacy applications that have been hand-coded for the institution over years (Serban & Malone, 2000). The *Stretching the Mould* scenario may be able to evolve for a limited period with only evolutionary changes to most of these existing information systems. The *Stretching the Mou*ld scenario can continue with its existing systems, but this will at some point curtail the amount that the system can stretch and bring increasing frustration to all in the enterprise (Edirisooriya, 2000). Also, "there is abundant evidence concerning the ad-hoc manner in which information management systems evolved within higher education institutions…each unit has developed or purchased an individual system to suit its own needs" (pp. 44-45). Gradually what will be needed is a move toward an integrated educational information management system as well as institutional-wide systems for access rights and control to learning resources and environments. A single log-in system where the user's log-in ID is linked not only to course-access rights but also to secondary services such as printing and costs for network access will emerge. The latter is the starting point for a *New Economy* scenario. Table 38 indicates some technology requirements for the

Stretching the Mould scenario and compares these with the requirements for the New Economy Scenario.

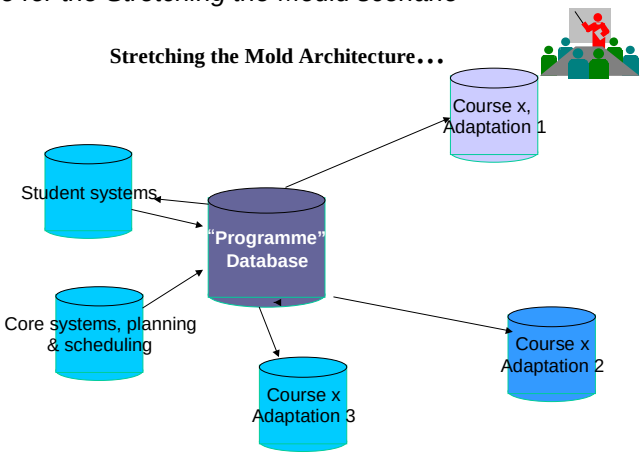
Table 38 Institutional information systems and the two scenarios (Collis & Gommer, 2001p. 16, extended from Serban & Malone, 2000)

System	Stretching-the-Mold Scenario	New-Economy Scenario
Core systems: Facilities, scheduling	May not have to change much from current approach (organised around programmes and pre-scheduled courses, courses with similar scheduling patterns (# of lectures, similar lengths of courses; examinations in a set period, etc); departments decide staff load in advance). However, systems will have to be re-tuned to accept flexibility within programmes.	Might need to redesign key aspects. For example, time-tabling may have to become responsive and dynamic: Contact sessions of various types scheduled when demand is adequate, with the system then communicating to potential attendees if the requested session will occur, and if yes, when and where. New system aspects will have to be designed to match expert availability with client demand; perhaps agendas will have to searchable centrally
Finance systems: Purchasing, budgets, income records, accounts payable	Might not have to change much from current practices	Changes might be needed depending on new sorts of services that may be needed such as new sorts of technology provision for staff and students
Human resources systems: Personnel and payroll	May not have to change much from current practices (Academic personnel paid fixed salary; salary and promotion based on time and academic (research-oriented) variables) but financial incentives for willingness to incorporate learners with different pre-requisites and requests may be needed as a stimulus. These may cause some tuning of existing systems.	Deep changes may become necessary: How to quantify instructor time for providing tailored services? Academic personnel may be (partly) paid *on commission*, based on demand for their knowledge units; promotion based (partially) on demand for one's knowledge units. New systems (and institutional procedures and culture) will be needed for these sorts of data-management tasks.
Student systems: Financial aid, accounts receivable, communication management, registrar, degree audit/advisement, student affairs/housing, admissions, records	There will be need for interfaculty coordination, as learners may choose courses in different programmes. Centrally available data about student status will be necessary.	Deep changes will be needed. Via a business plan and policy the costs of different forms of knowledge units (with variables, such as certain "star" instructors who have a higher rate than others) will have to be decided by the institution and managed by an integrated business-information system with e-commerce aspects. accommodated by Integrated systems and databases will be critical; records will need to be kept of all clients having transactions, not just well-defined cohorts
Instruction-related systems: Prior performance of learners, learner profiles, learner portfolios, exceptions tracking	The current system (records typically kept of final marks in a course, not component marks) may have to change; Some sort of learner-portfolio needs to be centrally available for an instructor to get insight into a learner's past performance when this learner has not followed a	Deep changes should occur. Learner preferences and characteristics should be stored so that mentors, instructors, and even personalised *software agents* can support the individual learner effectively; learners need access to an electronic portfolio of their learning history portable across institutions; Learners will need search and preview tools as well as

Technology architecture
Institutions should move now to plan for stretching-the-mould flexibility through technical systems that facilitate easy tailoring of course resources for different types of students.

In the *Stretching the Mould* scenario, the unit is the program or course, with possibilities for tailoring within these units. Figure 12 shows a general architecture of the *Stretching the Mould* scenario. (Figure adapted from De Boer, 2001).

Figure 12. Architecture for the Stretching the Mould scenario



The key feature here is a database driven system that allows easy tailoring and adapting of (portions of) courses to serve the needs of different groups of students. A system should allow the instructor to present different news messages and comments to different groups of students and to present different learning resources or instructions for activities with a minimal amount of effort. Objects for reuse need to be easily re-set in terms of user privileges as they become used in a variety of different learning settings.

Tools and functionalities for Stretching the Mould
The Web-based course management systems now common in higher education need to evolve to a new generation, where emphasis on tools for re-use and tailoring are key features.

In this section we look at some emerging tools and functionalities that are likely to be of value to the Stretching the Mould scenario. For this scenario, current developments in Web-based tools, systems, and functionalities will continue and become increasingly more powerful, flexible, and user friendly than current versions. Microsoft, for example (http://www.microsoft.com/education/planning/online/wpaper_cc.asp, 2000) indicates that: "the online learning system must be a container of robust interactive, communications, network and knowledge database functionalities, "smart" courseware templates and open-standards Internet technologies which, together, form a resource-rich virtual classroom and remote certification platform".

In particular, this will require much more complex tools and support than are currently generally available, for:

- Re-use on demand of materials from a variety of sources
- New search facilities, such as for non-text objects (simulations, applets, animations, images, segments of stored audio and video, etc)

- Ability to set and pre-test competency criteria, as learners increasing will come from different streams and backgrounds into a course or knowledge-unit activities; direct branching to appropriate remediation materials for those missing some required background
- Tools to tailor and manage assignments, monitoring of learners, and different forms of intervention and feedback. New feedback and communication tools, such as audio-feedback to provide effective feedback to students with many variations in their study programs.
- Progress-tracking tools with views for learners, instructors, and mentors
- Support tools for all involved, institutional decision makers, institutional counsellors, instructors, and clients, leading them through decisions in terms of flexibility options and the costs and implications of different combinations of options.

All of these technology tools are already emerging but there is much to be done before they can be used to scale up a *Stretching the Mo*uld scenario to rollout use. How to plan a path from today's emerging Stretching the Mould settings to the future scenario?

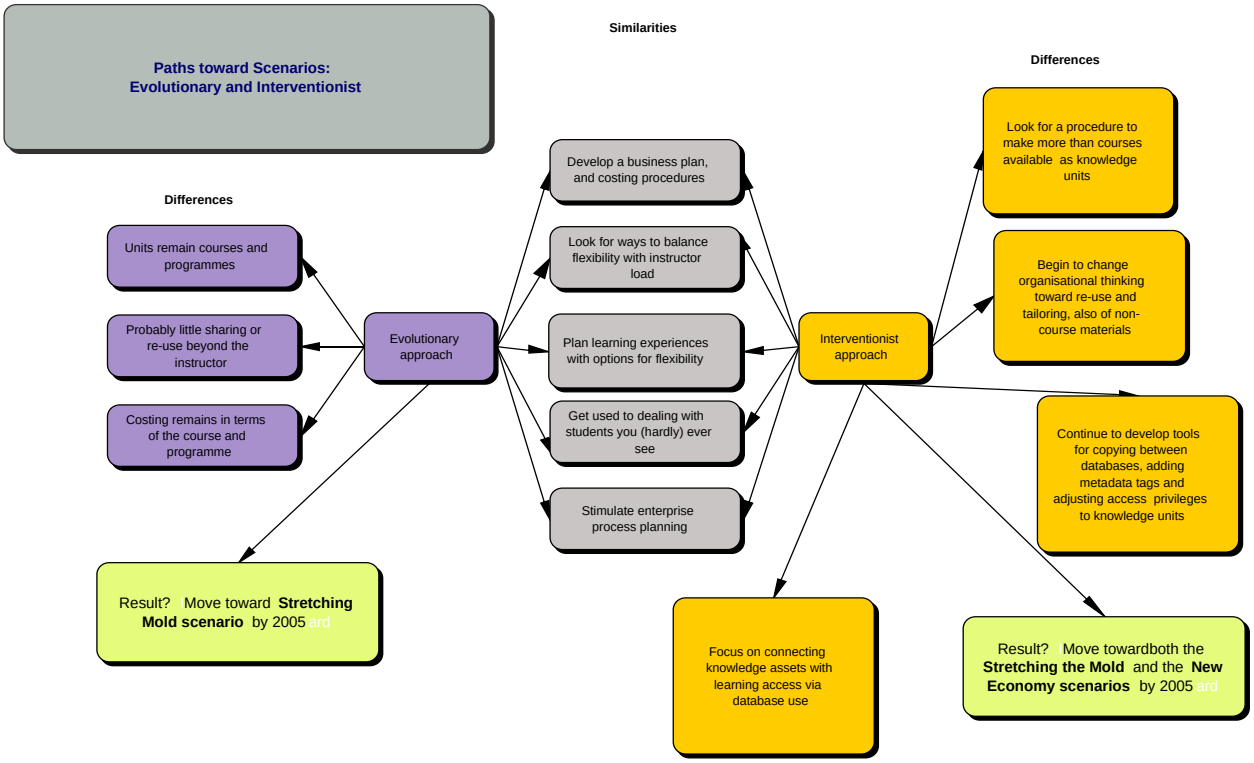
Paths to the scenarios

Institutions should make a clear plan for facilitating their evolution toward a future scenario.

In this section we conclude the report by suggesting two paths to Stretching the Mould, 2005. One path is evolutionary the other is interventionist (Collis & Gommer, 2001). The evolutionary path is one of continuing current trends toward Stretching the Mould for entry-level students in the traditional university settings, with courses become increasing flexible. The use of a well-designed course-management system can support and even stimulate flexibility within courses, especially when tools are used to allow easy tailoring of different views of the roster (course organizer), news, and course information areas to different user-defined groups. Flexibility within courses can evolve at the instructor's pace. Instructors can continue to think in terms of courses and the institution in terms of programs. All that has to change is the instructor's willingness to offer options within the course, and the tool options to make different views easily available in the same course environment. Re-use of existing resources can gradually grow as well, as instructors see the value of such re-use, first within their own courses from year to year, and then later between courses. Web technologies remain complementary to the core technologies of the textbook and lecture, although these core technologies will be routinely “stretched” by the use of Web-based tools and systems.

In contrast, the interventionist path is one of stimulating a change in thinking and in work habits in the institution. For experienced students, particularly those in the workforce, the need to keep some “Back to Basics” along with Stretching the Mould will be less, and in place of that, there will be more need to use Stretching the Mould as the starting point but also include New Economy aspects. The switch to this blend of Stretching the Mould and New Economy will eventually require institutional policy changes, not only the willingness of the individual instructor. Figure 13 visualises key policy actions.

Figure 13. Comparison of policy strategies for Stretching the Mould and the New Economy (Collis & Gommer, 2001)



In either case, a key addition to current situations should be more attention to direct rewards to the instructor for the efforts that will be needed for stretching the mould, for any type of student.

9.4 Recommendations for the specific university

The general recommendations in Section 9.3 can be further summarised into the following four sets of overall reflections and recommendations.

1. *Set the target*: At the policy level, take a decision as to the priorisation of types of learners for the next decade. Base this decision with input from a modelling exercise. Stimulate a wide discussion of stretching the mould for entry level vs. experienced students

   Without a common sense of goal, the university runs the risk of drifting; sponsoring or tolerating a series of incentives but not moving to a clear target around which decisions can be made. Is the goal more students? More research? More multidisciplinarity? More return on investment? A more well defined profile? More differentiation from other universities? More collaboration with other universities? Competencies or course objectives? Depth or breadth? The answer cannot be that the goal is everything; some sort of priorisation should occur.

In addition, traditional universities are currently organized at present around a Back to the Basics approach and an expectation that the mainstream cohorts of students are entry-level. At the same time, efforts to attract these entry-level cohorts from traditional intakes are not very successful for many faculties. Where is the growth potential in terms of student intake for the university? Modelling of different combinations of entry-level and professional-level learners should occur. Should we move toward being an institution that focuses its reputation on its "graduate school" (Masters and PhDs, as is the case with many of the elite universities in North America)? If the University continues to organize itself around a Back to the Basics and an entry-level approach (i.e., its Bachelor's program), then the likelihood of also attracting substantial numbers of professional-level clients in its Masters or an eventual Graduate School must be questioned. A return-on-investment analysis for simulated cohorts of the different types of learners could identify where the growth potential lies.

2. *Become more systematic about Stretching the Mould*: Plan for the integration of information systems that will be needed for both versions of the *Stretching the Mould* scenarios. Stimulate the development of decision-support tools for instructors to guide them in terms of strategies for "stretching the mould" of their courses, particularly the ideas of re-use and tailoring of views for different learner characteristics.

   Flexibility involves more than time and location; flexibility in terms of pedagogy and learning organization (group work vs. individual projects; project-based vs. expository; practicum-based vs. simulations or self-study of examples; communication oriented vs. resource oriented are only some of the bipolar options). Instructors need guidance and tools to offer a choice to learners. Also, the institution should perhaps not try to offer a carte blanche selection but instead profile itself around several instructional alternatives and develop pedagogical models and templates for its course management system that support those models. Universities such as Maastricht (with problem-based learning), Aalborg (with project-based learning), and Harvard (with case-based learning) have taken the step to profile themselves with a certain pedagogical model and thus mould institutional procedures around such a model. For efficiencies and scalability, a university wishing to stretch the mould should consider some well-defined pedagogical profiles for itself, and optimise flexible delivery of those profiles. The de facto profile in many faculties (lectures & exams) has been long institutionalised. New pedagogical profiles now need to be studied in terms of their operational procedures.

3. *Stimulate new tools that relate to Stretching the Mould*: Acquire, or stimulate targeted R&D projects on technical innovations for tools that make the following procedures easy for the instructor: such as:
   - Re-use on demand of many types of resources
   - New search facilities related to instructor-localised metadata
   - Tools to set competency criteria and pre-test learners on those criteria, as learners increasingly will come from different streams and backgrounds into a course or knowledge-unit activities; direct branching to appropriate remediation materials for those missing some required background
   - Tools to tailor and manage assignments, monitoring of learners, and different forms of intervention and feedback. New feedback and communication tools,

such as audio-feedback to help the instructor deal with increasingly personalized feedback in an efficient manner.

- Progress-tracking tools with views for learners, instructors, and mentors
- Workflow tools and other tools for management and monitoring, particularly of groups
- Support tools to help instructors be aware of options and set up different versions of a Web-based course environment as easily as possible

4. *Develop policy* for instructor incentives to do all the work that will be required as Stretching the Mould evolves.

   Although instructors are gradually taking on increasing amounts of ICT use, new pedagogical strategies and visions are not evolving at a similar pace. Without incentives, Stretching the Mould is likely to level off at certain types of logistical flexibility rather than also including flexibility more specifically related to learning activities and resources.

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Appendix 1: Overview of organizations involved in the implementation of the survey

Australia	NCODE-Flexible Learning Australasia (Centre for Flexible Learning, Macquarie University), Sydney
Finland	The Finnish Network for Higher Education and Training (FINHERT), Tampere
Germany	Bertelsmann Foundation, Gutersloh
Netherlands	Stichting SURF, Utrecht
Norway	The Norwegian Institute for Studies in Research and Higher Education (NIFU), Oslo
United Kingdom	Association for Learning Technology (ALT), (Oxford Brookes University), Oxford.
USA	WCET, The cooperative advancing the effective use of technology in higher education, Denver CO.

Appendix 2: List of responding institutions by country

Charles Sturt University	Australia
Deakin University	Australia
Monash University	Australia
University of Adelaide	Australia
University of Melbourne	Australia
University of New England	Australia
University of Queensland	Australia
Åbo Akademi University	Finland
Helsinki School of Economics	Finland
Helsinki University of Technology	Finland
Humanities Polytechnic	Finland
Jarmo Miettinen University of Kuopio	Finland
Kajaani Polytechnic	Finland
Kemi-Tornio Polytechnic	Finland
Pohjois-Savo Polytechnic	Finland
Pohjois-Savo Polytechnic Lisalmi	Finland
Pohjois-Savo Polytechnic, School of Business and Administration and Social and Health Professions	Finland
Pohjois-Savo Vocational Institute	Finland
University of Art and Design Helsinki	Finland
University of Kuopio	Finland
University of Oulo	Finland
University of Turku	Finland
Vantaa Institute of Technology	Finland
Alice-Salomon-Fachhochschule	Germany
Brandenburgische Technische Universität Cottbus	Germany
Carl von Ossietzky Universität Oldenburg	Germany
Deutsche Sporthochschule	Germany
Europa-Universität Viadrina	Germany
Fachhochschule Aachen	Germany
Fachhochschule Bielefeld	Germany
Fachhochschule Esslingen	Germany
Fachhochschule fur Verwaltung und Rechtspflege	Germany
Fachhochschule für Wirtschaft	Germany
Fachhochschule Gelsenkirchen	Germany
Fachhochschule Hannover	Germany
Fachhochschule Heidelberg	Germany
Fachhochschule Kaiserslautern	Germany
Fachhochschule Kiel	Germany
Fachhochschule Mainz	Germany
Fachhochschule Mannheim	Germany
Fachhochschule Nordostniedersachsen	Germany
Fachhochschule Offenburg	Germany
Fachhochschule Osnabrück	Germany
Fachhochschule Osnabrück	Germany
Fachhochschule Stralsund	Germany
Fachhochschule Wildau	Germany

Fachhochschule Worms	Germany
FernUniversität	Germany
Freie Universitaet Berlin	Germany
Friedrich-Schiller-Universität Jena	Germany
Handelshochschule Leipzig	Germany
Hochschule Anhalt	Germany
Hochschule für Angewandte Wissenschaften Hamburg	Germany
Hochschule fur Gestaltung Offenbach	Germany
Hochschule fur Technik und Wirtschaft	Germany
Hochschule für Technik und Wirtschaft des Saarlandes	Germany
Hochschule fur Verwaltungswissenschaften	Germany
Hochschule Mittweida	Germany
Hochschule Wismar	Germany
Hochschule Wismar, Fachhochschule für Technik, Wirtschaft und Gestaltung	Germany
Humboldt-Universität Berlin	Germany
Johann Wolfgang Goethe - Universität	Germany
Pädagogische Hochschule Freiburg	Germany
Pädagogische Hochschule Ludwigsburg	Germany
Pädagogische Hochschule Schwäbisch Gmünd	Germany
Padagogische Hochschule Weingarten	Germany
Stuttgart Institute of Management and Technology	Germany
Technische Universitaet Muenchen	Germany
Technische Universität Dresden	Germany
Technische Universität Ilmenau	Germany
Technische Universität Kaiserslautern	Germany
Tierärztliche Hochschule Hannover	Germany
Universität Bayreuth	Germany
Universität Bielefeld	Germany
Universität Dortmund	Germany
Universität Essen	Germany
Universität Kaiseslautern	Germany
Universität Kassel	Germany
Universität Mannheim	Germany
Universität Oldenburg	Germany
Universität Osnabruck	Germany
Universität Siegen	Germany
Universität Stuttgart	Germany
Universität Trier	Germany
Universitätsklinikum Essen	Germany
University of Mannheim	Germany
ZA Lebensmitelhygiene	Germany
Erasmus University Rotterdam	Netherlands
Fontys Hogescholen	Netherlands
Haagse Hogeschool	Netherlands
Hanzehogeschool Groningen	Netherlands
HES Amsterdam	Netherlands
Hogeschool Alkmaar	Netherlands
Hogeschool Domstad	Netherlands
Hogeschool Haarlem	Netherlands

Hogeschool Holland	Netherlands
Hogeschool Larenstein	Netherlands
Hogeschool Rotterdam	Netherlands
Hogeschool 's-Hertogenbosch	Netherlands
Hogeschool van Amsterdam	Netherlands
Hogeschool voor de Kunsten Utrecht	Netherlands
Katholieke Universiteit Nijmegen	Netherlands
Leiden University	Netherlands
PC Hogeschool Marnix Academie	Netherlands
Stoas APH	Netherlands
Technische Hogeschool Rijswijk	Netherlands
Technische Universiteit Delft	Netherlands
technische Universiteit Eindhoven	Netherlands
Universiteit Groningen	Netherlands
Universiteit Twente	Netherlands
Universiteit Utrecht	Netherlands
University of Amsterdam	Netherlands
Wageningen University and Research Center	Netherlands
Aalesund University College	Norway
Agder University College	Norway
Hedmark University College	Norway
Høgskolen i Oslo	Norway
Høgskolen i Sogn og Fjordane	Norway
Høgskolen i Sør-Trøndelag	Norway
Høgskolen Stord/Haugesund	Norway
Nesna University College	Norway
Norwegian Academy of Music	Norway
Norwegian University of Science and Technology	Norway
Oslo University College	Norway
Soer-Troendelag University College	Norway
Sogn og Fjordane University College	Norway
Stavanger University College	Norway
University of Bergen	Norway
University of Tromsø	Norway
Goldsmiths College, University of London	UK
Liverpool Hope	UK
Oxford Brookes University	UK
Queen Margaret university College	UK
Scottish Further Education Unit	UK
Sheffield Hallam University	UK
Staffordshire University	UK
Strathclyde University	UK
University College London	UK
University of Derby	UK
University of Edinburgh	UK
University of Glamorgan	UK
UNiversity Of Glasgow	UK
University of Gloucestershire	UK

University of Greenwich	UK
University of Kent at Canterbury	UK
University of Leeds	UK
University of London, Royal Holloway	UK
University of Salford	UK

University of Strathclyde	UK
University of Teesside	UK
University of Wales College of Medicine	UK
University of Wales Institute	UK
University of Wales Swansea	UK
UWIC-	UK
York St John College	UK
Colorado State University	USA
Concordia University	USA
Dakota State University	USA
Ivy Tech State College USA	USA
Jack Dobbs	USA
Kansas State University	USA
Lake Region State College	USA
Memorial University	USA
Minnesota West Community & Technical College	USA
New School University	USA
North Dakota State University	USA
Northern Arizona University	USA
Saginaw Valley State University	USA
San Juan College	USA
Trent University	USA
University of Calgary	USA
University of South Dakota	USA

Appendix 3: Questionnaires

http://www.bsk.utwente.nl/cheps/ictsurvey/ictsurvey.html