Models of Technology and Change

In Higher Education

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

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Report

December 2002

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

Scenarios of the future in which flexible learning will be part of a setting …
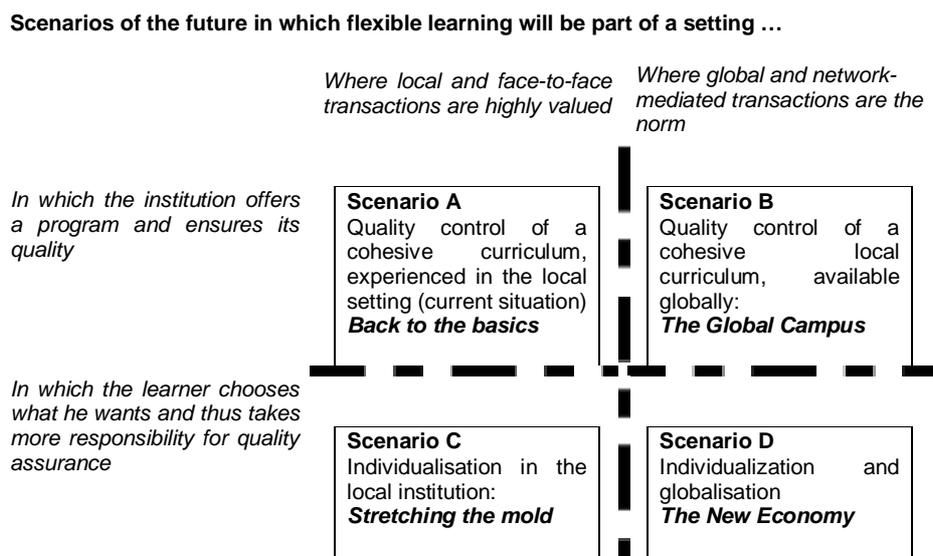
The dependent variables in the model were four scenarios for the current time: Back to Basics, Stretching the Mould, the Global Campus, and the New Economy; and the same four scenarios for the future. How well was that model supported by the questionnaire data? To answer this question, a series of statistical 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
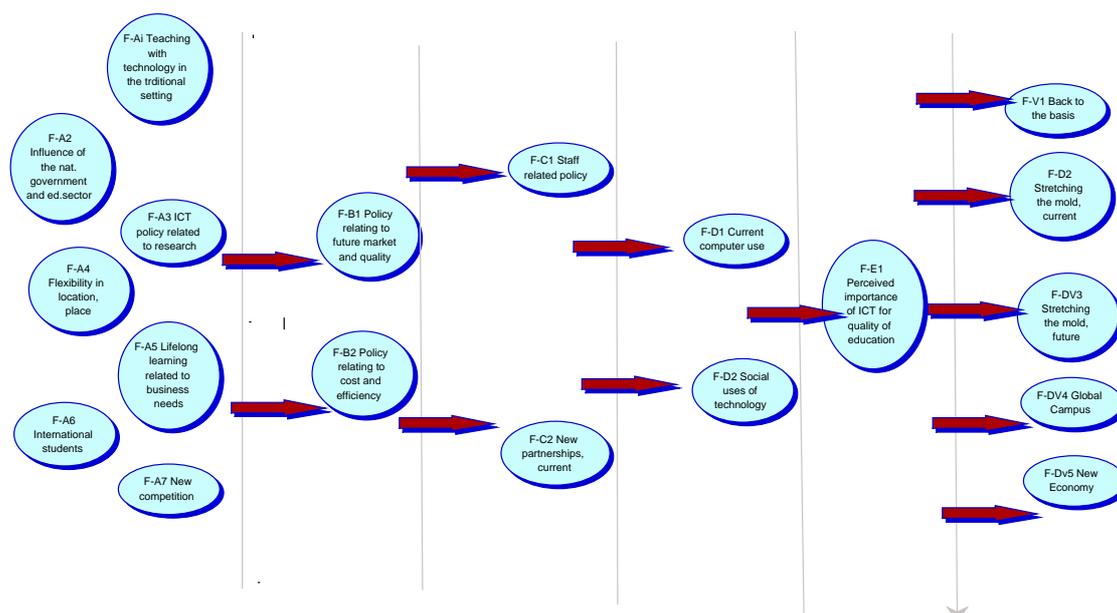
8.3   Which factors predict which scenarios?

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
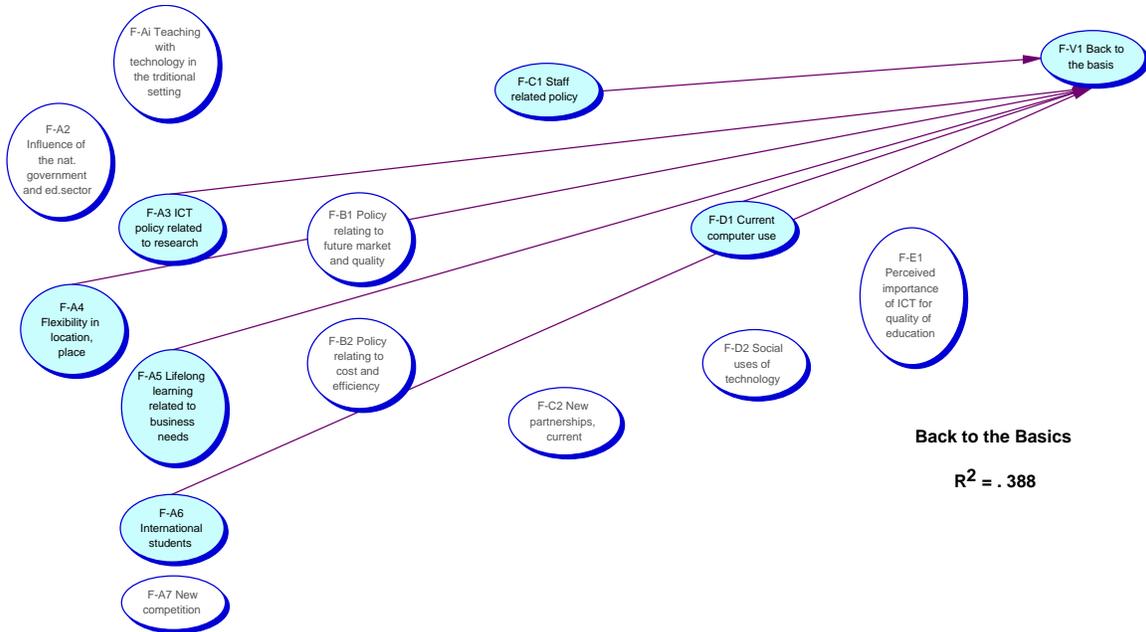
The factors that predict the Back to the Basics scenario include several that could be expected, given their relationship with current, "business as usual" operations in the university. These include ICT policy related to research (FA-3), current levels of ICT use (Factor D1) and staff-related policy 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
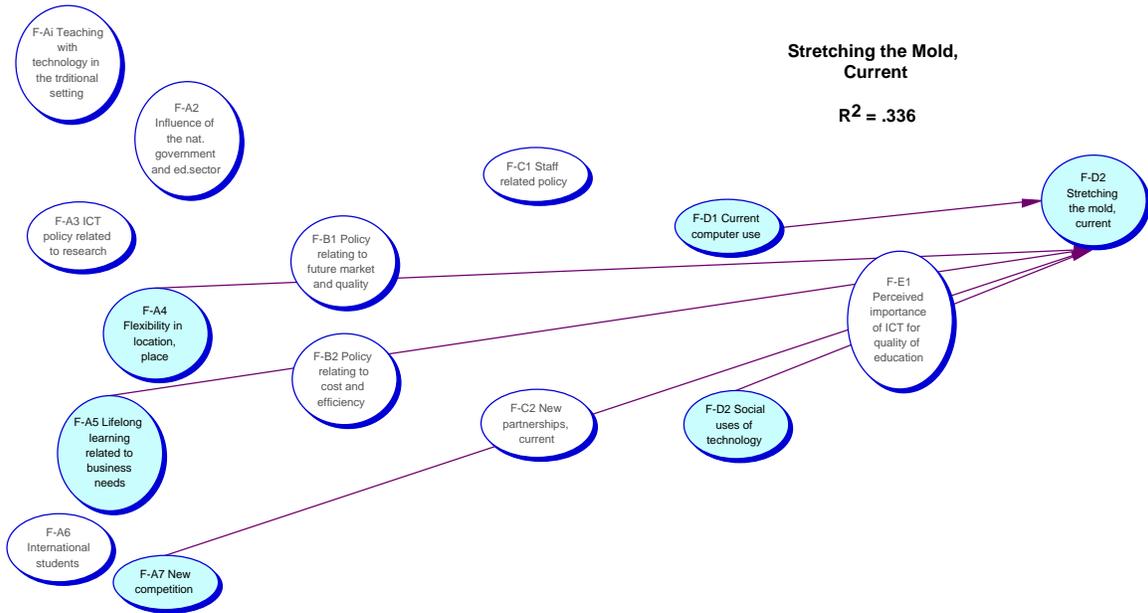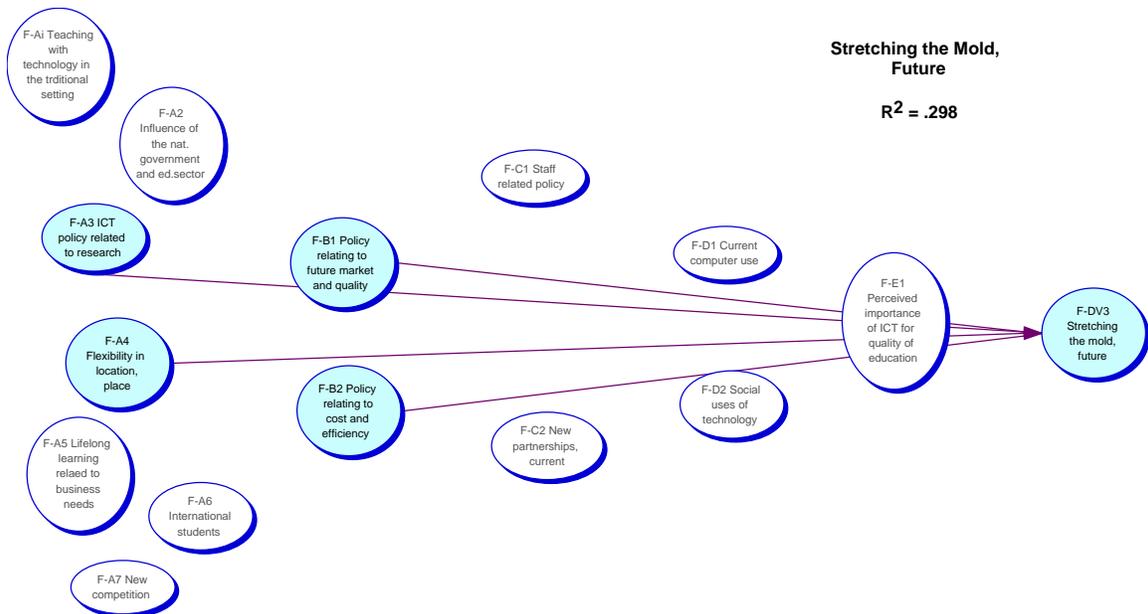

*Figure 7. Factors predicting the Stretching the Mould scenario, future*

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
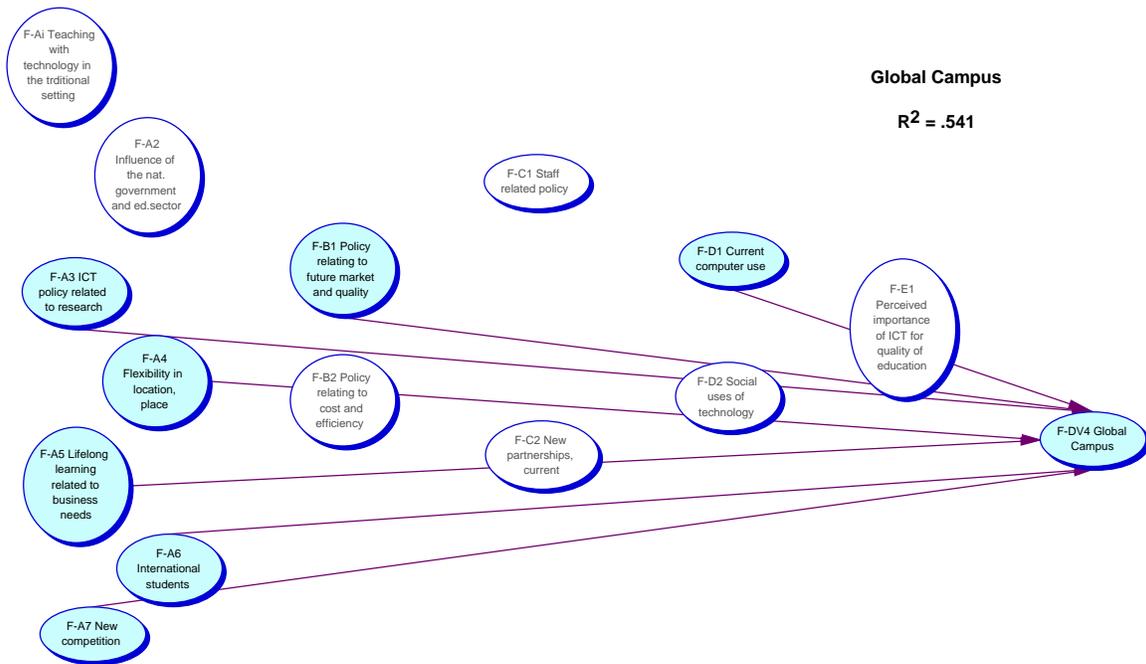
In the Global Campus scenario, the influence of international students (Factor A6), of new competition from commercial and foreign providers (Factor A7) and of policy related to future market and quality (Factor B1) are all important predictors. These factors do not appear in combination in any of the 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
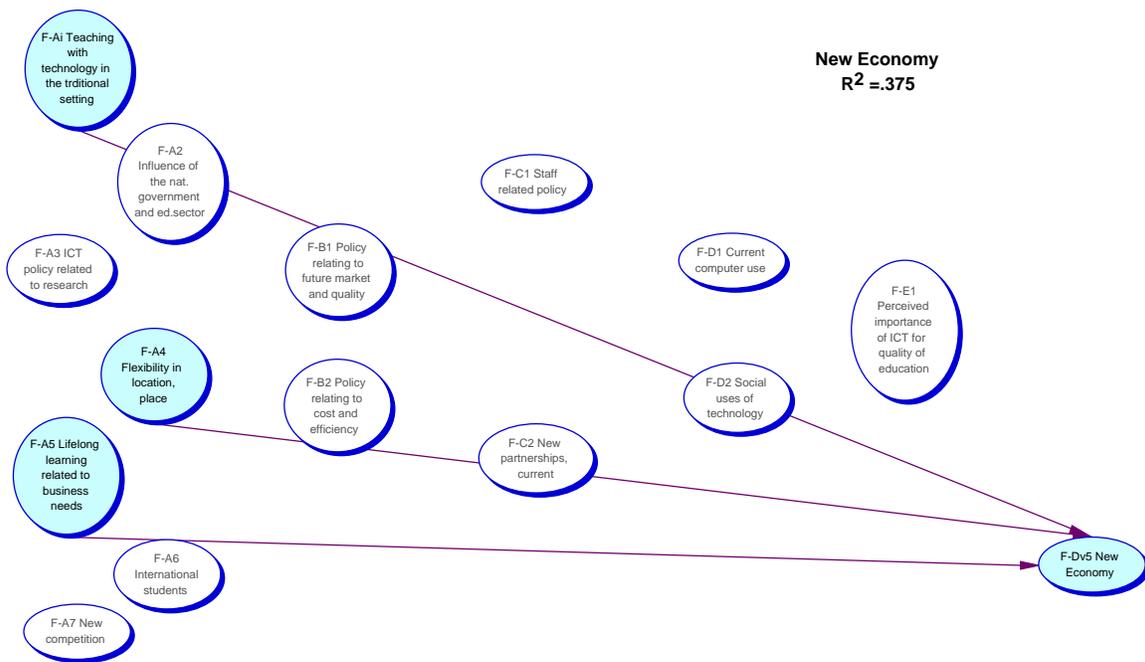
The New Economy appears to be motivated by two different sets of impulses. One relates teaching with technology (Factor A1) and the other to lifelong learning related to demand from the business world (Factor A5). Both of these demands relate to the other significant predictor, flexibility in time, location, 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.