SECTION 6: KEY ISSUES

The data here has captured some of the ways in which several issues and understandings play out differently in the local institutional contexts, depending on the peculiarities of the institutional environments. In particular, different notions of change embraced by key national and institutional players in the field will determine the kind of issues prioritized in the different institutional contexts. It became evident during the course of this study that how ICTs are understood and taken up (or not) is context specific, particularly in the absence of provincial and national policy frameworks and resource allocations. The emphasis on context was most evident in the second and third clusters of meanings in the data gathered. Thus, 'context' is a significant theme, because the potential for technology to enhance teaching and learning happens at certain times and under certain conditions, which are institution specific. This means that technology led changes need not necessarily lead to improving or changing teaching and learning paradigms in any substantive way. The extent to which it does is crucially dependent on its broad social and educational contexts. In this view, ICT-enhanced learning can contradictorily be superficial or deep, depending on the context. ICTs in themselves do not change anything, but may have the potential to do so, depending on the context. These observations about context permeate the issues illustrated below.

It is impossible to do justice to this complex and rapidly changing arena. However, it is important to mention some key issues, which emerged as pertinent from the review of the literature and policy texts, and from the interviews conducted. This last section therefore describes four clusters of issues:

- ICT growth implications – new costs, unequal resources and competing priorities;
- software issues – key debates surrounding software choices and imperatives;
- institutional mergers – issues arising specifically from the reshaping of institutions; and
- access issues – inclusion and exclusion to access and use of ICTs in terms of technological, personal, contextual and content resources.

6.1 NEW COSTS, UNEQUAL RESOURCES AND COMPETING PRIORITIES

The growth of ICTs in higher education institutions requires the consideration of new costs, unequal resources and competing priorities. The fact that South African institutions are spending more on ICTs as a percentage of their total expenditure than they did five years ago (Greaves, 2005) raises several issues for the higher education sector. Between 2000 and 2003 there was a 62,9% increase[13] in expenditure on new computer equipment from R134 361 000 in 2000 to R218 980 000 in 2003 (figures from STATS SA). The new cost areas include new infrastructure (networked computers, Internet access, computer laboratories), maintenance and upgrading of existing infrastructure, software staff capacity, training, and other general administrative costs. Three areas, in particular, demand annually escalating costs and involve huge budgets: bandwidth, computer security and information systems (Greaves, 2005).

6.1.1 Bandwidth

Actual bandwidth increased from 8Mbps of international traffic in 2000 to the 104Mbps in 2004/05. Greaves (2005) suggests that while the cost of bandwidth has fallen during this period, the absolute

[13] This is not only a local issue. For example a recent survey (Foster, 2004) of information security issues facing US universities found that over 50% of colleges and universities in the Unite States spent a greater proportion of their IT budgets on information security in 2004 than in 2003. The University of Pennsylvania, for instance, spent $287 000 to deal with computers infected in August 2003 with the Blaster worm. The costs were related to staff time to rebuild or to patch infected computers.

expenditure has increased, with much of the bandwidth going to new PC installations for students. These changes have resulted in further costs related to firewalls, proxy servers, networks software, mail servers, mail server administrators, network managers, switches and routers, user support staff, and so on.

6.1.2 Computer Security

The institutional costs for computer security to deal with computer worms and viruses are increasing. Related issues include requiring new staff for information security, whether the computer security systems of institutions should be centralized or decentralized, educating staff and students on protecting their computers, purchasing security products (hardware and antivirus software), a security strategy (including putting security measures in place, hiring security officers, automating some aspects of security systems, such as ways to identify whether campus machines are installed with security software and quarantine infected machines), and so on. A necessary follow-up study would need to investigate the kinds of security measures in place – the current range in use includes antivirus software, the use of firewalls, spam filtering tools, spy ware-control software, virtual private networks, smart cards, and biometrics.

6.1.3 New Systems

Institutions are spending large amounts of money on new software for administrative information systems, such as Oracle and Peoplesoft, and these costs, according to Greaves (2005), may not be a part of the institutional IT budgets. Similarly, many institutions spend large amounts on E-Learning software, such as WEBCT and Blackboard, while others are developing open source alternatives. The related debates about the advantages and disadvantages of using open source or proprietary software options include issues of costs, building institutional and national capacities in software development, and the use of public funds to develop software programmes for use in public institutions as a way to break the increasing reliance on proprietary software.[14]

In addition, the amount that institutions devote to ICT-related expenditure differs by institution and clearly leads to unequal student access to ICT resources, both across institutions (nationally, regionally, and by historical privilege) and within institutions (by faculty, department, student residences, and the status of students by class and level of study). As one respondent observed,

> … now the DVC has been trying ever since to solve the huge problem areas that we have now, such as we have no money for, student bursaries, the staff are completely demoralized, it is a nightmare, so the last thing DVC is interested in is e-Learning. (I.B.) The possibility of regional collaboration around the sharing of ICT resources deserves further study.[15] As mentioned earlier, some institutions devote a significant proportion of institutional funds to the development of IT and e-Learning structures, initiatives, and capacity, while others rely almost entirely on donor funds.

[14] Kiernan (2004) cites recent warnings about the security flaws in Microsoft's Internet Explorer, which has over 90% of the worldwide browser market, and is closely aligned with the Windows operating system. Some university Web sites provide links to download alternative browsers, including Firefox, Netscape, Communicator and Opera. Firefox is an open source program (i.e. not commercial, but developed by volunteer programmers) and its programming is open to inspection. Software issues are discussed as a separate issue later in this section.

[15] TENET is a good example of institutional collaboration around ICTs. An area for further investigation (with a linked implementation plan) could involve the higher and FET sectors around ICT resources, multilingual curriculum materials, teacher education and institutional conditions that facilitate access to higher education.

Finally, the unequal resources across institutions suggest that prioritizing institutional ICT allocations in relation to other pertinent areas of higher education transformation is a crucial issue related to: the location of ICT structures in the institutional hierarchies (and hence their decision-making power); the degree to which the institutional elites see ICTs as important; and the relation of ICT initiatives to other change initiatives.

6.2 SOFTWARE ISSUES

Software issues in teaching and learning in higher education are not only about technical matters. The debate rages over the use of proprietary software and free and open source software (known as FOSS). Entangled in these debates, are political and pedagogical issues, as well as resource issues, many of which relate to broader debates in society about the choices, priorities and decisions for higher education institutional transformation as a whole.

There are three broad classes of software used in relation to teaching and learning: generic software (including desktop operating systems, productivity applications such as word processors and spreadsheets, and information and communication tools such as email clients and web browsers), specialist software (such as simulation or modelling software designed for a specific need, purpose or discipline), and online learning environments, which make available a range of content, communication and administration tools designed to support and extend teaching and learning practices.

Generic software applications can often be customized and used for more specific educational purposes. Examples of this approach include departments and faculties in some institutions, which have used Excel extensively as a learning environment. While this class of software is sometimes referred to as COTS (commercial off-the-shelf) software, open source equivalents exist for most applications (such as OpenOffice, broadly equivalent to Microsoft Office). It makes little difference in pedagogical terms whether this type of application use is built on proprietary or open source foundations, although there are arguments made about the value of exposing students to open source as well as or instead of proprietary products, because of perceived social and macro-economic benefits of open source.

Pedagogical debates are far more central in the choice of products for online learning environments, (OLEs) variously known as Learning Management Systems (LMS), Instructional Management Systems (IMS), Content Management System (CMS), Managed Learning Environments (MLE), Collaboration and Learning Environments (CLE) and Virtual Learning Environments (VLE).

There is at present an increase in South African higher education institutions in the use of such software. There are three choices regarding OLEs: a licence for proprietary OLE software, open source software, and 'home-grown' software. The latter two are not mutually exclusive, as in some cases 'home-grown' software products have been developed or subsequently released as open source products, and taken on a broader life.

There are examples at different levels within the institutions of all of these decisions. Many South African institutions using proprietary software use an application called WebCT (with Blackboard and TopClass being used on occasion). There are also numerous institutions using or moving to FOSS. To a lesser extent, there are examples of locally produced OLE software (see van der Merwe and Moller, 2004, for a discussion of what happens when two such systems are confronted by a merger situation).

In many institutions there is a range of OLEs being utilized, with ownership resting at Department or Faculty level rather than at the institutional level. However, in South Africa, as elsewhere, the tendency is to reduce the number of available OLE choices and the debate rages particularly over the first two options: using proprietary software or open source software. Institutions which have developed home-grown solutions have realized that this is a relatively expensive option, and are either looking at alternatives (whether proprietary or open source), or are positioning their products as open source projects which can gain wider use and attract external resources, thereby reducing overall development costs for the institution.

At first glance, the decision between proprietary and open source solutions appears to be about cost. WebCT requires a licence denominated in foreign currency, whereas open source software requires no licence costs. However, licence costs are typically not the most important factor:

> The cost is an interesting by-product of the other benefits. The real benefits are being able to get something that does what you want it to do and having control of the tools that you are using and then as a side benefit you also typically end up saving money if you do your planning right. Of course you can spend money on free software and you can spend more money on free software than you do on proprietary software if you don't get it right, so it is the getting right that brings cost benefits, I mean the financial benefits. (I.H.)

Other factors are also important including ease of installation, use and support, capacity building, local/foreign support and development, etc. The open source debate rages beyond education (as elements of government have expressed support for FOSS through for example the National Advisory Council on Innovation, while the Department of Education is simultaneously accepting free Microsoft software for all South African schools).

In educational and pedagogical terms, software issues are usefully located within the debate about standardization and flexibility. Here, Agre's (2002) article on infrastructure and educational change is helpful. A key premise is that ICTs considerably amplify incentives to standardization. The key tension lies in separating those elements that need to be standard from those which need to be diverse. A university is a particularly diverse environment, a 'diverse assemblage' of social and situated practices. These need to have space to be diverse and locally located (in disciplines, levels of study, educational objectives and so on), but also to be interconnected, to be able talk to one another and to be re-usable. Standardisation can either be a force for uniformity or for diversity depending on how it is designed. The ongoing debate (which flares up at conferences regularly) about software, such as WebCT is to what extent it is able to serve flexibility and diversity and to what extent its design encourages and supports specific pedagogical practices (while potentially discouraging or constraining others). Tricky decisions have to be made regarding meeting competing requirements, while balancing affordability, features, flexibility and risk.

Risks associated with proprietary software include vendor lock-in (that it will be difficult to switch to competing products in subsequent years), uncontrollable escalations in licence fees, costs escalating through exchange-rate variations, or vendors going out of business. Risks associated with open source software can include lack of formal paid-for support, and open source projects not gaining sufficient momentum to ensure a long-term future.

A common response to these concerns in open source projects is for institutions to join open source consortia. It is for this reason that some South African institutions have joined global initiatives, such as the Sakai Project, which is designed to build a standardized framework within which local solutions can be created. Moodle is another open source solution being adopted by local institutions, and at least one higher education institution is developing a consortium around its own open source product.

Software choice is a hotly contested issue and, as Agre notes, the future is not yet foretold. As he says, 'the forces that encourage higher education to standardize its technologies interact with other forces that may push in other directions. Information technology is uniquely malleable and is easily shaped by the ideas and interest of whatever coalition has the wherewithal to guide the development and implementation of new systems'.

It is not possible to do justice to the complexity of these issues here. What can be done, is to flag the importance of this debate and stress that decisions have ramifications beyond the practical question of a software choice.

6.3 ISSUES ARISING FROM INSTITUTIONAL MERGERS

The institutional mergers have a number of implications at the infrastructure level, including the integration of operating systems and additional operational costs. These issues are mentioned in the interviews and discussed with particular reference to ICTs in a paper by Paterson (2004). In one case, the merger is seen as the priority. Other matters, such as ICTs, simply have to take a back seat:

> At the moment the focus is on making this merger integration work, now the focus is certainly not on e-Learning as a high priority for a new [...] University, I heard that [our merger partner] has experimented with WebCT as a means for trying to encourage e-Learning. It hasn't taken off in a big way, whether that will survive in new merged institution I do not know, I think over the next two years technology is currently used by institutions will probably prevail for the next two years. What focus and emphasis is going to prevail in e-Learning that I cannot tell you. It will probably be dictated by a new academic strategy.…
>
> The merger will certainly put everything on hold, what has been realized is that e-Learning will require a huge upfront investment both in terms of resource and support infrastructure and time before you can actually get in there. The risk that you are running is that you have to do things to the last degree in parallel until you are adequately resourced. (I.P.)

Unlike the view that nothing will happen until the newly created institution develops a joint strategy, there is a more common view that the 'stronger' partner, the one already using ICTs, is likely to be the dominant one in this domain.

> Well I think we were taken over very well by [...] University, because that's what it is and I'm not a liar, I'd rather be honest about it and say we've been taken over and hence all their policies and procedures and that kind of thing have, or will be transferred here at some stage, ok. But I don't have a problem with the ICT because they really were progressive in relation to what we've done here. (I.D.)

This might be viewed positively with regard to ICTs, as in the above example, but may also be problematic and lead to situations of 'othering' when potential partners in an institutional merger do not meet as equals. In several cases, one of the partners was considered the principal partner. One respondent observed that they were the lead partner, because the institution they were going to be merging with had shown no interest to date, but that they would have to once the merger had happened. In another case, the institution that had already been working with ICTs had assumed responsibility for the institutions that would be joining them.

> X is not incorporated yet but what we have planned to do is to incorporate them, and X is from next year onwards but we will have a very thorough training the first six months of next year in X for the students as well as the lecturers there in Computer Literacy, Computer Training, how to use the software, what is e-Learning, etc…. We are still also busy to get their labs ready and stuff like that but [they have had] no IT education. (I.O.)

The 'othering' of the partner perceived to be the weaker often occurs in the setting up an us-they antagonism where 'we' are in the know and 'they' will be taught, as in the above quotation.

In another case, students were somehow seen to be at fault for their perceived weaker computer skills, and were clearly stigmatized:

> The fact that these students who really do not deserve to have a XX University badge on their degree certificate are going to get that has to do with the merger. (I.J.)

Mergers may in themselves be leading to the use of ICTs. This is particularly the case where there are already, or are going to be, multiple campuses.

> The other capabilities that we're looking at as well, and this is also dependent on the usage of the bandwidth, is actually edu-conferencing. We find that there is a great need, especially with the geographical location of the campuses… AA campus is approximately two hundred and forty kilometres apart from the BB campus. So effectively what we will be doing is looking at video conferencing across that link, perhaps for strategic meetings that would need to take place. You know, there could be, that bandwidth could be booked for lecturers to conduct a lecture, for example, across campus. So these are possible ICT technologies that will be implemented within the next three to four months, in terms of the direction forward of the institution itself. (I.A.) Interestingly, being a residential institution located in an isolated place was considered a contextual advantage in one case. Another residential institution commented that full-time students are travelling long distances and do not have access to campus facilities.

> Our university has the highest proportion of residential students… most of our students are on campus which is interesting because it allows us to make technology available with that in mind and not having to worry about where the students are accessing the Internet from etc., whether it is Internet cafés or home or whatever it is, you know we can concentrate on building facilities here which we are doing. (I.M.)

> But the other interesting thing that we really struggling with is the students who actually commute and that is a huge problem for us because a lot of the students do commute, they have to be off campus by about 4 o'clock especially in winter time. They are full-time students who live far away. It is … becoming an issue on campus as to how to provide access to those students after hours. (I.I.)

In both the above cases, neither of the universities concerned claims to be involved in distance education. Clearly access is a central issue in both residential and distance education contexts.

Finally, the contextualization of change is clearly crucial to exploring the power dynamics of ICT-related change in higher education; particular historical and national contexts present institutions with unique challenges. It can be argued that changes arising from the innovative use of ICTs are dependent both on the broader socio-economic and political contexts, and on the local struggles and strategies around the distribution of resources and other aspects of redressing historical inequities in educational institutions.

6.4 INCLUSION AND EXCLUSION: ICTs AND ACCESS

There has been a strong view in the broad literature on ICTs and higher education that connectivity and online education are great equalizers. Increased access to higher education across institutional and national boundaries through various Internet-based options is believed to be achievable for all (Coombs, 2000). Access to connectivity would leapfrog those who have been excluded from the information society while also bridging the legacy of apartheid (Naidoo, 1998). However, this perspective has receded as the local realities and complexities of implementing ICTs in education in a diverse and divided terrain have become more evident.

This cautious view is evident in the growing research on the existence of digital divides and strategies to deal with them. Much of this literature accepts broadly that ICTs can change the way HE institutions operate, but also points to the existence of new digital divides, emerging out of existing social divides around class, race, gender, nationality and disability as impediments to that potential role. These divides restrict higher education access and participation and therefore lead to the continued exclusion and under-representation of historically excluded groups in ICT fields. This makes access to ICTs a redress issue.

There is agreement that issues of exclusion and inclusion involve access to new technologies if students are to have appropriate educational opportunities and are able to participate fully in the social, economic, political and cultural realms of life (Burbules & Callister, 2000; Castells, 2001). This requires an understanding of 'access' as 'thick' and multidimensional (Burbules & Callister, 2000b), covering both the quantity and quality of access, which involve issues of distribution and recognition.

As has been noted earlier, there is surprisingly little local research into access and use of ICTs in HE in SA (van der Westhuizen & Henning 2004). Here, the key concepts and frameworks used in such research as is currently underway in the Western Cape is drawn upon. This framework (see Czerniewicz & Brown, 2004) argues that the notion of access to different kinds of resources is a powerful way to describe what people use, need and draw on in order to gain or acquire access to specific ICT uses and practices. Such resources may be socio-cultural capital (Gee, 1999) or 'rules-resource units', a term, which describes rules that exist in relation to social practices (Giddens, 1979). Indeed, the very resources that people need access to are the same resources to which they will be able to contribute (Warschauer, 2003c). Thus, access and use are closely interrelated: access to resources and the creation of resources are interdependent. ICTs do not have any meaning in isolation – they have meaning only in relation to an implicit or explicit purpose. That purpose is the way they acquire meaning; this in turn contextualizes them.

It is therefore necessary to develop quite detailed resource groupings: a) technology resources; b) resources for personal agency; c) contextual resources; and d) online content resources. Further explanations of such groupings are discussed elsewhere (Czerniewicz & Brown, 2004); they do however provide a useful as a way of commenting on the data texts reviewed for this study.

6.4.1 Technology resources

There is generally consensus that access to technological resources is the primary requirement for teaching and learning; and this observation remains at the forefront of all accounts of access in the literature. This includes the tangible resources of computers and associated telecommunication infrastructure including appropriate location, availability and adequacy. Access is also required to practical resources in the form of control over when and to what extent computers are used.

While recent, accurate and comparable figures are hard to come by, it is clear that the situation in South Africa is uneven nationally and lagging internationally. Teledensity rates are low: 11 in 100 people have fixed lines and 36 in 100 people have mobile telephones (Bridges, 2002; TU, 2003).

6.4.1.1 Access to computers

Estimated personal computer density is low at 7.2 in 100 people. Students are coming into higher education from a rapidly improving school system. Nationally, 39% South African schools have a computer and 26% have one for teaching and learning (Department of Education, 2003). While direct figures are hard to pin down, it is clear that school access to computers in developed countries is substantially higher. The percentage of computers available to 15-year-olds at secondary schools in the United States is 73% and in the United Kingdom 78% (OECD, 2002), for example.

Of Cape Town's 105 public libraries in 2003, only six had any computers – five each respectively – available for public access. Higher education statistics are hard to find. It seems that one-sixth of South African users are in the academic sector.

6.4.1.2 Internet access

There were 3 523 000 South African Internet users in 2004, 7.4% of the population (according to Internet World Stats). While exact national breakdowns are hard to ascertain, a report on one city reveals ongoing class, education and gender disparities: most computer users in Cape Town are men from the highest income group, living in middle-class areas and with post-secondary education (Bridges.org, 2003).

In terms of Internet access, South Africa, with 7.4 in 100 people, is way ahead of the rest of Africa which averages 1.4 in 100 people. But South Africa still lags behind developed countries: 42 in 100 people for the United Kingdom and 55 in 100 people in the United States have Internet access (all figures ITU 2003). Only 57% of students and staff in higher education were Internet users in 2002 (Czerniewicz, 2004).

Internet access relies on Internet service providers (ISPs or hosts). South Africa had only 0.12% of total world hosts in 2004 (according to the Internet Systems Consortium, 2004).[16] The total number of computers permanently connected to the Internet in Africa (excluding South Africa) exceeded 35 000 in 2001, according to Jensen (2002).[17] Access to the Internet also relies on access to basic telecommunications infrastructure, which is lowest in African countries, which have limited connectivity, and generally slow connections because of insufficient bandwidth (see Beebe *et al.*, 2003; Jensen, 2003). Beebe *et al.* (2003: 3-4) list the following factors that limit the development of ICT infrastructure in African countries: a) telecommunications policies and regulatory frameworks (including harmonizing the regulatory frameworks in the education and telecommunications sectors); b) lack of telecommunications specialists; and c) inadequate contribution of telecommunications to economic and social growth. The costs of Internet access vary considerably in Africa, depending on the country – for example, Somalia and Liberia have no Internet access (P & E), while the comparative costs for the USA and UK are: USA ($6pm) and UK ($16pm). The costs also vary according to the type of connection, based on telephone cables, ISDN connection or satellite connections.

Finally, dependent colonial relations between Europe and Africa persist, for as Lelliott *et al.* (2000) point out: 'Direct connectivity between countries within the continent is almost non-existent. This means that for African countries to link up with each other via the Internet, they have to connect through a European or American 'hub', sometimes provided as part of an aid package.'

Yet despite given the historically skewed access to resources and the fundamental inequalities that continue to characterize South African higher education, there is a marked interest in ICTs. In this context, it is therefore not surprising that physical and practical access was so strongly foregrounded: As one respondent put it bluntly "the issue is access – physical access". Access to computers is limited and often has a very limited starting point. One institution reported that less than ten years ago it had 20 computers on campus for students (in 1995). Another institution reported that the current ratio of students to computers is still 1:100 (I.A.). Access to Internet connections, computer laboratories and printers is also limited in many cases by specific institutional practices, such as laboratory operating hours, and time limits and booking systems for computer use (Mkhize, 2005). The problem is exacerbated by slow telephone access, lack of connections to residences and limited broadband access as elsewhere in the world.

What is considered adequate access, varies too. In one case, 1:20 is considered a major improvement, but in general this is considered too low.

> I think up to about two years ago, access to facilities was a major complaint; we had technology, PC's for students who actually required them as part of the learning process within their disciplines. In other words they would be taught theory and then they have to get and execute that theory on their PC's. There were very little facilities and students were required to go and type up assignments but not actually having access to facilities − that was the major problem up to the end of 2002. Then we created a general-purpose laboratory where students do have access. In one instance, it is 24/7 and that has served the student community well. We also have facilities at the hostels for convenience sake but they are limited at times and other general purpose are also for limited times and the complaints right now is for more facilities to be opened for longer. …

[16] The Internet Systems Consortium does a survey of the Distribution of Top-Level Domain Names by Host Count Jul 2004 http://www.isc.org/index.pl?/ops/ds/

[17] However he notes that these figures have also become increasingly meaningless in Africa with the widespread use of .com and .net domains, and the frequent re-use of Internet address space behind firewalls due to the difficulties of obtaining pubic Internet space. As a result many of the African countries surveyed by Network Wizards show zero or only a handful of hosts when in actual fact there might hundreds if not thousands of machines connected to the Internet there.

> I think the problem that … we at this stage are not sure whether we have got our ratios correct as yet, like in the general purpose labs we are still faced with a situation of above 20 students per PC which for most of the time may be adequate but there are certain times of an academic year typical just before your semester ends. Just before the exams starts, there is a huge bottle neck for the submission of final assignments or so, then I think that ratio is impacting on the access for students because then the competition for access to a seat is much higher and the student to a PC ratio at this stage is not healthy for that situation. (I.P.)

Existing laboratories are full to capacity. At one university, laboratories are open 18 hours a day, everyday. At another, they are open until midnight, and reported to be always full. Most institutions have general all-purpose laboratories open to all students, as well as faculty or department-based stations in certain disciplines. While these may be discipline appropriate in terms of ICT (for example, it would be difficult to teach Information Systems without computers), there are nevertheless inequalities of resourcing across faculties.

Access to computers for everyone is stressed:

> … and then you have to ensure that you have adequate access to learning stations for you. E-Learning is fine when you actually have a market which owns their own learning stations, in our target market, a large percentage of them do not have technology facilities at home. We have also have a ratio where students do not have to stand in a queue for a workstation. Those are the issues you have to resolve before you can actually embark on e-Learning in a big way. (I.P.) It is not only historically disadvantaged institutions who complain of inadequate access to computers. Even those historically advantaged institutions, which have prioritised ICTs in both policy and resources, are struggling with access, especially as computer integration increases:

> Our computer user areas are totally over-used at the moment. [They are] insufficient, yes. Not all of them but some of them so there is quite a few projects on the way at the moment trying to assess what is the ideal way to go – to put up another massive computer user area or to go for hotspots or to go for kiosks or go for laptops for every student, I mean I am just mentioning…. [Even though everyone else thinks you have got the perfect infrastructure and is the best equipped, you are saying it is still not enough?] No, we found a huge increase this year, especially in our concurrent users. Because I think ICTs are becoming more and more integrated so it is not so nice to have add on anymore – students they have to access a computer some time, not all of them most probably but a lot of them have to actually get to a computer during the day or the night or somewhere during the week to actually access learning material, communicate, do assessments, quizzes, stuff like that. (I.I.)

There is also acknowledgement that access to a computer is only the starting point, and that a broader infrastructure is required:

> Now a student may get the media and documentation and so forth related to that [electronically], but he may not necessarily have the support infrastructure to be able to communicate online with a mentor, and so forth. You know, so when I talk about that it's not…because if you like to see deployment of e-Learning you like to see that holistic approach. (I.A.)

It is of note that there is a growing interest in the possibilities of wireless technologies across higher education institutions. The cellular telephone phenomenon, which burst upon South Africa less than a decade ago, offers an opportunity for innovation in a country where 5 million landlines exist in locations which have electricity, yet 18.7 million mobile telephone users are spread across the population at large. Of these, 84% are prepaid users, possibly an indication that they are less wealthy. By 2006, there are expected to be at least 19 million cellphone users.[18]

While the growth in cellular telephone use and ownership is consistent with world trends, this is a particularly promising opportunity to bridge the digital divide. Unlike other kinds of access (computers, Internet, connectivity etc.), cellular telephones are as much in use among students from disadvantaged backgrounds as among their more privileged counterparts. It was noted by one Eastern Cape institution that a larger percentage of students had stable cellular access than outside Internet access. In a survey at the University of Cape Town, 96% of students reported owning a cellular telephone (Czerniewicz and Brown, 2004a), while in answer to a similar question, a survey at the University of the Western Cape found that 88% of students reported owning a functional cellular telephone (Barnes, 2004).[19]

6.4.2 Resources of personal agency

In order for individual students or academics to use ICTs meaningfully for teaching and learning, they need access to personal, collective and contextual resources. While contextualized use is essential, it is important to acknowledge the specific resources, which need be accessed by individuals in order to give them agency. An actor in a social structure is more likely to become an agent when able to use or generate knowledge ability, power, commitment, and consciousness (Etzioni in Lehman, 2003). Access to personal resources allows an individual to exercise agency, to act with intent and give meaning to objects and events. (Drislane, n.d.). Such personal resources include a person's interest in and attitude to using computers (generally and specifically for learning) as well as their knowledge and skills in using a computer. Indicators include interest, purpose, experience, knowledge, training, and skills.

Respondents for this project empathized with the relevance of attitudes in particular:

> I think it is a mindset, either you explore these new things and you enjoy them or else you just don't go near them. (A.B.)

> Yes and you know as well as I do some people are just techno phobic; they just don't want to do it …some students will come back to you and say "I like it, I like it, the colours and I like the fact that I could contact you every day" and then the others will say to you, "I think I will rather sit in a room and discuss the topic" so there are not any absolutes in this game, but I am hesitant of anybody that says there are. (I.L.)

> …. in one faculty there is a lot of resentment towards e-Learning because it was badly managed and now you have to change that and there is a whole paradigm shift, so there is a lot of stuff involved, there is a lot of challenges, but it is a challenge in a positive way. (I.O.)

[18] Figures are from http://www.cellular.co.za/stats/statistics_south_africa.htm
[19] This contrasts with the 45 % of students who report using their students email accounts.

An interesting dimension that emerged was the difference between students and staff: "I think the students are more ready for it than staff are. And I think it's due to the fact that it's something new for staff members" (I.O.). This introduces an additional complicating divide, based on age and expectations emerging from the cultural context in which the younger 'digital' generation grew up.

6.4.3 Contextual resources

In order to use ICTs, people need access to resources in and from the context in which they function. These resources, together with mutually sustaining schemas, make up the structures that empower and constrain social action and that tend to be reproduced by that action (Sewell, 1992:19). These resources determine how conducive the environment is to using ICTs; and how enabling the context is to the integration of ICTs for teaching and learning, specifically in a higher education institution. Two sets of contextual resources have been found to be essential. The first is community social networks (Carvin, 2000; Di Maggio & Hargittai, 2001; Jarboe, 2001; Ganett & Rudd, 2002; Kvasny, 2002; Murdoch, 2002; Warschauer, 2003 a,b,c).

The second set of contextual resources is institutional resources (Government of Japan, 2000; Bridges, 2001; Jarboe, 2001; van Dijk & Hacker, 2003; Warschauer, 2003c) that have affected technology use. This includes extent of integration, existence of relevant policies, extent of support and the intentions of institutional leadership.

For some, ICTs are threatening:

> the use of ICT tends to threaten certain individuals and I think they feel threatened due to the fact that they know they will not have an appropriate support structure in place. And I think that is fundamentally where most of the problems reside. We need to have the right support structure, or system in place to assist the academics in their use of ICT. (I.A.)

6.4.4 Online content resources

Given the interest in ICTs for teaching and learning, an interest in online content is essential. Content can potentially play several roles. It may be a mediational means (to use Wertch's term, 1991); it may be the outcome of, for example, a collaborative effort; it may be the agreed discourse of a discipline community; it may be a knowledge domain; or it may more prosaically be subject matter. However it is interpreted, content is essential to pedagogy. It is one of the three elements in a triangle of interaction comprising C-T-S with the T being Teacher (or expert or facilitator) and the S being Student (or learner, or apprentice) Laurrilard, 2001; Garrison & Anderson, 2003).

While researchers studying ICT use in developed countries may not identify content as critical, it cannot be ignored in the local context. The African continent generates only 0.4% of global online content, and if South Africa's contribution is excluded, the figure drops to a mere 0.02% (UNECA, in Chisenga, 1999). English remains the dominant language of publication for African producers, despite the fact that English first language speakers comprise no more than 0.007% of the whole African population (Boldi *et al.*, 2002). In fact, globally, only 35% of people online are native English users, accessing Web content which is 65% English (according to http://global-reach.biz/globstats/refs.php3). Certainly, the lack of local content has been identified by senior South African leaders as an essential issue to increase access to ICTs for the majority of South Africans. They have called for local content (Mbeki, 2001) and 'information to bridge the digital and knowledge divide to ensure

that our people can access information that can shape their lives in the languages of their choice' (Matsepe-Casaburri, 2003).

This may be an issue for local students and academics. In particular, it has been observed that digital content relates closely to literacy, and literacy develops most effectively when it involves content that speaks to the needs and social conditions of the learner (Freire, in Warschauer, 2003c). It is safe to assume that this applies equally to digital literacy as to academic literacy. Others have noted the need to consider whether content is locally produced, relevant to user needs and in the required language (Bridges, 2001). Language has also been mentioned as being relevant to identity, people's notions of themselves as computer users, or not (Murdoch, 2002).

And finally, the form of the content is noted as important given that access to content in new media forms often requires tacit knowledge of shortcuts, heuristics and conventions that travel within particular communities of users (Burbules & Callister, 2000).

Despite these concerns, during interviews for this [CHE] study, none of the respondents mentioned content in responses to open ended questions. And the Western Cape research data reveals that, at a regional level, an astonishingly high percentage of students and staff feel confident that they can find relevant content, with 76% of students and 89% of staff reporting that they can find content relevant to the courses they are studying/teaching.

Surprisingly too, 68% of students and 84% of staff report that they can find Internet content relevant to South Africa. However, fewer say they can find locally produced content – only 56% of students and 74% of staff report that they can.

Language too yielded interesting results: 69% of students and 88% of staff report that they can find computer resources in the language they want, perhaps because English is the accepted language of higher education. There was an extremely varied response to the question of multilingual content with 32% of students reporting that they did not know if they could; 29% reporting that they could; and 23% reporting that they could not. Staff responded quite differently here: 18% did not know if they could; 60% report that they could find content; and 16% report that they could not.

These findings about online content in one South African region are so unexpected that the recommendation is that detailed attention be paid specifically to explaining these discrepancies.

This section on key issues has highlighted four clusters of issues. Many more issues have been flagged in this report and these, and others, need further investigation. As mentioned earlier, ICTs and change specifically need to be explored in the context of dedicated distance education institutions, and in that increasingly blurred space between contact and distance education. Other issues which emerged relate to ownership of content and the related matters of open content, open archiving and open access with all the implications the resolutions of these debates have for teaching and learning. Attention also needs to be paid to parallel developments in ICTs and the market leading to increases in for-profit initiatives, outsourcing and other forms of commodification of teaching and learning processes. Finally, while this research report has focused on access to ICTs, attention also needs to be paid to the role of ICTs in increasing access to higher education, in terms of quality, delivery and redress.