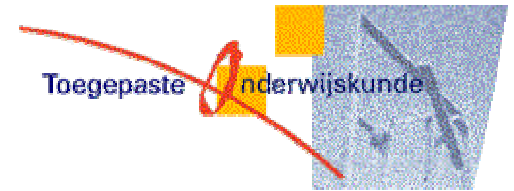


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Models of Technology and Change In Higher Education

**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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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")

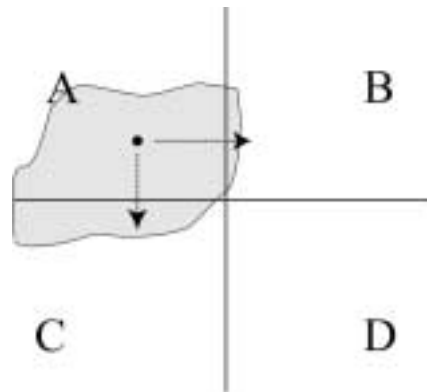
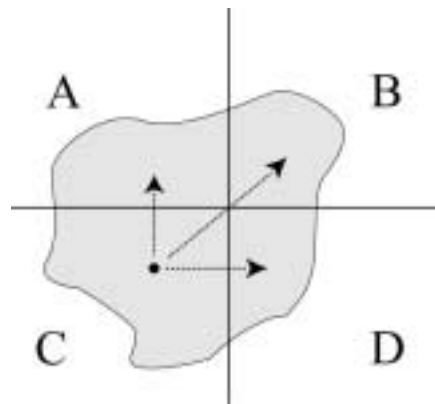


Figure 11. "Stretching the Mould" in the year 2005 (from Collis & Moonen, 2001, p. 201) For more-experienced learners, the amount still in "Back to the Basics" will be reduced. For entry-level learners, the amounts in Sectors B and D will be less.



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 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.

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 extend 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 Mould* 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)

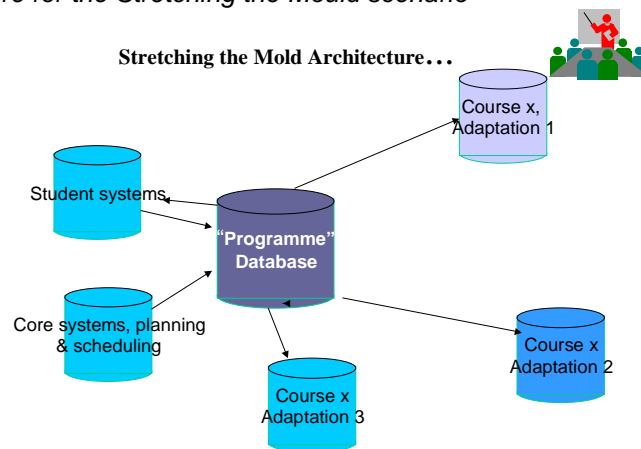
System	Stretching-the-Mold Scenario	New-Economy Scenario
<i>Core systems:</i> Facilities, scheduling	May not have to change much from current approach (organised around programmes and pre-scheduled courses, courses with similar scheduling patterns (# of lectures, similar lengths of courses; examinations 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 be searchable centrally
<i>Finance systems:</i> 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
<i>Human resources systems:</i> 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 <i>on commission</i> , 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.
<i>Student systems:</i> 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. Integrated systems and databases will be critical; records will need to be kept of all clients having transactions, not just well-defined cohorts
<i>Instruction-related systems:</i> 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 <i>software agents</i> 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 Mould* scenario to rollout use. How to plan a path from today's emerging *Stretching the Mould* settings to the future scenario?

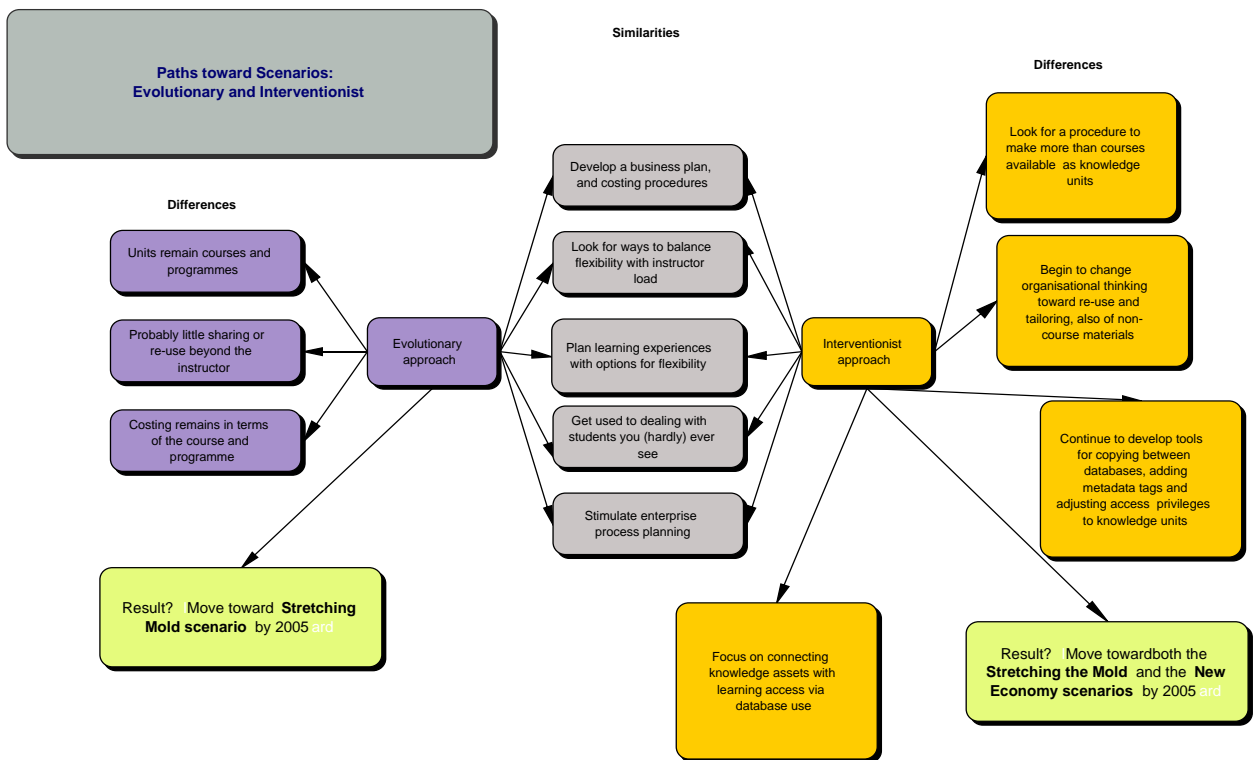
Paths to the scenarios

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 prioritisation 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 multidisciplinary? 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 prioritisation 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.