

E-LEARNING IN NEW ZEALAND INSTITUTES OF TECHNOLOGY/ POLYTECHNICS: FINAL REPORT

**David Mitchell
John Clayton
Beverley Gower
Hugh Barr
Stephen Bright
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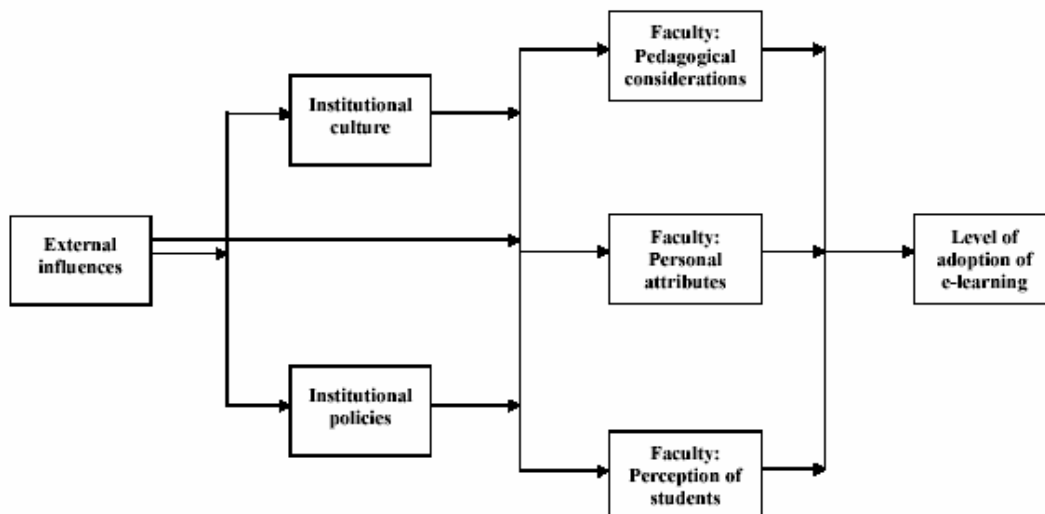


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EXECUTIVE SUMMARY

1. In response to some of the objectives of the Tertiary Education Strategy 2002-2007 and the recommendations of subsequent strategies around ICT and e-learning, the Ministry of Education is administering the **Tertiary e-Learning Research Fund** to support the conduct of research into e-learning in the tertiary sector.
2. This report is the final report of the project, *Learning from Adopters and Resisters of ELearning*, based at Waikato Institute of Technology, Hamilton, New Zealand. The main **goal of this project** was to investigate the factors that lead teaching staff in New Zealand Institutes of Technology/Polytechnics (ITPs) to adopt or resist the incorporation of e learning approaches into their teaching practices.
3. The research had four main **phases**:
 - Phase 1*: A literature search was conducted.
 - Phase 2*: The managers of e-learning in all 20 ITPs were surveyed to determine their institutions' e-learning policies and the extent to which e-learning had been adopted. Eighteen managers responded, yielding a return rate of 90%. As well, an analysis of publicly available policy documents for each of the 20 ITPs was carried out.
 - Phase 3*: Case studies were conducted in three ITPs. In these, the following tasks were carried out: (a) an analysis of policy documents pertaining to e-learning, (b) interviews with key management personnel with roles in e-learning, and (c) focus group interviews with a range of tutors.
 - Phase 4*: Teaching staff in all New Zealand ITPs were surveyed online to determine what factors influence their adoption or rejection of e-learning. A total of 831 tutors responded to the survey. This figure represented 23.6% of fulltime tutors, a return rate comparable to other large-scale surveys reported in the literature.
4. The principal findings of the study are arranged according to the variables outlined in the following model.



5. Level of Adoption of e-Learning in ITPs

- 5.1 A key aspect of the project was a **category system** that addressed tutors' levels of adoption of e-learning. Briefly, five categories were identified:
- A. Embracers:* advanced knowledge of e-learning/ thoroughly familiar with LMSs/ use e-learning to transform teaching...
- B. Modifiers:* understand e-learning tools and use selection of them/ exploring Learning Management Systems (LMSs)/ mainly focused on transmission of content...
- C. Examiners:* limited grasp of e-learning, but considering its possibilities/ use low-threshold technology/ exploring placing some material online...
- D. Doubters:* know a little/ not actively exploring/ satisfied with existing pedagogy...
- E. Refusers:* not interested/ know little about e-learning/ philosophically opposed...
- 5.2 Overall, the following self-identifications of tutors' **levels of adoption** of e-learning in their teaching were obtained: Embracers (11.9%), Modifiers (45.5%), Examiners (33.5%), Doubters (8.92%), Refusers (0.2%). These figures suggest that the sample was somewhat skewed towards the 'higher' end of adoption, although other data showed that 51% of the sample were not currently engaged in designing and/or delivering e-learning courses.
- 5.3 Responses from e-learning managers on the **management of e-learning** indicated that it was centrally managed in just under half of the ITPs, with another third opting for a model of devolved responsibilities within institution-wide integration.
- 5.4 With reference to **trends over time**, the bulk of the 18 e-learning managers considered that e-learning adoption was increasing, rapidly in the case of 4 and slowly in the case of 12. Two considered that it was plateauing, while none thought that it was decreasing. A related point is that e-learning managers noted considerable increases in Embracers and Modifiers from 2000 to 2004 and they anticipated even greater increases in those categories for the next four years.
- 5.5 In 90 percent of the ITPs, virtually all of the teaching staff had **e-mail accounts** and a significant majority of tutors reported using **personal e-mail** in their teaching practice. Significantly, **telephone support** was less widely used. It could be argued that the use of e-mail is more highly valued as it is not reliant on time or place, while the telephone is a somewhat haphazard form of connectivity. There was a clear trend towards Embracers and Modifiers finding *both* e-mail and telephone support more valuable than Examiners and Doubters/Refusers in their teaching, possibly suggesting that Embracers and Modifiers are more 'tuned in' to communicating with their students, irrespective of the medium.

- 5.6 **Audio conferencing via computers** was little used by tutors in general and, of those who did employ this approach, most found it to be of little or no value. Embracers were more likely to use it than the other groups, but even then only 45% of them employed it.

Using audio conferencing via computers (i.e., voice over internet protocols (VoIP)) raises a number of issues. Firstly, the potential limited internet capacity, broadband, of participant's computers limits the use of these tools to fairly robust high broadband networks. Secondly, the complex nature of the e-tools requires a highly technically literate participant to operate them successfully. Finally, participants' computers must have the necessary hardware, such as a graphics card and the processing speed for the tools to function. Therefore, it is not surprising the use of audio conferencing via computers is not widely used. It could be as VoIP technology becomes increasingly robust and reliable it will be more widely utilised.

- 5.7 Although personal e-mail was valued, general communication strategies using **email discussion groups** were not widely used, except among Embracers, where just over half employed the approach and most found it to be valuable. In contrast, only one-quarter of Doubters and Refusers used this method and, of those who did, the vast majority considered it to be of little value.

It could be argued that the perceived increased number of e-mails received during e-mail moderated discussion and the resultant increase in tutors' workloads generated by managing and responding to these e-mails is a major factor in tutor's lack of use, and perception of limited value, of these strategies. It could also be argued that the e-tools provided by multi-functional single-space learning management systems have made this method of communication obsolete.

- 5.8 Fewer than half the tutors surveyed used **video/audio conferencing**. Even among the Embracers, only 45% used this approach in their teaching. Of those who did employ it, few found it valuable or very valuable. For example, only 10% of Embracers gave it high marks.

The use of these synchronous e-tools is based on the assumption all participant's will be available at a specific time, and in the case of video conferencing, where delivery and reception hardware is required, they are further constricted to be in a specific place. The complex nature of e-tools requires a robust technical infrastructure and a sophisticated, technically literate participant to operate them successfully. Only a limited number of ITPs have invested in the development of an infrastructure to use video and audio conferencing tools and they are therefore not widely used.

- 5.9 With the exception of Embracers, **discussion groups and chat rooms** were little used. About two-thirds of Embracers employed un-moderated discussion groups in their teaching, the majority of whom found them to be of value. By comparison, only one-quarter of Examiners, Doubters and

Refusers used such approaches, most of whom rated them of little or no value. A similar pattern occurred with respect to the use of chat rooms.

A number of tutors appeared to be unaware of the perceived benefits of using student-to-student collaboration e-tools such as chat and discussion groups. For example, the benefits derived from peer collaboration on student achievement, retention and satisfaction may well have been underestimated. This suggests that tutors need to be regularly exposed to research and case studies demonstrating successful creation of e-learning environments using multiple e-tools. These should focus on how the provision of a range of e-learning activities, regardless of student location, enhances and enriches the learning environment of all students.

- 5.10 Tutors made wide use of **remote access to library electronic databases** in their teaching. As might be expected, Embracers and Modifiers were most inclined to use this approach (around 80%), most of them reporting that it was valuable or very valuable. Even over half of the Doubters and Refusers used it and mostly found it valuable/very valuable. Similar findings occurred in relation to the use of hyperlinks and accessing files from course websites.

It could be argued there is a need to ensure that library staff and other information specialists are fully included in discussions of e-learning activities contemplated within an institution and that they are asked to provide advice and assistance on the services and e-resources they can provide.

- 5.11 The use and provision of **web-based course materials** to students was highly correlated with the tutors' degree of adoption of e-learning. Thus, while over 90% of Embracers utilised this approach, only a little over one-quarter of Doubters/Refusers did so. Correspondingly, the vast majority of Embracers who used it rated it very highly, whereas the users in the other groups had a more mixed response.

These findings suggest that tutors need to be regularly exposed to research and case studies demonstrating the benefits to students of providing material via the web. These should focus on how the provision of digital material, regardless of student location, enhances and enriches the learning environment of all students.

- 5.12 Tutors' use of **CDROMs** in their teaching varied from 60% of Embracers to 36% for Doubters and Refusers, with the other two groups ranging between these two extremes. Of those who did use them, most found them at least moderately valuable.

It is significant that, given firstly, the publishing world's production of supplementary CDs with text books and the increasing development of interactive CDs by educational providers and, secondly, the potential reduction in the required broadband capacity of student computers, that this resource is not widely used or valued by a significant majority of tutors.

- 5.13 While two-thirds of the Embracers included **downloadable audio or video files** in their teaching, only one-half utilised **streaming audio or video files**. A similar shift occurred with Doubters and Refusers, the comparable proportions being one-half and one-quarter, respectively. The bulk of tutors who did use downloadable audio or video files considered this approach to be valuable, whereas those who used streaming audio or video files were more mixed in their judgments.

It could be argued that tutors are conscious of a number of issues that the presentation of sophisticated e-learning content generate. Firstly, the potential limited internet capacity, broadband, of participant's computers limits the use of this content to robust high broadband networks. Secondly, the complex nature of the e-content requires a highly technically literate participant to create and view them successfully. Finally, participant's computers must have the necessary hardware, such as a graphics card and processing speed, for the content to be speedily accessed. The use of media-rich content seems not to be highly valued or used.

- 5.14 **Web-based testing** was not widely utilised, other than among the Embracers. Of the Embracers and the Modifiers who did employ this approach, it was generally found to be of some value, the opinions of the tutors in the other two groups being more mixed.

It appears that significant e-tools designed to reduce the tedious task of marking and recording simple assessments are not widely used by tutors. It may be that institutional academic policies, processes and procedures regarding assessments and accreditation do not fully address the issue of delivering assessments via the web and, instead, favour traditional face-to-face institution-based examinations as the only means of valid assessment.

- 5.15 While over 80% of Embracers used **web-based administration materials**, the remaining tutors' usage ranged from just over half in the case of Modifiers down to around one-quarter for the Examiners and Doubters/Refusers. The Embracers who utilised this capacity were almost unanimous in the value they placed on it, the other users awarding it more mixed ratings.

Given the potentially large institutional financial investment in the provision of web-based services and information it is significant that these e-tools, which are designed to reduce academic queries and provide student information services, are not more widely used. Potentially, these e-tools could reduce tutors' workloads and provide students with more immediate responses. It could be argued there is a need to ensure that student support staff are fully included in discussions of elearning activities contemplated within an institution and are asked to provide advice and assistance on the services and information these support services can provide.

- 5.16 The **preferred Learning Management System (LMS)** used within the ITP sector was the proprietary system Blackboard, closely followed by the open source system Moodle. Tutors' utilisation of **LMSs** such as Blackboard and

Moodle was highly correlated with their levels of adoption of e-learning. Thus, nearly all Embracers used an LMS and the vast majority rated it as being valuable or very valuable. At the other extreme, only 25% of Doubters/Refusers used an LMS, most of whom rated it of little or no value. The other two groups fell within this range, with Modifiers being more similar to Embracers and Examiners more similar to Doubters/Refusers.

Given that there is a correlation between exposure to the integrated environments created by LMSs and the use of new e-teaching techniques, it is recommended that tutors be exposed to these systems if e-learning activities within individual institutions are to increase.

From the above findings, it is clear that tutors vary greatly in their use of various components of e-learning-related technology. This poses particular challenges to those responsible for formulating and implementing e-learning policies in ITPs: while some are advanced exponents of e-learning and incorporate a considerable array of its component parts, others are barely at the starting line. Equally clearly, any professional development programme aimed at expanding the uptake of e-learning must accommodate to this diversity of skills and attitudes. A one-size-fits-all approach must give way to a more targeted, customised approach.

To address these issues, it is recommended a limited number of e-learning software applications be used within an individual institution. It would appear the adoption of multi-functional single-space learning management system is advisable.

6. External Influences

6.1 In general, tutors agreed that **employers' expectations** for e-learning were more likely to facilitate than inhibit their adoption of e-learning, a view that did not differ greatly from group to group. Just under half of the e-learning managers thought this factor was critically or very important, with just over half rating it as being only of moderate or little importance. However, in all three of the case study institutions it was clear that management was perceived to be under pressure from employers of potential graduates to produce the kind of employees they need, in particular graduates with advanced skills and competence in computing and information technology.

Further work needs to be done to ascertain employers' expectations regarding ITPs making available courses utilising e-learning approaches, and those expectations should be conveyed to tutors.

6.2 Tutors felt that **students' expectations** neither facilitated nor inhibited their adoption of e-learning. Embracers were somewhat more likely to see students' appreciation of e-learning's value as an influence than were Doubters/Refusers, with the other two groups somewhere in between. The e-

learning managers rated students' expectations as the most important of seven listed factors in driving the development of e-learning in their institutions. In the case studies, managers, and to a lesser extent, tutors were aware of an increasing student demand for flexible and technology-rich learning environments in which barriers created by time and space are reduced. There was also an impression that students expect on-campus courses to be enhanced by e-learning, allowing them access to the web, the library, student facilities and tutors.

Here, too, further work needs to be done to ascertain students' expectations with regard to accessing courses taught through e-learning approaches. This applies to on-campus, as well as to off-campus students.

- 6.3 Tutors saw the need for their institution to obtain a **competitive advantage** through e-learning as a very influential factor, irrespective of their level of adoption. e-learning managers had a range of views as to the importance of this factor, with opinions ranging right across the spectrum, Competition from other providers was a very important issue for management and tutors in one of the case studies, but less so in the other two.

The reality is that e-learning (or, perhaps, more broadly, 'flexible learning') is here to stay and is likely to increase rapidly among tertiary institutions). Individual ITPs ignore this at their peril and will need to incorporate e-learning significantly if they are to be attractive to students and thus remain competitive.

7 Institutional Culture and Policies

- 7.1 The effect of **management support** for e-learning was rated by tutors as having neither a facilitating nor an inhibiting effect on their uptake of e-learning, but with a trend towards the former effect. There was only a low positive relationship between tutors' levels of e-learning adoption and their ratings of management support. When asked to give their views on the extent to which organisational structures in their institutions constituted barriers, the e-learning managers were spread across the spectrum, with a mean rating signifying that these structures constituted only a moderate barrier.

Clearly, without management support and encouragement, e-learning will develop only slowly, if at all. Any innovation requires leadership at all levels of an institution, but particularly at the senior management level, if it is to be taken up

- 7.2 e-learning managers' views on the degree to which a lack of an **institutional policy** on e-learning constituted a barrier in their institution ranged across the spectrum, with approximately one-third rating it as a major or significant barrier, another third as a moderate barrier and the final third as only a minor barrier or no barrier at all. All three case study institutions had long-term policies in place, although some of these were considerably more

advanced than others. All were committed to e-learning, and establishing comprehensive and specific policies was an important goal in each of them.

- 7.3 Tutors generally considered that their access to **professional development** that was focused on e-learning was neither facilitating nor inhibiting, but with a trend towards the former. There was a low positive relationship between tutors' levels of e-learning adoption and their ratings of access to professional development. However, there was a consensus among e-learning managers as to the importance of tutors having access to such professional development if they were to implement e-learning, with 17 of the 18 rating it as critically or very important. Management and faculty in all three case study institutions recognised the urgent need for professional development that would provide tutors with the technological skills they need to fully utilise e-learning. To a lesser degree, they were aware that the introduction of e-learning would result in changes to teaching and learning methodology and that this would create a demand for pedagogical professional development.

Appropriately-resourced and clearly-targeted professional development programmes are the *sine qua non* for introducing and expanding the uptake of elearning. Such programmes need to take account the findings in this report and other research. In particular, they should recognise the diversity of skills and attitudes that exist among tutors and the range of pedagogical possibilities that modern (and future) technology offer.

- 7.4 The availability of adequate **time to develop e-learning courses** scored the lowest of 30 variables that were investigated in the tutor survey, indicating that they generally found this to be inhibiting. This was the case across the board, even for Embracers. There was a consensus, too, among e-learning managers as to the importance of tutors having adequate time to learn about and develop material if they were to implement e-learning. All 18 respondents rated this as being critically or very important, the mean rating being among the very highest. This issue was a major one for faculty in the first case study institution, where faculty regarded the time involved in this process as a major deterrent to adopting elearning. They claimed that management greatly underestimate the time it takes to set up new courses or to modify existing courses. In a second institution, management and faculty were aware, from the experience of other providers, that the development of digital material could increase the time spent on the development of course material and they admitted that this could be problematic. However, the limited experiences of the institution and of individual tutors in the development of digital material meant that neither management nor faculty had any clear idea about how much time would be needed in developing e-content for courses. In the third institution, management asserted that while tutors might be concerned about the additional time needed to develop courses, this was only because they were new to technology. Managers argued that experience showed that introducing technology reduces workloads in the long-term, so using technology would increasingly become

less of a burden. Faculty in this institution expressed no concern about the additional time needed to develop courses.

This finding is of critical significance and poses a challenge for ITPs to invest resources to provide sufficient time for tutors to become skilled in developing and implementing e-learning courses.

- 7.5 Tutors' perceptions of the impact of e-learning on their **out-of-office time** was rated fourth equal lowest of the 30 variables, the mean trending it towards being an inhibiting factor. There were negligible differences among the ratings of this variable made by tutors according to the four levels of adoption. In other words, there was a general concern about the effects of e-learning on tutors' discretionary time. In a similar vein, e-learning managers considered tutors' perceptions that adopting e-learning would not unduly impact on their out-of-office time was very important or moderately important in their decisions to adopt it.

It is clear that individual tutor workloads would be affected by the introduction of e-learning and the associated growth of tutor-student communication, a finding that calls upon skilled management of human resources.

- 7.6 Participants in all three of the institutions studied were aware of the need to adequately **resource the introduction of e-learning**.

This involves providing funding that would finance professional development opportunities, providing time for tutors to create digital material and providing a reliable technical infrastructure, all of these constituting recommendations arising from the study

- 7.7 **Management support** for e-learning was rated by tutors as having neither a facilitating nor an inhibiting effect on their uptake of e-learning, but with a trend towards the former effect. This pattern was true of all levels of adoption. All but one of the e-learning managers rated this factor as being from moderate to critical importance.

It is therefore recommended that ITPs' management develop an overall plan and specific strategies for supporting tutors in developing skills in e-learning approaches.

- 7.8 Tutors in general considered the availability and quality of **technical support** to develop e-learning activities to be neither facilitating nor inhibiting, but with a trend towards the former. This pattern was true of all levels of adoption. The bulk of the e-learning managers rated technical support for developing and delivering e-learning as being critically or very important. Tutors in all three case study institutions expressed concern about their technological competence and the lack of a robust technical infrastructure.

It is thus recommended that ITPs ensure that an adequate technical infrastructure be put in place to support the development and implementation of e-learning. The focus of such support could well be on

assisting staff to implement the range of functions outlined in section #5 above.

- 7.9 The degree of importance tutors attached to collective **employment agreements** was spread across the range, with e-learning managers rating it as moderately important, while tutors themselves saw it as a somewhat inhibiting factor, irrespective of their level of e-learning adoption.

These findings suggest the need for ITPs to consider the place of e-learning in their contracts with staff.

- 7.10 To the tutors, resolution of **intellectual property rights** constituted the third lowest rated issue, the mean indicating that tutors felt it was neither facilitating nor inhibiting. There were negligible differences among the ratings made by tutors according to the levels of adoption. e-Learning managers' opinions on the satisfactory resolution of intellectual property rights as a determinant of tutors adopting e-learning were spread across the range, with a mean placing it in the very (but not critically) important category.

Notwithstanding this range of opinion, the researchers consider that ITPs should develop clear intellectual property policies relating to e-learning resources developed by staff.

- 7.11 Almost identical comments to the intellectual property rights can be made with respect to the effects of providing **rewards and incentives** for undertaking elearning. In the tutors' survey, the mean score on this variable was the lowest of the 30 surveyed and the extent of the differences between the various categories of adoption was also the lowest recorded. e-Learning managers' views were consistent with these results, with 8 of the 18 claiming that rewards and incentives for staff were critically or very important, while the remaining 10 considered them to be of only moderate or little importance. The mean rating was one of the least important for the 27 factors considered by the managers.

These results suggest that involvement in e-learning should not necessarily attract greater rewards for staff than any other area of their teaching.

- 7.12 **Size of institution** seemed to influence the extent of e-learning adoption, with a trend for tutors in larger institutions to have higher levels of e-learning adoption than those in smaller institutions.

These results pose a challenge for small ITPs where there are no economies of scale. A bare minimum of support structures is required for developing and implementing e-learning, especially beyond those in the Embracer category.

8. Pedagogical Considerations

- 8.1 Tutors in general considered that institutional support for them to work **flexible hours** was neither facilitating nor inhibiting, with a trend towards the former. e-Learning managers' opinions on this issue ranged across the

scale, with 12 of the 18 claiming that it was critically or very important to tutors, while the remaining 6 considered it to be of only moderate or little importance. The mean rating placed it near the middle of the 27 factors considered. All three case study institutions were aware of the flexibility that e-learning can provide, making it an attractive option for management and tutors who see it as a way of catering more effectively for students in remote areas and students who want to take classes outside normal teaching hours.

These findings suggest that employment contracts for ITP tutors should include consideration of the flexibility required/permitted by incorporating e-learning in their teaching

- 8.2 Tutors in general were only moderately concerned that e-learning would give them **less direct control over their teaching**, although there was a slight trend towards seeing it as having an inhibiting effect. The e-learning managers' opinions on this factor ranged across the scale, with just over half of the 18 claiming that this was critically or very important, while just under half considered it to be of only moderate or little importance. In the case study institutions, management and most faculty agreed that a change to e-learning would involve a significant change in pedagogy, but the view that traditional methods of teaching and learning were becoming obsolete as new technology-rich ways of teaching are introduced was not universally held.

The challenges that e-learning pose to tutors' pedagogical philosophies and practices are manifold and should be addressed in systematic professional development programmes.

- 8.3 Tutors in general considered that the relevance of e-learning to their **subject areas** to be rather more facilitating than inhibiting. However, there was a strong indication that those who have not committed themselves to elearning (i.e., Doubters and Refusers) saw it as not being appropriate to their subjects, whereas Embracers had no such qualms. The e-learning managers considered that tutors' perceptions of the relevance of e-learning to their subjects were of considerable importance in their decision to adopt this approach, this variable having one of the highest means. Management in the three case study institutions saw few problems in introducing e-learning, agreeing that it could be applied to almost all subjects. However, there was a greater variation of opinion among tutors.

Clearly, many tutors remain to be convinced that e-learning is a viable, even superior, alternative to more traditional approaches to teaching. For those who feel it does not suit their particular subject or field, exemplar programmes should be able to be accessed and analysed.

- 8.4 Tutors in general considered that the **pedagogical benefits** of e-learning was rather more facilitating than inhibiting. However, there was a strong positive relationship between tutors' levels of e-learning adoption and their ratings of its pedagogical benefits. In other words, Embracers were much more likely to perceive benefits than Doubters/Refusers. In a similar vein, e-learning

managers considered that tutors' convictions as to the pedagogical benefits of e-learning played a very important role. Quality assurance was a major issue in all three case study institutions. Tutors particularly wanted to be assured that introducing e-learning would not detract from the quality of their courses.

These results suggest that further research needs to be carried out to demonstrate the (presumed) benefits of e-learning and that the results of existing research in this field should be disseminated.

- 8.5 Tutors in general considered the availability of **mentors** to be neither facilitating nor inhibiting, although the evidence suggests that mentors could well have played a significant role in facilitating Embracers adoption of e-learning and (possibly) their absence might have inhibited Doubters/Refusers. The e-learning managers gave a very high rating to the availability of mentors as influencing tutors' decisions to adopt e-learning, all 18 rating this factor as critically or very important. In all three case studies, the availability of peer support, guidance and advice, both from internal and external colleagues, was considered to be essential. Tutors were of the opinion that this sharing of experiences could provide them with models and examples, avoiding the trials and tribulations that occur when tutors introduce e-learning activities within their courses on their own.

These results suggest that professional development courses on e-learning should utilise the experiences of staff who have successfully incorporated this approach in their teaching. It also suggests that panels of experienced exponents of e-learning should be drawn up in each institution to provide assistance to staff who wish to incorporate e-learning into their courses.

- 8.6 Tutors considered their experiences of the **reliability of computer technology** to be neither facilitating nor inhibiting, but with a trend towards the former. A related factor, tutors' **tolerance of changes in computer software**, yielded a mean that indicated that they were equivocal about whether it was facilitating or inhibiting. However, there were differences of opinion within the sample, with Embracers rating it as facilitating and Refusers/Doubters as trending towards inhibiting.

This finding suggests the importance of carefully rolling out new technology in institutions and ensuring that it is adequately "de-bugged" before giving access to it by staff. Any new system will require careful introduction and technical support, especially in its early days.

9. Tutors' Personal Attributes

- 9.1 There were no **gender** differences in the levels of adoption of e-learning.
- 9.2 There appeared to be a relationship between **ethnicity** and level of adoption of e-learning, with Pakeha/Europeans and Asians having higher levels of adoption than Maori and Pacific Island tutors. For example, 58% of the Pakeha/Europeans identified themselves as Embracers or Modifiers, compared with 42% of Maori.

Further work needs to be done to explore any cultural barriers to the uptake of e-learning. For example, are Maori inhibited from adopting e-learning because it is seen to contravene their world view or because the courses they predominantly teach are considered to be inappropriate for conversion into an e-learning mode?

- 9.3 **Age** was not related to level of adoption of e-learning.
- 9.4 Tutors who taught **off-campus courses** were more likely to have higher levels of e-learning adoption than those teaching mainly on-campus.
- 9.5 Tutors in general considered their **technological competence** to be rather more facilitating than inhibiting, but with a moderately positive relationship between tutors' levels of e-learning adoption and their ratings of technological competence. In a similar vein, the e-learning managers rated tutors' technological literacy as a moderately to very important determinant of their decision to adopt e-learning, the mean rating placing it towards the middle of the 27 variables explored. In the case studies, all the tutors interviewed, even those who rated themselves as Embracers claimed that they would need to continually update and improve their technological skills. However, even those tutors who considered their skills to be only adequate, or less than adequate, did not see this as a barrier to implementing e-learning in their programmes.

In addressing this issue it is important to recognise that staff are spread across the whole spectrum of technological competence, ranging from those with no or minimal computer skills to those with high levels of such skills. It is probably most cost effective to place an emphasis on upgrading the skills of those with moderate proficiency.

- 9.6 Embracers indicated that their **openness to change in general** facilitated their adoption of e-learning, while Doubters/Refusers found it to be neither inhibiting nor facilitating. Likewise, tutors' openness to change was given one of the highest ratings by the e-learning managers as a determinant of tutors' decisions to adopt e-learning, with 15 of the 18 considering it to be critically or very important. In the case studies, most of the tutors claimed that they were already innovative in their teaching, often introducing and trying new methods and resources. They agreed that their motivation to try new systems is higher when the benefits of change are clearly articulated.

While openness to change is probably a deeply embedded personality trait, it must be recognised that most human beings are flexible and adaptable. The trigger point for change, however, will vary from individual to individual and a good manager will both recognise this and, accordingly, will adopt appropriate strategies to encourage staff to change.

10. Student Factors

- 10.1 The highest levels of adoption came from tutors in **courses** in which there would appear to be a perceived need for students to acquire skills in information and communication technologies in order to meet industry

requirements (e.g., Business, Administration, Retail, Information Technology and Health). The lowest level of adoption occurred in those courses in which there would appear to be a greater emphasis on the acquisition of practical skills (e.g., Trades, Engineering, Construction or Media Arts) or those with a focus on interpersonal communication (e.g., Social Services, Maori, Pasifica).

These findings pose a particular challenge to proponents of e-learning: how to demonstrate the utility of e-learning across a wide range of subjects. This can be addressed in a variety of ways, including demonstrating existing e-learning courses (or parts of courses) in, say the 'practical' subjects, making available relevant literature on such courses, and getting alongside staff who express an interest in developing such courses.

- 10.2 The e-learning managers expressed a range of views on the relative importance of **attracting new markets** as a driver of e-learning adoption, but generally rated it quite high. Ten of the 18 rated it as being critically or very important, the remaining 8 rating it as being only moderately important. In the case study interviews, management and faculty were aware of the ways that e-learning can create opportunities for extending the boundaries of courses in which they have a specialist advantage. They saw the flexibility that e-learning provides can attract mature students, students returning to the workforce and students in remote areas.

This could well be the most important driver for staff to incorporate e-learning in their teaching, for the vast majority of them are sensitive to and responsive to students' needs.

- 10.3 Tutors in general considered **students' access to computers** to be rather more facilitating than inhibiting, with a moderately positive relationship between tutors' levels of e-learning adoption and confidence that their students have ready access to computers. Given the ubiquitousness of computers, these results are unsurprising. Three questions in the e-learning managers' survey addressed students' ability to deal with e-learning – their ready access to computers, effective orientation to software, and technical support. All three received high ratings. Likewise, in the case studies faculty recognised that students face new challenges in e-environments and that in these environments students need to be able to use systems effectively, to be e-information-literate and be able to retrieve, store and use reliable and relevant information from the web. Faculty considered that many students lacked these and other skills. In most instances, this was because students lived in remote areas or because they were entering tertiary education from the workforce. In some cases, language and literacy skills were a barrier to using e-learning. Faculty claimed that many students had less experience with computers and fewer technological skills than was generally assumed by management and by tutors themselves.

While most of the preceding findings have focused on tutors, the other half of the teaching-learning equation is made up of students. Clearly, for e-

learning to work, students' technological competence and access to appropriate technology must be high on the list of ITPs' priorities. This involves giving consideration to familiarising student with what is involved in e-learning, ensuring that e-learning courses are adjusted to the kinds of computer resources they can access and ensuring that they can access adequate technical support.

11. Conclusions

- 11.1 The central question of this study was what factors inhibit or facilitate ITP tutors' decisions to incorporate e-learning into their teaching? The briefest answer to this question is that a complex array of factors comes into play in influencing the extent to which tutors adopt e-learning and that, depending on various circumstances, a particular factor may be seen as facilitating by some tutors and inhibiting by others.
- 11.2 There is wide diversity among tutors with regard to their levels of e-learning adoption. This has ramifications for planning and delivering professional development. Clearly, one size does not fit all. However, to reduce anxiety and to ensure consistency of tutor professional development there should be a limited number of software applications used within an institution. The adoption of an institutionally deployed learning management system could resolve this issue.
- 11.3 As with so many technological developments, it would seem that the majority of tutors, even the Embracers, are only scratching the surface of technology's potential. For an institution to continue to develop skills, strategies and techniques in e-learning, staff at all levels need to be continually exposed to applied research demonstrating successful, pedagogically sound emerging technologies in elearning environments deployed in a range of disciplines.
- 11.4 There is wide diversity among ITPs in their commitment to and involvement in elearning, with a few that are advanced and many that are only at the beginning stages. Institutions need to develop long-term policies and strategies that take account of rapidly shifting developments in technology and attendant pedagogy.
- 11.5 Institutions should recognize that expenditure in a reliable, robust and secure elearning technical infrastructure is a critical investment in an increasingly competitive environment with heightened expectations from tutors, students and employers.
- 11.6 It is clear that the place of e-learning in ITPs (not to say other parts of the tertiary education sector) is going through a period of rapid development - and it shows every sign of continuing to do so. The findings of this study, then, are strictly time-bound.

12. Limitations of the Study

- 12.1 Although a 90% return rate was obtained from e-learning managers, the return rate from tutors was only 23.6%. While this rate is comparable to

several other published studies, it clearly limits the extent to which the findings are true of the whole ITP sector.

- 12.2 Responses to the tutors' survey may be somewhat biased towards e-learning practitioners, but against that it should be noted that half the respondents were not involved in developing or delivering e-learning courses at the time of the survey.
- 12.3 There was a slight gender imbalance in the respondents to the tutors' survey, with females being overly represented compared with the national ITP gender ratio.

13. Implications for Further Research: Some Questions

- 13.1 Is the considerable investment of time that early adopters put into developing courses in the early days of e-learning still necessary, or has the increasing availability of more sophisticated LMSs and technical infrastructure significantly reduced time requirements?
- 13.2 What is going to be the impact of likely/possible changes in technology on e-learning in the future? How can institutions prepare for inevitable change when its parameters, by definition, are largely unknown?
- 13.3 What expectations, skills and experiences relating to e-learning do students bring to tertiary education? How rapidly are these changing?
- 13.4 What do employers and professional bodies expect regarding e-learning provisions in the future? Are they currently using e-learning in training staff inhouse? Will they be increasingly likely to do so in the future?
- 13.5 What are the key features of professional development programmes that take account of results of studies such as the present one? How can professional development programmes accommodate to the wide range of e-learning-related skills and attitudes of faculty and managers as portrayed in the findings of this study?