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# Information and Communications Technologies (ICT) in Higher Education Teaching - a tale of gradualism rather than revolution

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## **Abstract**

The widespread adoption of information and communications technologies (ICT) in higher education (HE) since the mid 1990s has failed to produce the radical changes in learning and teaching than many anticipated. Activity theory and Rogers' model of the adoption of innovations provide analytic frameworks that help develop our understanding of the actual impact of ICT upon teaching practices. This paper draws on a series of large-scale surveys carried out over a 10 year period with distance education tutors at the UK Open University to explore the changing role of ICT in the work of teachers. It investigates how HE teachers in one large distance learning university have, over time, appropriated ICT applications as teaching tools, and the gradual rather than revolutionary changes that have resulted.

## **Introduction**

Despite the widespread adoption of information and communications technologies (ICT) in higher education (HE), recent research suggests that the impact of ICT has fallen short of the rhetoric that it would produce radical change in learning and teaching (Collis & Wende, 2002; Zemsky & Massy, 2004). This has led to a sense of disappointment that the transformatory potential of the technology is being missed (Garrison and Anderson, 2000), or worse resisted. However, if what *is happening* in the sector is examined in an analytical fashion, and without prejudging against what enthusiasts said *should be happening*, ICT can be seen as being appropriated by HE teachers to support their core teaching activities.

While most HE institutions now possess abundant computers and technological infrastructure, there is considerable variability in adoption patterns when it comes to the activities and purposes for which ICT is being used. The differing adoption patterns are better understood if HE is seen being made up of many institutional activity systems. ICT is only one of the tools and sub-systems that make up the whole and teaching is only one of the many activities that take place there. In this paper we use two analytical frameworks to make sense of examples of variable adoption patterns in one institution.

Central to the first of these frameworks – Activity Theory – is the principle of tool mediation, i.e. that human activity is oriented towards an overall goal (object) and mediated by the use of tools, either conceptual (e.g. language) or physical (e.g. instruments or devices) (Leont'ev, 1978). The tool mediation model has been extended by Engeström (1987) to provide a representation of the wider socio-cultural (*community*) context that both enables and constrains activity through *rules* and the *division of labour*. The activity system model accentuates aspects of the context that must be taken into account when examining tool use within a specific setting, for example how ICT tools are used in particular HE settings. Thus it is useful for identifying potential contradictions within a particular system, for example between

the ‘tool in use’ (teacher behaviour) and ‘tool as intended’ (policy maker’s or manager’s intention)

The other analytical framework we draw on is the staged adoption of innovations proposed by Rogers (1995) and used effectively by Zemsky and Massey (2004) to explain what has happened to e-learning in the US HE institutions they were observing. The innovation adoption curve (Figure 1), developed from Rogers (1995), suggests that *innovators* and *early adopters* who are the first to use any innovation, behave differently from later adopters. They are driven by intrinsic interest in the innovation and are willing to take risks and invest time and energy working with the innovation. The *early majority* are also interested in the innovations, but are more attracted to what the innovation can do for other areas of their lives rather than the innovation *per se*. *Diehards* (sometimes referred to as *confirmed traditionalists* or *resisters*) may never adopt the innovation willingly. This framework is useful both to explain and predict a general cycle of technology adoption, but it cannot explain why some tools and technologies are adopted in the way intended and others are not. But, combined with an explanatory theory that focuses on the particular relationships between the components of any technological system or tool use - in this case Activity Theory - the reasons for specific adoption trajectory of any technology can be better understood.

Figure 1 About Here

For any innovation, it is a mistake to extrapolate from the actions and enthusiasm of early adopters in order to predict the use and impact on the larger scale. However, in much of the recent literature this appears to have been done for ICT in education. What is needed are studies of ICT use in HE teaching over a longer period, so that the behaviour of late adopters, even of resisters, is examined.

This paper reports a longitudinal, interval study ( see internal reports Kirkup 1998, 200, 2003 and Kirkwood et al 1996)of attitudes towards and use of ICT in teaching at the UK Open University (UKOU), a national distance teaching university. Regular large-scale surveys of access to and use of ICT by UKOU teaching staff have been carried out since the mid-1990s. Changes in the behaviour and attitudes of this group parallel, and in many cases anticipate, what has been happening in elsewhere in HE contexts.

Although distance education (DE) has historically been the poor relation in HE, it is from within DE that a great deal of the present understanding of good practice in HE teaching originated. Further, because of the potential of ICTs to improve the nature of interaction in distance education, DE teaching activity has taken the lead in many aspects of ICT use – in particular, use of the Web and computer-mediated communication. UK Government initiatives now require campus-based universities to achieve economies of scale for increased enrolments, and to apply systematic quality assurance methodologies to their teaching. Such demands have existed for DE over a much longer period.

The practices that DE tutors have developed, using a variety of media, are increasingly seen as highly important for teachers in face-to-face contexts. Many of the most widely used practical texts for HE teachers, such as those written by Gibbs (1988) on how to promote active teaching and learning and those by Salmon (2000; 2002) on how to design and moderate computer based teaching activities, stemmed

from work which originated in a DE context. ICT systems have now replaced many of the media previously used in DE, and are also involved other systems in HE: quality assurance, instructional design methodologies, student support and interaction, research and general administration.

### ***Technological Drivers - Advances in ICT***

In the last decade of the 20<sup>th</sup> century computers had become commonplace in a wide variety of settings: at home, at work and in educational institutions. For example, by July 2003 almost half (48%) of all UK households had Internet access (Office for National Statistics, 2003), while research for the UK Department for Education and Skills (BECTA, 2003) indicated that 98% of young people used computers either at home, at school or elsewhere. HE institutions now rely on computers for all aspects of their activities: administration, teaching and research.

In DE, the communications capability of the Internet has acted as an important driver for change. DE courses have made increasing use of e-mail, computer conferencing and access to resources via the World Wide Web. In recent years there has emerged a preference for constructivist learning theories and Nipper (1989) predicted that ‘third generation’ distance education would be characterised by a greater emphasis on the use of communication technologies to facilitate dialogue between the participants in the educational process and with the establishment of on-line learning communities. He maintained that a more organic approach to teaching and learning would be possible, in contrast to what he argued was the largely one-way flow of packaged knowledge and instruction from teachers to learners inherent in ‘second generation’ distance education. However, many distance educators would argue that this presented a simplistic version of DE. In many cases, instructional design and student support together engaged the student to interact with materials, with other students and with the tutor. This explicit interest in interaction and dialogue provided the fertile ground for networked ICT to be well received.

Within conventional universities there has been high institutional investment in ICT infrastructure to support more ‘flexible’ or ‘blended’ models of teaching and learning. Institution-wide networks have been established, often including a Virtual Learning Environment (VLE) or similar system (see, for example, Brown, 2002; Ingraham *et al.*, 2002; O’Hagen, 2003). ICT has been introduced into courses to support distributed or part-time learners, or simply to supplement classroom-based teaching. There are many examples of ICT resources that have been developed for use within individual academic departments (e.g. Rainbow & Sadler-Smith, 2003; Saunders & Klemming, 2003; Szabo & Hastings, 2000; Williams, 2002) and of materials developed by subject-based consortia for use in a number of institutions (e.g. Jelfs & Colbourn, 2002; Garland & Noyes, 2004).

By June 2000, every HE institution in England had published a Learning and Teaching Strategy (Gibbs, 2001). Analysis of those documents revealed that 48% of institutions had targeted the HEFCE priority relating to the ‘development of flexible learning’ and 47% had targeted ‘improved access to learning resources’. The exploitation of communication and information technology was one of the most frequently cited change mechanisms, specified by 81% of institutions (Gibbs, 2001). Yet, despite these figures, the implementation of ICT systems for teaching and learning has had less impact than expected.

It is becoming apparent that, in campus-based contexts, teaching staff appropriate those technologies which they can incorporate into their teaching activity most easily, that offer affordances for what they already do, rather than those which radically change teaching and learning practices. For example, in a study of staff at Brighton University, Haynes *et al.* (2004, p. 161) report that:

“Staff have initially used IT to support their current working arrangements, such as the production of typed handouts and lecture presentations and are more confident using IT to reinforce existing working practices rather than embark on radical new learning practices .... This has led to an incremental implementation of IT in higher education with gradual application of IT to support current teaching, learning and administration.”

Activity systems models, and Rogers’ model of innovation adoption help explain why this is the case.

### ***Teaching in HE - Tools and Systems***

Activity systems theory is a popular framework for understanding problems with the implementation of new tools into established systems of activity (Engeström *et al.*, 1998). Activity systems analysis can provide a framework for understanding the activities involved in university teaching (Knight, 2002). The analysis produces diagrams which highlight the interactions between the mediating artefacts (ICT and other physical resources) that a teacher uses and the rules and conventions of institutions and national systems, the professional and local communities of practice of the teachers, and the division of labour of teachers and students in the teaching activity. It provides a way of understanding what is happening when conflicts occur between any of the components of the system.

Activity theory suggests that both the technologies and the teachers themselves are changed as they interact in the activity system. Changes happening in HE teaching may be missed because they are not occurring where research attention is being focused. For example, before the widespread adoption of ICT in HE, research on teacher’s conceptions of teaching in face-to-face institutions found that greater use of teaching media was factored with a preference for teaching as knowledge transmission: teachers who were more ‘student oriented’ used less technology (Kember and Gow, 1994). This would appear to be changing. A recent survey of teaching staff in 5 UK institutions (Norton *et al.*, 2004) found that the use of media was associated with an orientation towards learning facilitation, rather than knowledge transmission. However, this attitude change was predated in DE, where extensive media use was there to support student learning.

### ***Description of the Research***

This paper describes, at the meta-level of large-scale survey data, the process of these trends over a decade in which there has been a rapid acceleration in the use of ICT in UK HE. The data were collected from four large-scale postal surveys of UKOU tutors (see Note). This series of studies provides a unique resource for examining the development of institutional policies and practices over a 10-year time frame. They provide information about the extent of use of ICT by tutors and their concerns about the increasing adoption of ICT tools in their work. The surveys were conducted in response to the university’s need to monitor the changing behaviour, opinions and

environment of their tutors. They also enabled tutors to express their needs for both technical support and professional development for their work with the UKOU.

The surveys explored changing concerns as the technologies and the activities for which they were used developed over time. Many of the tutors who were using ICT in the mid-1990s were early adopters, with their ICT use often closely linked to the course or subject they tutored. As use of ICT became more mainstream, the surveys explored the range of activities tutors undertook with ICT. Many tutors were late adopters, whose tutoring was facilitated by the communications aspect of ICT use.

Each survey was sent to a large sample of tutors; approximately one-third of all tutors employed by the UKOU at the time. In the early surveys the samples were drawn randomly: subsequent samples were representative, reflecting the relative distribution of tutors across faculties and levels of study. All the surveys achieved a high response rate. Details of the samples and response rates are presented in Table 1.

Table 1 About Here
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## ***Findings***

### **Tutors' access to ICT and the Internet**

Over the period of the research, tutors' overall computer access increased, especially to equipment located at home. All tutors are part-time employees of the UKOU and the university provides them with neither computer equipment nor accommodation in which to use it; they must provide these for themselves. However, many have their main employment in other HE or FE institutions, and there was an assumption in the mid-1990s that a considerable proportion of tutors would have access to a suitable work-based computer. In fact, many tutors had computer access 'both at home and at work' – Table 2 presents the data for the period 1995-2000.

Table 2 About Here
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In the mid-1990s there was a clear link between tutors' computer access and the course they tutored. Only a minority of the University's courses *required* students to have computer access and to undertake activities with course-related software. Most of the tutors for those courses were early adopters of computing equipment, while tutors for other courses were less likely to have access. So, access was highest among those tutoring courses in the School of Management and the faculties of Technology, Mathematics & Computing and Science, in which there were many courses with *required* ICT components. Access was lowest among the tutors for courses in Arts, Education and Social Sciences, in which few had essential ICT elements.

The most recent survey (2003) revealed that computer access had become almost ubiquitous. Many late adopters were now using ICT and fewer than half of the respondents (46%) were tutoring courses that *required* the use of course-based software. Nearly all tutors used the Internet by this date: Only 4.3% indicated that they did not go on-line for UKOU work.

This is in marked contrast to the position in 1995, when UK domestic access to the Internet was still quite low. Then only 20% of home computers used by tutors had a

modem. By 1997 65% of respondents with access to a computer had some form of communication facility (representing 28% of all survey respondents). Computers without communications facilities were more prevalent among those tutoring courses in languages (47%) and arts and humanities (51%). In contrast, 87% of tutors for courses in management and technology were using a networked computer.

By 2000, 90% of tutors had Internet access (78% at home), illustrating the fact that a major function of personal computers was communication as part of the 'Network' Society (Castells, 2000) and the domestic media landscape. Actual use was also high: 51% of tutors accessed the Web daily, 66% used e-mail, 42% engaged in computer conferencing, 49% consulted the general university website, 37% used course specific websites.

### **Using ICT for student support**

Contact between UKOU tutors and their students is achieved by various means throughout the study year. Most importantly, the tutor grades and provides comments on the assignments submitted by students, usually by post. These extensive comments provide important feedback aimed at enabling the further development of a student's learning. The tutor also provides academic support to their group of students, either face-to-face (at occasional group sessions, where these are viable), by telephone or – increasingly – by electronic means. Students are encouraged to make individual contact with their tutor to clarify difficulties they encounter when studying course materials, to explain misunderstandings or to elucidate aspects of the course structure or approach.

Tutors also provide learners in their group with general academic support and guidance in their studies. They are encouraged to act proactively to motivate independent learners and can also offer advice and guidance (to individuals or the whole group) on wider issues related to studying, for example, helping learners to develop appropriate study skills. In order to carry out these responsibilities effectively, tutors need to maintain contact with several parts of the Open University often at great geographic distance.

For most courses, opportunities for face-to-face contact between tutors and students are limited to occasional group sessions. Student attendance at course tutorial sessions has always been optional and many do not go to them due to a range of factors, primarily the time and/or location being inconvenient.

From a single course in 1988, computer conferencing has been increasingly incorporated as a course component, although often on an optional basis. One-to-one or one-to-many e-mail communication developed as a result of individual initiatives and capabilities, rather than as a result of institutional policy. The 1996 edition of the *Supporting Open Learning* handbook for tutors (Open University, 1996) included a brief section on computer use, only part of which provided some practical advice about the tutor's use of e-mail and computer conferencing.

By 2000 ICT use in the UKOU had moved from being an activity for innovators and early adopters to include the late majority. It is not surprising that much of the ICT mediated activity undertaken by the late adopters was in support of their traditional tutoring role. 72% of tutors used the Internet for their UKOU work and, to a very large extent, they used general-purpose applications for their tutoring activities with

students. Table 3 lists common tutor activities and indicates the percentage of those who used ICT to undertake them.

Table 3 about here
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Of crucial importance in DE are the interactions tutors have with students about assessment. The importance of extensive and rapid feedback on students' work has long been recognised as a key aspect of DE. As access to ICT (and confidence in using it) increased, one of the key uses of ICT tools – both custom-built and general-purpose applications such as e-mail – was for giving feedback on student assignments. Although these late adopters used the Internet extensively for contact with their students, they still valued their face-to-face contact and were worried that there was a general move towards making **all** student contact online. Two tutors commented:

*A move towards Internet teaching will make me review my position with the OU.*

*Wouldn't suggest an entire switch to electronic media. It's a useful back-up, but students still need (and want!) face to face contact at tutorials, phone calls, etc.*

### **Appropriating ICT as a tool for tutoring**

By 2003 students and tutors were using a wide range of course-based or university-specific applications and resources. 47% of tutors were working on courses with specific course-based software, 72% on courses that used computer conferencing (mainly *FirstClass*<sup>™</sup>), 72% on courses with online resources, 59% on courses with online library use, and 26% on courses with electronic submission of assignments.

Tutors were asked to rate the usefulness of five methods of student contact (telephone, post, e-mail, conferencing and face-to-face). E-mail was the highest rated contact method (76% rated it as 'very useful'), followed by face-to-face (75%) and telephone contact (62%). Despite widespread integration of computer conferencing into courses and extensive professional development for tutors on how to use this medium, it was rated as the least useful (only 37% rated it as very useful). In the DE context of the UKOU, 'face-to-face' was the least frequently used medium, but it was still perceived as extremely useful. This preference for face-to-face teaching continues through the whole period described in this paper, and goes hand-in-hand with an enthusiasm for using online media. It would be a mistake to presume that a new technology will simply replace an older one. Usually the new and old technologies bed down together in some kind of synergetic relationship. For example television, cinema and digital media now not only co-exist but are entwined in joint products. Sometimes managers make a financial decision to withdraw resources from one technology to fund another, and an argument that one will successfully replace the other is therefore attractive. However, historical precedent would suggest that is not an accurate representation of what happens in practice. So we should not be surprised that tutors make clear their desire to retain some face-to-face components for student contact, and for their own professional development.

In the 2003 survey, tutors were asked which media they used for each type of tutoring activity. For any particular activity, many tutors used more than one method of communication. Table 4 gives an indication of the different ways in which tutors were using media when they had a free choice (as a percentage of total respondents). Again



it shows the increase in the use of ICT alongside the extensive use of traditional media.

Table 4 about here
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Tutors felt that the option of using ICT had improved the quality of their work, most significantly their ability to respond to students' queries; nearly 70% felt that quality had improved 'very much'. In all the other listed activities, the percentage reporting some, or a great deal, of improvement in quality ranged from 56% of those who use ICT for creating or storing student records, to 85% of those who use ICT to make contact with faculty members. For most activities the majority of tutors reported a reduction (or no change) in time spent when using ICT (less than 20% reported an increase in time).

Many tutors felt that they derived benefit from using ICT for the administrative aspects of tutoring. Most teachers at any level would be very pleased see a reduction in such activities, or in the time spent doing them. In the 2000 survey tutors expressed enthusiasm for administrative materials to be sent electronically, to avoid duplication and reduce costs to the university. More detailed questions were asked about this in 2003. Although the telephone was still the preferred medium for contacting the University for administrative matters, e-mail contact was popular. 75% of respondents who used electronic media for administration contacts felt that quality of interaction had improved and 44% felt that time spent had decreased. Few tutors defended paper-based administrative communications, although there was recognition that the costs for printing (if they chose to do this) had transferred to the tutor.

For this teaching-related activity, the use of ICT has been very beneficial in helping tutors achieve their objectives. They are happy to incorporate it into their administrative activity system and there are no conflicts between components of the system.

In contrast, there were two activities for which a substantial proportion of tutors reported expending increased amounts of time: responding to student queries and giving feedback to students on their assessed work. For the first of these, 36% of tutors reported an increase in the time spent, because the technology had raised student expectations and the demands they made from their tutors, as illustrated by the following quotes.

*Students are much quicker to ask questions than they would be if they had to pick up the phone. Generally, I think electronic support provides the student with a much better service but it is much more time consuming.*

*Student email: I have to lay down very strict guidelines – originally inundated with lengthy course related queries.*

*Email contact with students seems to increase each year (and this feels more time consuming than telephone contact).*

The second activity for which time had increased was in giving feedback to individual students on their assignments. Tutors have always been expected to provide extensive comments on each assignment: this is a key opportunity to provide feedback aimed at enabling the further development of a student's learning. Student demand for

feedback has not changed, so the increase in time for this activity appears to result, in part, from the introduction of a new electronic system. Traditionally, students' assignments were all on paper, mailed to tutors for their comments and grading. A growing number of courses now require use of the 'electronic tutor-marked assignment (ETMA) system. This is a 'bespoke' system where students send 'zipped' files to a secure website, which recognises the student and course, attaches documentation to the work, and archives it. The tutor accesses that same secure site, collects the zipped file plus attached documentation and downloads it. The files are then unzipped and marked using another bespoke application which record the grades and comments, and a word processing application to make in-text comments on the student's work. When complete all the new files are zipped and uploaded to the same secure website, which records the grade, archives the marked work, from where it can be collected by students. In 2003 the ETMA system was being used by 18% of tutors. More than half (55%) of those reported an increase in time spent, while 25% reported a decrease. Other tutors (not using the electronic system) also appear to have voluntarily spent longer creating higher quality word-processed feedback for students, but not to the extent demanded by the ETMA system.

Figure 2 uses an activity diagram of student assessment in the UKOU to show where the conflicts occurred between components of that particular activity system (the zigzag lines which overlay the connections between nodes in the diagram). The marking/ commenting tool itself was causing problems for tutors because it introduced technology related activities that were time-consuming and ponderous to use. The tools were not obviously improving that aspect of teaching for the tutor. The ETMA system modified the nature of the task and conflicted with well-established practices. Tutors were willing to change their previous practices of hand-written marking, with its familiar system and technology (paper, pen and post) despite the fact that it was faster and simpler to use, because they could see the improvement in quality of feedback for the student. However, it was harder for them to feel that the extra time and new learning demanded by the ETMA system was producing enough extra advantage, and the ETMA system remains unpopular with some teaching staff.

Figure 2 About Here
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These later surveys (2000 and 2003) show that UKOU tutors are both enthusiastic and relatively well experienced in using ICT in their work. They see the advantages of incorporating new media alongside established facilities such as telephone and face-to-face meetings. While these new media have improved the perceived quality of tutors' work in many aspects, they have also increased the time spent in some significant others. These problems of increased time and student expectations were not highlighted in the early stages of ICT adoption. Innovators and early adopters – both students and tutors – are more accepting of increases in workload and may even relish learning new skills to master the technology innovation. In contrast, later adopters have a different attitude to the innovation and find these a disincentive.

### ***Discussion***

The research reported here illustrates, on a large scale, both the successful and less successful appropriation of a number of ICT tools into the activity systems of HE teaching staff in a particular DE university. What we observed was the appropriation of technologies in ways that support the specific needs of DE teaching. This study

suggests that when ICT has been adopted by the majority of teaching staff (after an initial experimental stage involving fewer people), it is mostly used to support and improve existing practices, rather than to radically change them. Our research supports the argument that HE teachers are **not** resistant to ICTs, they welcome and use those tools and systems that support and improve their activities. Contextual factors in the activity system that constitutes teaching in HE (e.g. departmental culture, assessment practices, competing priorities and the interaction of ICTs with other tools and media) influence whether and how ICTs are adopted and used.

ICT has been described as a self-referential technology. Many people who use it for learning in their homes are using it to learn about the technology itself (Gorard and Selwyn, 2005). In the same way innovators in HE teaching were enthusiastic for the technology as valuable in its own right. Later adopters are less interested in the technology and need evidence that it will improve their lives or work. Rogers' (1995) innovation adoption curve would predict that teachers who could not be considered 'innovators' or 'early adopters' are unlikely to be adventurous in their use of ICT; instead they will use the technology to replicate or supplement existing teaching practices. Such uses do not **require** teachers to rethink their teaching practices (Laurillard, 2002) or reconsider their understanding of student learning. The impact might be on another aspect of their behaviour.

Activity theory suggests that even late adopters will be changed in the process of adopting or adapting to new tools, because these will inevitably lead to changes in the behaviour of the whole activity system. However, the nature of that change to all components of the system – including people – is unpredictable. Worryingly for some, it might be outside the control of policy makers, and it might take a significant time to 'bed down'. The literature reflecting disappointment about the impact of new technologies on HE teaching suggests that both these things have occurred.

### **Replicating or transforming educational practices?**

As well as considering tutors as actors in the innovation adoption cycle, particular activities can be seen as belonging to different parts of that cycle. Zemsky and Massy (2004) describe four aspects to e-learning adoption: enhancement to traditional course/program configurations; course management systems, imported course objects, new course/programme specifications. In their 18-month survey of US universities they see that each of these aspects is at a different stage. Enhancements have been adopted by the majority of institutions and teachers; course managements systems (VLEs such as Blackboard<sup>TM</sup> and WebCT<sup>TM</sup>) have also achieved majority adoption, but imported course objects and new course configurations remain only with the innovators and early adopters. Similarly, the international survey by Collis and van der Wende (2002) found that ICT had been introduced into HE largely as a supplement to existing teaching and learning practices. There remained much to be done in terms of exploiting ICT for rich pedagogical use (i.e. improved forms of teaching and learning) and for serving learners in different target groups.

The research presented here suggests that whether or not these later innovations will ever be adopted by the majority of HE teachers depends both on how well they function as tools within the teaching activity system, and whether they offer an improvement on the existing tools in the system. In many cases ICT has been used to replicate existing teaching practices (e.g. improved presentation quality or an on-line repository of course resources) or to enhance those practices by adding some

additional features (e.g. making external resources available in the classroom or enabling learners to access materials whenever they choose). This is a very reasonable practice from the perspective of the tutor who has teaching/student support as the focus of his/her activity system.

Over the last 15 years the discourse about HE teaching has been couched in terms of transformation (of learning) and revolution in technology. Any change that appears to demonstrate less than this looks disappointing. When the research focus is on the technology rather than the teaching activity, attention is diverted from important changes that are taking place as teachers modify and improve their practice, grounded in the interconnections of teaching activity systems.

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**Table 1.** Details of the Four Surveys

<b>Year</b>	<b>Sample</b>	<b>Selection</b>	<b>Respondents</b>	<b>Response Rate</b>
1995	2,600	Random	2,044	78.5%
1997	2,500	Random	1,880	75.2%
2000	2,500	Representative	1,832	73.3%
2003	2,500	Representative	1,373	54.9%

**Table 2.** Tutors' Access to a Computer – 1995 to 2000.

<b>Computer Access</b>	<b>1995 (%)</b>	<b>1997 (%)</b>	<b>2000 (%)</b>
No access	12.3	7.6	4.7
Only at work	10.3	8.1	4.7
Only at home	32.0	41.4	47.0
Both at home and at work	44.4	42.6	43.6
<i>Total home access</i>	<i>76.4</i>	<i>84.0</i>	<i>90.6</i>



**Table 3.** ICT use by tutors for UKOU activities

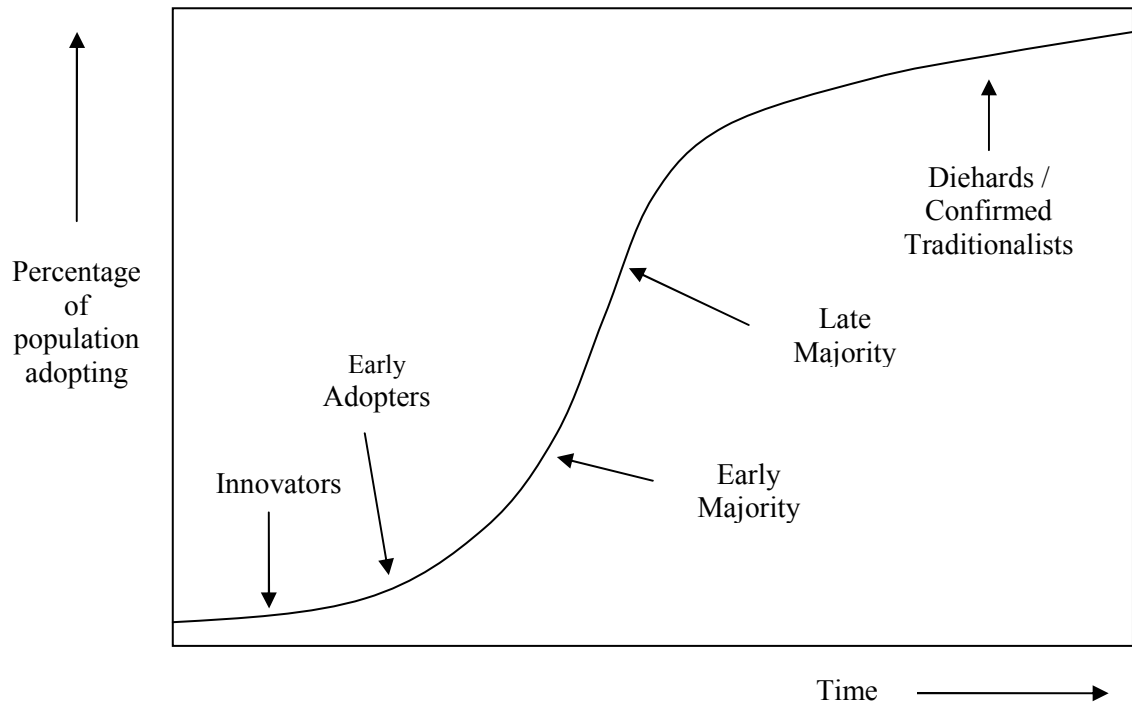
<b>Activity</b>	<b>% of respondents</b>
Feedback commenting on assignments	41
Student records, letters to students, tutorial handouts, etc	81
E-mail / computer conferencing contact with students	65
E-mail / computer conferencing contacts with other tutors	49
Contacts with UKOU course developers and Faculty	53
Contacts with the regional centre	56
Contacts with UKOU central administration	39
Other academic related purposes	22

**Table 4:** Use of different media for tutoring activities in 2003

<b>Activity</b>	<b>Letter %</b>	<b>E-mail %</b>	<b>Telephone %</b>
Introducing yourself to your students	94	40	35
Creating and sending face-to-face tutorial agendas	45	39	*
Creating and sending face-to-face tutorial handouts	52	39	*
Creating and storing student records	21	21	*
Responding to student queries	40	91	86
Reminding students of assignment cut off dates	33	49	29
Make contact with the course team/Faculty	18	77	53
Make contact with Regional Centre	24	76	72
Make contact of any kind with OU Administration	29	66	69
Giving feedback on assignments to individuals	71	43	33
Giving feedback on assignments to the group	25	21	*

\* = Less than 5% of respondents

**Figure 1.** The Stages of Technology Adoption (adapted from Zemsky and Massy, 2004, p. 9)



**Figure 2.** Activity diagram for student assessment (UKOU)

