REPORT
FIFTH ANNUAL SATN CONFERENCE 2012
ICTs AND UNIVERSITIES: THE STRATEGIC ADVANTAGE

HOSTED BY: POLYTECHNIC OF NAMIBIA, WINDHOEK, NAMIBIA
30 AUGUST 2012

1.   PLENARY SESSION
Chairperson: Prof. Thandwa Mthembu, Chairperson: SATN & VC: Central University of Technology

1.1   WELCOME
Prof. Tjama Tjivikua, Rector: Polytechnic of Namibia

1.1.1   Prof. Tjivikua, the Rector of the Polytechnic of Namibia, declared the conference open and extended a warm word of welcome to all delegates present. All protocols were observed. The hope was expressed that the conference would provide an opportunity to the representatives of all the institutions present to network and share knowledge.

UoTs are defined by their missions, meaning that they must be at the cutting edge of technology, fostering excitement about new technologies and their application. Worldwide there is a tendency to develop and grow new technologies, with mobile phones and other technologies playing an increasing role in how people go about their daily tasks. Many mobile technologies have been developed in universities, and UoTs have to stay abreast of new developments in order to fulfil their mandates.

The computer is presently one of the most important learning and communication tools. This conference aims to give meaning to how these technologies can be used to greater effect. Much progress has been made in accessing broadband connectivity, and the internet has been instrumental in furthering ICTs at universities. Today, ICTs are characterised by a dynamic increase in computer power and storage capability. A plethora of devices had been developed, with a myriad of applications. Internet has changed the way in which we communicate, and in which the markets operate. ICT mobility also means that we are able to access data, moving to an ICT user-centered environment. As devices continue

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to improve, institutions are required to consider new dimensions of data storage. Universities should be revolutionary platforms for knowledge management. ICTs can help universities to transform education innovation and delivery. Africa's population is set to double over the next 40 years; as the population grows, there will be an increase in the ratio of younger working people wanting to use ICTs. More education and more options and opportunities will be required, which will be possible through ICTs. Education has to be accessible to large numbers of learners through the internet, something to which most institutions are responding. ICTs also present a solution to the influx of students to higher education institutions. Collaboration between institutions must be fostered to create knowledge and stimulate innovation, allowing UoTs to add value to the economy. Income generated should build better universities, further enhancing the intellectual capital of those institutions by attracting high-level academics.

1.2   THE CONFERENCE IN CONTEXT

Prof. Irene Moutlana, VC: Vaal University of Technology

1.2.1   Prof. Moutlana reiterated the word of welcome to all delegates, and expressed a word of gratitude to the Polytechnic of Namibia for hosting the conference.

The central thread of the conference is based on the creativity, inventiveness and freedom of thought of young people, any country's greatest assets. Designing new products is vital to the success of any country.

In 2003 Prof. Kader Asmal, the then Minister of Higher Education, called for the introduction of Universities of Technology (UoTs). One of the issues that made the establishment of SATN imperative was the introduction of the HEQF, meant to facilitate the transition of Technikons to UoTs and providing a convenor process for joint re-curriculation. The driving objectives were to promote national education and training policies, promote academic quality and relevant research and development, and to promote cooperation between UoTs and industry and among themselves, at local and international level. SATN has published a number of papers, on issues like WIL, research at UoTs, the place and role of UoTs in the higher education landscape, and differentiation in the higher education sector. SATN plays a role in branding and marketing the UoTs, and growing international and local linkages.

The strategic application of ICT for effective teaching and learning and research has to be aligned to the fundamental mandate of higher education, which is firstly to create the best possible educational environment for students. Students' lives have to be significantly changed for the better during their years of study, making it a moral obligation for institutions to commit to the advancement of knowledge, upliftment and the betterment of all for the public good. Education is intended to preserve and improve human life.

With the advent of personal computers and the internet over the years, ICT has changed millions of lives. Behaviours in terms of how we learn and transmit knowledge have changed. Universities and their stakeholders have to develop solution driven interventions to match government's transformation driven agenda. Higher education is under increasing pressure to produce graduates with the knowledge, skills and resilience needed to cope in a world characterised by an information revolution. Where our institutions enjoyed a relative measure of independence in the past, now they have to be responsive without sacrificing their academic integrity. They have to re-assess their relationships with business, industry and other institutions to respond to globalisation and technological innovations. Institutions have fallen badly out of balance in some areas, something that could be addressed through ICT innovations.

Practitioners and professionals have to stay relevant and set the pace for social transformation through adopting and adapting ICTs, to define who we are and where we are going.

What is the paramount characteristic of a UoT? UNESCO defines technology as the know-how and creative processes allowing people to use tools, resources and systems to find solutions to improve their lives. The effective and efficient application of knowledge and expertise that result in value-added knowledge, products and services are required across the board. UoT graduates should be able to make or do things on the basis of their acquired knowledge. Technology is the qualifying factor in all UoT endeavours, where technology design, development and commercialisation should have priority. UoTs are different from traditional universities in that they have to fuse knowledge with what can be learnt in the workplace. Technology should permeate every aspect of the curriculum, so that graduates would be technologically literate and ready for the world of work. Students and their employers should gain a competitive advantage from this work-readiness.

World-class universities thrive in competitive environments, where critical thinking, innovation and creativity are found. These are agile institutions not constrained by bureaucratic and externally imposed limitations and standards. The use of ICT has changed fundamentally how things are done in a range of contexts, but its impact could be increased even more. With the world moving rapidly into digital media and information, ICT is becoming more important in education.

What is the strategic importance of ICT in effective teaching and research? Given the background provided, this conference will attempt to bring together experts in areas of teaching, research, administrative and other technologies. Technology should become the bedrock of how we teach at UoTs. How will we change the mind-sets of lecturers to optimally use technologies? There has emerged a need for institutions to ensure that their graduates are able to demonstrate technological literacy. ICTs are tools that enable learning, and the more students

use these tools, the more they become immersed in the learning. The South African government has identified the use of ICT as an imperative for teaching and learning and research, to develop the skills needed to create lifelong learners and full participants in the global community. E-learning is not merely a medium for transmitting knowledge, but changes the basis of interaction between learner and lecturer.

How UoTs respond to these challenges is the question. Knowledge is better acquired through the active involvement of learners in their knowledge acquisition, to make it personalised and internalised. Since teaching and learning challenges are multi-faceted, multi-pronged approaches are needed. Thought leaders have suggested that the central role is to provide additional strategies to ensure that educators' and students' needs are met. ICTs are cost effective only if other simultaneous interventions are instituted. The time and effort spent on ICTs will only be effective if a wholesale approach is adopted by all. In some cases where fundamental teaching and learning issues are not addressed, ICTs alone will not be successful.

Collaborative learning is the most effective means for teaching and learning in technological environments. There are times when technology may not be useful, and may indeed be counter-productive. There is no single version of reality, but rather a multitude of realities for each learner. The current trend is to provide cognitive tools to facilitate critical thinking in higher education.

While strong arguments have been presented for ICT, the benefits could also be harnessed through providing a catalyst for re-thinking education and learning interventions, and enhancing and improving the quality of learning. Given government imperatives for transformation in the higher education sector and improved access, there is a need to ensure that ICTs function optimally in a simple manner. Students' needs and skills vary widely, and their preoccupation with outside issues affects the teaching strategies employed to impart knowledge. Even if students could be moulded in predictable ways, it would be hard to know which moulds are best. Feedback is slow or absent; professors rarely know what benefits students take away from their courses. One can only hope that ICTs will be useful in changing this situation.

TEACHING AND LEARNING TECHNOLOGIES

Chair: Prof. Thandwa Mthembu, Chairperson: SATN & VC: Central University of Technology

1.3   KEYNOTE ADDRESS:

Opening scholarship: opportunities and challenges for African universities
Prof. Laura Czerniewicz, Director (seconded to OpenUCT Initiative), University of Cape Town

1.3.1 The internet as we know it was only conceptualised 25 years ago, which is remarkable. It is up to us to shape what is happening, considering how quickly things are changing. Focusing on content and communication specifically, copying and content is increasingly easy and free. Content can be made available speedily; sharing means multiplying and broadcasting, not dividing. Content is no longer linked to the medium; what is known as device agnosticism. There is a disintegration and separation between content and medium. Content can be changed, commented on, annotated, updated, and interacted with.

Communication in the internet age has become visible. In the past people filmed something, copies of which could be kept. Now, communication has become increasingly visible, and can be tracked, measured and kept. Communication has become content. There is a growing notion that communication forms part of the read-write web – people assume the right that whatever they read also entitles them to making a comment on it. Social media is a new form of communication, with mediums like Facebook taking on a radical new role in society. New forms of communication open up new forms of influence, particularly important for academics who believe that they can make a difference and influence society.

What does this mean for scholarship? The scholarship process can be divided into teaching, engagement and discovery, which has shifted through the imposition of the layer of visible communication. To date, certain elements of the knowledge production process has been individual and private, not really contributing much to broader scholarship. This is changing, through shared and social bookmarking processes allowing us to collaborate with others. Literature reviews are profoundly important and influential, and through the use of new tools like Mendeley, opening up increasingly. Resources are opened up and can be linked to referencing mechanisms, and shared with others in a community or discipline.

In the data collection phase, a lot of data is not digitised – something that is changing profoundly. Linked data, curated data, shareable data, text mining, big data, digital humanities and crowd sourcing are examples. Figshare is a mechanism through which an academic can immediately share knowledge with anybody in the world. Those data sets are given object identifiers, meaning that they can be found. Another international repository, named Dryad, makes it possible to access the actual data behind research. Citizen Science is another rising platform, where citizens can collect information and share this information on a platform. This means that the ability to collect data is more widespread. There is also a slowly growing increase in the Humanities. An example is the digitisation of a collection of quilts, the Quilt Index, making it possible to identify similarities in quilt designs across time and contexts that was not possible before.

In terms of findings, new kinds of articles are emerging (surffoundation.nl and Elsevier), with links to data and images. Not only are articles changing, but also journals are evolving into what are now known as mega-journals. All of these

innovations have led to a challenging of the notion of peer reviews, with new kinds of peer reviews taking place.

The notion of the lecture in one place and one time with one audience is disappearing. Students can now attend lectures anywhere, and they can access better ones if the quality is found lacking. Shifts are also taking place in terms of textbook publishing, with open textbooks becoming more and more available.

The days of clearly demarcated audiences are over. Online content is available to all, and is changing fast. Pubmed Central is the depository on which all research outputs have to be placed. An analysis in August found that there are 2 million full-text articles, with 420 000 unique users per day, of which only 25% are universities, 18% are government and related agencies, 40% are citizens and 17% are companies. All of this means that the way we measure what we do is changing. We are all very much locked into traditional journals on "the list", but new ways of measuring impact and influence is necessary. South Africa and Mexico are the only two countries in the world using the system that they do, but better ways have to be found to incentivise their work and its use. Obviously there will be overlaps, but "the list" should not be the only measure.

Impact has to play a role, measured through usage, peer-review, citations and alt-metrics. These points show that the terrain is changing, and that there is a need for knowledge to be replicable and reusable. There is a rising tide globally around open practice, and we have to ensure that we keep abreast of this trend. Global open access policies have been adopted by stakeholders like UNESCO, the World Bank, European Commission, DFID, Spain and Denmark, European Medical Research Councils, etc, and those that do not play along will be out in the cold.

The first issue to consider is infrastructure, which is beyond the ambit of individual institutions and will require government intervention. Advocacy is critical, and all senior policy and decision makers have to be engaged. Those that do not participate will fall out of the knowledge circulation groups. We have to get to grips with new tools, and develop new skills like content curation for education and learning: meta-data is a love note to the future, and those failing to use it could expect that their data will not be found. Intellectual property will be massively affected by all these changes and the use of creative commons licenses, among others. All of these issues change the difficult critical literacies that our students have to absorb – how do they find open stuff?

If we are going to participate in the global knowledge realm, we have to ensure that we are active in content creation. Students and scholars use Wikipedia, meaning that this is a valuable source of knowledge to which the global South has to start contributing. We do not have any choice but to become open-networked scholars in the changing world of knowledge creation and dissemination.

1.4   DISCUSSION:

1.4.1   Q: As institutions we are trying to comply with national policies and imperatives. Given the open spaces that are now available to all of us, are we not shooting ourselves in the foot if we are not thinking differently about how we do things? Must we be leaders or followers? Do we want to be a force to be reckoned with worldwide?

Q: You mentioned that the way we measure research output must be changed to rather focus on impact – can UoTs use different indicators? Concerning open-source material being the way of the future, will this not affect imperatives to publish?

Q (CPUT): You talked about the importance of infrastructure, yet UCT is quite advanced in this regard – could you share with other universities in South Africa?

Czerniewicz: I am in agreement that we should look at all these trends and determine how they can benefit us. The problem with many of the journals on the DHET's list is that they only focus on the needs of the global North. South Africans need to focus on their own developmental needs, which is why local policy drivers have to be on board. I think there might be a perception that there are no open-access journals on the accredited list; unfortunately only about 30% of them are, but the two concepts are not mutually exclusive. New initiatives will change this some more. What has to happen in our own region is that there has to be more of a focused change, which is unfortunately linked to behaviour, incentives and financial rewards. UCT is not the only university doing work in open content, and the aim is definitely to create opportunities for co-operation.

Moutlana: We heard about the digital breakthrough, but on the other hand we should know that we have to adapt and adopt to suit our own context. It is not that we don't have the knowledge in Southern Africa; the problem is that we need to improve infrastructure and resources.   The outputs of research will only be meaningful if they can be applied to improve lives.

Q: It will be imperative for universities to remain abreast of changes in scholarly practice. Are there specific areas where universities could optimise the benefits through collaborations?

Czerniewicz: Definitely. The EU has been early adopters in this area, where they experienced many of the same problems that we experience. On a regional basis a lot can be done in terms of knowledge curation and scholarship.

2.   PARALLEL SESSION 1

Chairperson: Prof. Nqabomzi Gawe, DVC: Durban University of Technology

2.1 **The utilisation of video as primary content delivery medium for staff development of health professions educators**
Mr Nico Baird, Instructional Designer (Multimedia), Central University of Technology

2.1.1 This study was done as part of a Master's degree, looking at how content can be provided through the medium of video presented online. Staff development is a continuous process, which is made easier through the use of technology. Different staff members experience different training needs at different times. Video makes it possible to address these different needs when it suits the individual concerned. The study was conducted over a period of one month, and was presented online.

There is a move away from physical media, which is difficult to update regularly and the review process is often complicated. The structure of the online course has to be done in such a way that the learner is engaged at all times. Most of the people who participated were between the ages of 41 – 50 years (58%), with 21% between 31 – 40 years. 100% of respondents missed staff development sessions due to other imperatives, while 55% left early due to an emergency. 63% of respondents undertook the tutorials at work, but the remainder did so in their own time. 90% wanted the format to be replicated for future use. The majority of respondents (94%) felt that the duration of video clips (4 – 5 minutes) was just right.

Negative input highlighted lack of interaction with the presenter, internet connectivity and resistance to being recorded. Recommendations from the respondents included:
- Do not drastically implement video training sessions, but rather implement in a phased approach by recording sessions that are presented in real time.
- The structure of the video should incorporate an introduction, followed by a video and some self-reflection, which could be repeated.
- 6 C's for success:
    - Be childlike, be willing to experiment and try new things
    - It should be continuous;
    - It should be creative;
    - It should be challenging;
    - Ensure commitment;
    - It should be compulsory.

Think out of the box, and think of all aspects that will add value to workers. Think about aspects that they would like to know about in order to improve themselves.

2.2 **Determinants of student performance in an introductory programming course: the case of students in the Polytechnic of Namibia**
Mr Marshal Gorejena, Lecturer, Department of Basic Computer Studies, School of IT, Polytechnic of Namibia

Prof. Ravi Nath, Department of Business Intelligence & Analytics, College of Business Administration, Creighton University
Prof. HN Muyingi, Associate Dean, School of IT, Polytechnic of Namibia

2.2.1   This study was conducted because first-year students had low success rates, a major concern among faculty members. Possible factors included relaxed recruitment criteria, poorly motivated students, and inappropriate teaching and learning styles.

The study investigated the impact of motivation, critical thinking and learning styles on student performance. Performance in the course 'Introduction to Algorithm Design' was assessed.

The objectives of the research were to determine the level of motivation among first year students, what factors influenced their performance, and remedial interventions. Prior research was conducted in the area, and many factors that contributed to the success of students in programming included high school background, motivation, learning style and curriculum.

The study focused on:
- Extrinsic motivation – focused on external reward or a future that may be provided by the external environment;
- Intrinsic motivation – related to an interest in the subject itself;
- An 11 item questionnaire was used, with each item measuring a 5-point Likert scale. Items were adapted from instruments to measure motivation by various authors.
- Learning styles were viewed as an element contributing to academic performance. More creative and complex thinking styles signify a more holistic and global mode of thinking.
- Active learners work actively with learning materials, preferring communication with others and learning through group work. Reflective learners prefer to work alone, think about and reflect on learning materials.
- Sensing learners like to learn facts, use standard approaches, have patience with details, and relate materials to the real world. In contrast, intuitive learners are more creative.
- Other categories include visual, verbal, sequential and global learners, each with different preferences and approaches.

Once learning styles had been identified, it was possible to identify the desired outcomes, namely:
- Critical thinking – cognitive skills and a disposition to apply critical thinking skills. It is possible that those with a greater critical thinking disposition at entry also had better developed critical thinking skills upon leaving.
- Measuring critical thinking skills is based on engagement, cognitive maturity and innovativeness.

Individual and contextual factors include:
- Mathematical skills – ability to study computer science;
- Previous exposure and familiarity with computer usage before enrolling in the programme;
- New learning environment;
- Age and gender.

Data were collected from all first year students, during the first week of admission. SPSS was used for the analysis of survey data. More male than female students participated in the study, with the majority under the age of 20 years and a small percentage over the age of 25 years.

Those who had used computers before exceeded those who had not, while all respondents had exposure to mobile phones. The majority had also had previous access to the internet, although most of the respondents did not have IT classes at school. The majority had used computers for office use, followed by internet access and gaming.

Research findings indicated that students are highly motivated, but this did not affect their performance in Algorithm Design. Grade 12 test scores significantly affected their performance, with older students performing better than younger ones. Students with a high level of engagement also performed better in programming classes.

As students progress into their second year, the study will look at materials and aids used for learning, learning processes, and facilitation of learning. A new group will also be engaged in the study to try and identify new issues to consider.

Recommendations:
Universities should admit students with acceptable high school credentials. Students who do not make the grade should be encouraged to undertake remedial coursework. Collaborative learning should be employed, and teaching strategies should match the learning styles of students. The establishment of university high-school relationships could be achieved through ICT academies.

2.3   DISCUSSION:

2.3.1   VUT: The approach of using visual materials for staff development is valid, but what about different learning styles – what if somebody is not a visual learner? How do you get learners to be involved in active learning? How do you deal with scaffolding of learners since there is no direct feedback from the learners?

VUT: We have had introduction programmes for the past ten years, with a 75% success rate. What about kinaesthetic learners? Everybody has a combination of at least two learning styles, which lecturers have to be able to accommodate.

Baird: I concentrated only on video for this study, but I never proposed that other delivery mediums should not be used. I wanted everyone to try and use the same method of learning to see what could be used to expand the learning. Many respondents indicated that they would have liked more materials, and more time to engage with the learning materials. We do use a learning platform, Blackboard, on which learners could get feedback. I wanted to focus only on video, but other resources are available if needed. Videos were deliberately kept short.

Gorejena: At our institutions we are aiming to also achieve high pass rates. We are saying that students with different learning styles require different teaching styles. The shift is that lecturers should be using inductive and deductive methods to meet all students' needs.

??: I think the 75% pass rate is commendable, but what about the context from which those students come. In the US there are high failure rates in certain fields, which is due to different factors. We conducted our study at the Polytechnic of Namibia.

VUT: We have a lot of previously disadvantaged learners who are enrolled in an introductory course to prepare them for the programming course, which shows that we have good results in this area. This course is compulsory for all learners enrolling in IT.

CUT: If you look at the learning process as a partnership between students and lecturers, motivation is the common thread between them. The first presentation indicated that there is a need for a compulsory element. We should ensure extrinsic and intrinsic motivations in all our courses.

??: The model that was presented on universal learning styles may differ depending on different contexts. We aimed to understand what learning styles are favoured by our learners.

Q: To what extent has gender played a role in this study? Is there a continuum of learning styles?

Baird: I would say that because people are resistant to change, it is often necessary to make things compulsory just to jump-start the process. Many people only use computers to read their e-mails. Now that they know how to do more than that, they are open to exploring other avenues, which they are finding to be of more value.

Gorejena: We introduced all the variables to identify only those that are vitally important. When we were conducting the analysis we found that gender was not a significant variable. We have identified that male students favour playing games on the computer over female students, which may open up their interest in programming.

3.   PARALLEL SESSION 2

Chairperson: Prof. Anthony Staak, DVC: Cape Peninsula University of Technology

3.1   Sustaining the leading edge in the integration of ICT into higher education
Ms Nadia Rhodes, Senior Lecturer, Department of Commercial Accounting, University of Johannesburg

3.1.1   This presentation will focus on sustaining the actual implementation of ICT integration in accounting education.

Our vision is to better equip accounting diplomates with the skills and knowledge required in the workplace, making them productive without requiring time away from work to be re-trained on operating systems.

A concern arose because most accounting training is still done using manual accounting systems out of textbooks, while in the world of work sophisticated accounting software is used requiring graduates to convert their theoretical knowledge into practice. Following an investigation, it was found that taught as a separate subject accounting software training was totally ineffective. Graduates indicated that they could not meet the expectations of their employers, and that there was no or limited communication between accounting lecturers and IT staff responsible for actually presenting parts of the programme.

There are four key features to ICT in accounting education, namely:
• Training of staff on accounting software,
• Linking IT and accounting software through the integration model;
• Linking accounting theory and accounting practice,
• Setting up dummy businesses on software to gain an understanding of actual practice.

In the accounting environment there are 6 elements/forces, including:
• Mediating artefacts/tools;
• Subjects;
• Objects transforming to outcomes;
• Rules;
• Community; and
• Division of labour.

Because the rules have changed, support from all staff is important to produce a work-ready graduate with relevant skills and knowledge in balance. The four phases of implementation were initiated in the last year, so the project is now in its second year of implementation.

Gap verification and validation from the design principles are as follows:
- Recognising the gap - is there a need to investigate?
- Recognising the extent of the gap
    - o How important is the gap? Check personal experience, literature, industry, staff, students, management.
- Recognising the value in closing the gap
    - o Quantitative – measurable; cost benefit analysis;
    - o Qualitative – difficult to measure but important; quality for education programmes;
- Recognising the opportunity to close the gap;
    - o Is there buy in from staff, students, industry, management?

The integration model was designed to bring together ICT and training with the aim to combine knowledge and skills, to support the cognitive process. Its aim is further to support current educational tools, giving it real time application and making it friendly, accessible and empowering the user.

A series of planned interventions are embedded in the design principles, namely:
- Inviting students to commit and engage;
- Providing a flexible design;
- Providing a safe and supporting environment;
- Respecting experience and integrating new knowledge;
- Promoting active involvement and collaboration;
- Directing tasks to achieve goals or to solve problems;
- Providing activities with real life evidence; and
- Recognising evidence of integrated learning.

With implementation, it is critical to secure support from management and industry and to ensure that the necessary tools to support implementation are available.

In conclusion, the design principles that were developed in this research sustain a process of evolution by integrating ICT into higher education. These principles can be used in combination or a stand-alone to sustain the leading edge in the integration of ICT into higher education.

3.2   Using Learn 2.0 Technologies for continued professional development
Ms Christa van Staden, Owner: Arendsig Akademie

3.2.1   This presentation is based on the findings of PhD research into the ways people work together to improve practice.

Professional development as an activity can be broken down into the following activities:
- Regular participation;
- Classroom attendance;

- Web technologies;
- IQMS (2003);
- CPTD-system (2007); and
- Networking and collaboration as informal professional development activities.

In the areas of networks and communities three basic concepts are used to refer to a group of people working together to enhance their practice, namely communities of practice, professional learning communities and teacher networks. According to Linda Hamlet, teacher networks help teachers considerably to improve their work and practice. Networking is the purposeful building of social ties to share or to get access to social sources, knowledge, advice, experience, support, leadership and documents to enhance performance. The activities and attitudes of teachers are best explained in terms of their network positions. Development networks can enhance or impede the activities of teachers, and teachers can change their network positions to improve certain aspects.

Three current implementation problems hamper professional development. These are the lack of opportunities to participate, effective methods to monitor professional development, and a lack of transparency in monitoring.

Three possible solutions are proposed, namely:
Solution 1: Use Learn 2.0 technologies to support learning and networking in new ways; support passive learning and support different groups simultaneously; use this platform to create technology (Ning).
Solution 2: The goal of monitoring is to collect reliable, relevant information.
Solution 3: Use sociograms to enhance transparency of the monitoring process.

The study identified the following significant findings
- Networking supported the development of dimensions of Learn 2.0 technologies;
- There is a need to enforce participation;
- Teachers rely on personal development networks;
- There is a strong need for regular monitoring; and
- Social network analysis provides a method to understand, enhance and monitor the professional development of the teachers.

3.3   DISCUSSION:

3.3.1   Q: I was very interested in your training for staff. Who is responsible for doing that and how did you go about it?

Rhodes: I am the promoter of this new way of teaching, so I was asked to set up a committee to plan and facilitate the training. This is very difficult if you don't have involvement and support from management to reduce workloads or pressure. We are trying to demonstrate the demand out there in industry to re-

skill and create students that are work-ready.

Q: You just illustrated how theory and practice can be brought together. Aren't there alternative ways to use your system, and is it being used optimally? In the Sciences in particular, the integration of theory and practice is normal, but I am uncertain what is happening in Accounting - as academics we should perhaps share best practice more often.

Q: Ms van Staden's presentation was most interesting. You indicated that intensified interactions translated to better performance. How do you ensure that the quality of the interaction relates to better performance?

Rhodes: We were the first institution that adopted an integrated approach in terms of accounting. It is difficult to say 'this is the only way' in terms of any system of teaching. However, while there is still room for research, I believe that in Accounting it is a step in the right direction. My research showed that the idea originated in 1995 but was never put into practice. It is a new way of working, and it may not be the best or the only way, but I believe it is a step in the right direction.

van Staden: The network was established and was monitored during a 3 month period. Questions were posed to other teachers which enhanced their performance. The research shows that responses from other teachers in the network were used specifically to improve performance.

Q: Did you look at alternative means of networking or communicating rather than posting, for example an email or interacting face-to-face? Did you look at what tools were used – were blocks used within the platform and was there any kind of integration like a knowledge management system?

van Staden: My study focused specifically on the use of social networking, which was what I monitored for purposes of the study. When participants sent emails to each other I would not be able to see those, meaning those interactions could not be used in my study. Of course, participants do speak to each other face-to-face, but if you look at my network beforehand, during and towards the end, teachers said that they got information from each other and the network shows that they did work together. People who wanted to improve their practice did the work and got results, and those who isolated themselves didn't improve.

Q: Ms Rhodes, your project has been running for a while and I was expecting you to tell us what progress had been achieved in terms of improving the quality of graduates. You've given us contextual factors relating to interim progress. What about the factors that are actually enhancing your project and whether you think you are going to achieve transformation of your graduates?

Rhodes: That is an extremely important question. We are only in the second

year of implementation and we are only dealing with second year students. It is amazing and exciting to see students who are able to think and work independently, and who are able to interact on a different level with their peers. How do I monitor success? How do we prove that we are actually achieving something positive and that we are actually changing the face of Accounting education? I think at this stage it can only be that based on our assessments, there is evidence that our questions and our assessment has changed to incorporate and integrate new skills and knowledge. We are definitely going to look at online assessments, using industry partners to set up an 'external' exam to test the skills of our students. Students have to provide a portfolio of assessment, in other words, they must have prove that they passed their assessments.

4.   PARALLEL SESSION 3

Chairperson: Mr Corneels Jafta, Registrar: Polytechnic of Namibia

4.1   Implementing e-learning against the odds – a success story for Namibia
Ms Leena Kloppers, Coordinator: Educational Technology, Centre for Open and Lifelong Learning (COLL), Polytechnic of Namibia

4.1.1   Institutions considering the practical application of e-learning have various models to choose from, of which the integrated model (suggested by Collins and Mornay) was applied by the Polytechnic of Namibia.

The model consists of four integrated components, namely:

1. Institution
- The institution needs to have a strong vision;
- The vision has to be supported by a strategy plan, budget and timeline;
- Communicating the vision to staff and students is essential.

2. Implementation
- Successful implementation should ideally be driven by a strong implementation team with strong leadership, technical and pedagogical skills.
- Staff members must be given proper training and support;
- The system needs monitoring and evaluation to see whether goals were achieved, and whether e-learning is working successfully.

3. Pedagogy
- Pedagogy must drive higher order thinking skills;
- Assessment remains a crucial component of the process;
- Training for lecturers and students on using the technology is crucial;
- Tutor support for lecturers when required must be provided.

4. Technology

- Technology must be accessible;
- Technology must work at all times, depending on reliable connectivity;
- Training and support should be provided to all using the technology.

Factors that encourage the use of technology:
- Educational value, or what added value does e-learning provide?
- Increased engagement.

E-learning at PoN is offered to distance students through the Centre for Open and Lifelong Learning (COLL), while on-campus students study through the Centre for Teaching and Learning (CTL). The Polytechnic has adopted both an e-learning policy as well as a 5-year strategic plan. While e-learning has many benefits, there are challenges and limitations such as a lack of interaction with Tutors and an inability to print materials for students.

What are students' requirements?
- Students must be computer literate;
- Students must have access to computers that are connected to Internet;
- Students must pass all the pre-requisites; and
- They must attend the student orientation session, whether at the main campus in Windhoek or at the Regional Centres. Well-trained regional coordinators are available to conduct these sessions, and marketing initiatives are constantly undertaken.

Other elements affecting the success of e-learning:
- Evaluations must be conducted at the end of every semester;
- An emphasis on collaborative learning is necessary;
- Vygotsky's social constructivist theory;
- Use existing study materials designed by COLL;
- Supplement with multimedia;
- Paced learning flexibility, students know when it is available;
- Varied online activities, for example Quiz;
- Tutor Support must be readily available.

Challenges affecting the workability of e-learning:
- Lecturers have heavy workloads;
- Resignations of lecturers;
- Low student enrolments;
- Connectivity problems.

What is the way forward:
- Integration of VLE with administration system;
- Use of social media to support trained lecturers to create communities of practice (COPs);
- M-learning;

- More staff must be appointed.

Final thoughts
- Distance education must be extended;
- We need to form partnership with other Institutions.

4.1.2   Q: How do you monitor cheating:

Kloppers: Online assessments require students to do research, while others require them to do assignments or special exercises. Tutors interact with students and are able to determine whether they understand the work, and whether the work they hand in is their own. The success of e-learning is not easily measured, or its value ascertained – a lot of evaluation must be conducted and documented. E-learning reduces the constraints of learning, allowing students to interact with tutors. Students should not experience a sense of isolation because web conferencing software allows them to have interaction with tutors, lecturers and other students.

4.2   ICT access, use and perceptions: the current state of play among staff and students at South African Universities of Technology

Mr Pradesh K Ramdeyal, Lecturer: Department of Information and Communication Technology, Mangosuthu University of Technology

4.2.1   The objective of this study was to determine how UoTs engage with ICT, considering its status as a relatively new and developing field and perceptions that most institutions implemented ICTs without well-conceptualised and coordinated plans.

The report set out to determine how ICTs are conceptualised and perceived in the South African higher education landscape. Data was drawn from interviews conducted with a number of ICT Technical Directors, and a large-scale survey into ICT access and use at 6 higher education institutions in South Africa.

The analysis of the research showed that:
- Everyone needs access to computers on campus, but as critical as it is for most IT students, they do not have access to computers;
- Access to computers off-campus is very low;
- Smartphones are increasingly being used;
- Staff members' access to ICTs at institutions is high.
- A comparison of students and staff usage of cellphone instant messaging applications shows that students make more use of these applications for teaching and learning.

In conclusion, it may be safe to say that academic staff should be consulted on the use of ICTs. The web presence of UoTs should be increased, while UoTs

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should work together to achieve economies of scale (perhaps purchasing computers through consortia or negotiating as a group with internet service providers). Other areas that should receive attention include LMS (mobile), staff training and education, and the establishment of a knowledge repository (OER).

4.3   DISCUSSION:

4.3.1   Q: There is a great concern regarding the update of web contents because it is very important for communication.

Ramdeyal: There are many open source resources for ICT users, and many industry services to develop students.   Students are also encouraged to download e-books.

5.   PLENARY   SESSION: ADMINISTRATIVE   AND   MANAGEMENT TECHNOLOGIES

Chairperson: Prof. Mashupye Kgaphola, VC: Mangosuthu University of Technology

5.1   KEYNOTE ADDRESS: How we use our own administrative technologies and the benefits received

Mr Kethan Parbhoo, Dynamics Director, Microsoft South Africa

5.1.1   Microsoft employs 90 000 people in over 190 countries. This means that the company employs a diverse range of people from different cultures and communities. The company invests in a variety of community programmes to develop countries' own software economies. Although Microsoft was initially driven by the notion of putting a PC on every desk, in order to empower everyone, this may have been achieved by empowering many people through the use of software.

The introduction of a variety of devices, software and services continue to drive Microsoft. Any device can be used to do what a computer used to do in the past, for which software continues to be developed.

Microsoft continues to provide a range of platforms in addition to the Windows operating system such as searching and phone connectivity to enhance productivity. Gaming and entertainment are also offered in addition to Skype, servers, tools and cloud. The Microsoft IT environment encompasses about 894K devices, while 460 million active Hotmail accounts are active worldwide. Some case studies were provided to demonstrate how Microsoft is using technology to achieve efficiencies and save money.

In order to understand customers better, it was necessary to gain a single view of customers which was challenging given the 170 applications on which they work.

This led to a slowing down of performance and architectural challenges. The solution was to develop a product called GSX, using the Dynamics CRM as a platform which resulted in savings of over $ 10 million per annum. If a customer sends an e-mail complaining about something, this is used as the document on which to action the system.

In terms of business intelligence, it was difficult to manage the costs per employee and track their performance. There was a need to empower all employees with knowledge, enabling management to take action based on data. The solution was a system called ManagePoint which provides a dashboard pulling data from various legacy systems. The benefits of this system include high user adoption, driving accountability and improving decision-making. It also provides a single version of the data, with the ability to go granular if there is a need.

A further challenge related to unified communications, in order to save the company money, increase productivity and efficiency, and encourage collaboration across regions. The solution is a platform called Lync, which has the benefit that it allows video conferencing and sharing of applications with others anywhere in the world. This has resulted in huge financial savings per annum and real productivity gains.

6. PARALLEL SESSION 1

Chairperson: Prof. Mashupye Kgaphola, VC: Mangosuthu University of Technology

6.1 An investigation of IPv6 and IPv4 Network Security: a Polytechnic of Namibia case study

Ms Mercy Bere, Junior Lecturer, Computer Systems and Networks, School of IT, Polytechnic of Namibia

6.1.1   IPv4 was introduced in 1981 with over 4 billion available IP addresses. New ideas for IP usage such as RFID, PDAs, and mobile phones evolved, meaning that IPv4 addresses were no longer adequate, resulting in the introduction of IPv6. In addition to increasing IP addresses, IPv6 was also designed with embedded security mechanisms. As internet connectivity grew, more and more network security problems occurred. The problem is that as IPv6 networks increase, so will security issues increase. IPSec is an internet security standard for protecting communications over IP, and must be supported by all IPv6 nodes. IPSec is also implementable in IPv4. It is necessary to determine whether there will be security gains to be had by implementing IPv6 and whether the security problems for the two versions are the same.

Network security testing was introduced to subject a network to different audits and analysis, which included network scanning, vulnerability scanning, password

scanning, etc. File integrity checkers are tools that files have not been altered. Network scanning and vulnerability scanning are incorporated in penetration testing. Log reviews are used as audit data to show deviations. Different steps are used to determine active hosts on the network, vulnerability scanning and vulnerability exploitation to penetrate the network.

Initial results identified the network attacks that plague both networks. These include reconnaissance attacks (gathering information about the target network) which include ping sweeps, packet sniffing and port scans. Access attacks involve getting access to computer resources to execute unauthorised or illegal activities. Various types of attack exist.

The Polytechnic of Namibia intends to migrate its network from IPv4 to IPv6 starting in 2013. As such, network administrators volunteered their network to be used as a testing site. Penetration testing was chosen because it would confirm whether current security measures are effective or not. It would identify types of information available to the attacker and whether such information is hazardous or not. It would also identify the information that is exposed to the public or the internet world, and would identify and narrow down security risks. The Polytechnic of Namibia production network was used to test IPv4 network security, while an island network emulating the IPv4 network was used to test IPv6 network security. Different levels of information about the network are known. Nmap was used for network scanning, while Nessus was used to determine vulnerability and the level of the risk.

From the results for IPv4, many active hosts were discovered. Critical servers were selected for further probing. Active ports and services running on those hosts were detected. Similar results were found for IPv6.

Using penetration testing it was found that both IPv4 and IPv6 networks are susceptible to network attacks.

6.2   DISCUSSION:

6.2.1   Q: If there are any social responsibility projects driven by Microsoft in Southern Africa, what do they entail and how would one apply for them?

Polytechnic Namibia: Do you have any experiences to share in terms of the cloud system?

Parbhoo: We have quite comprehensive social responsibility projects in South Africa, where we focus on some challenges that we see in a number of areas. We have funded training for about 8 000 teachers in the areas of maths and sciences, through a train-the-trainer programme. We provide high discounts to all the public schools in South Africa to provide them with access to Windows. We invest in programmes that allow students an opportunity to put forward their

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software ideas, where they can win funding to set up their businesses. We subsidise the salaries of people wishing to study in IT education through the SETAs, allowing them to go into our partner network for work experience. They could then either gain employment through our partners, or find alternative employment.

Microsoft developed a platform named Azure to provide a cloud, which should be commercially available in the next two months. People can use Azure to develop their own applications, which can also be hosted in the cloud. As for Skype, we acquired the product from Cisco and it is now a fully owned division of Microsoft.

VUT: One can sense that security is an endemic problem. At what point can preventative mechanisms be built into the system to prevent unauthorised attacks?

Bere: I think one should not wait until the damage is done. It depends on what the network is meant to do, and who will use it. The people using the system will determine the kind of intrusions you should anticipate. Your network designers should incorporate all possible security measures in your network, even though they will never be able to consider them all.

Polytechnic Namibia: I would like to add to what Ms Bere has said. Considering how fast knowledge is changing, by the time something under construction is completed somebody will have come up with a way to crack the security system you built into it.

Bere: From the literature it has emerged that apart from Nigerians that tend to want to hack into bank accounts, the majority of attacks in Africa come from employees within an organisation. Even if one does find the people or identify the guilty parties, because our law does not stipulate what exactly constitutes a transgression it is also not that easy to prove guilt. Transgressions usually go unpunished, and it depends on the actual crime what punishment is meted out. There are also issues of jurisdiction – who will prosecute a Nigerian transgressor in Namibia or South Africa?

Q: The point is that we should investigate further to find out what the reasons are for people breaking into IP addresses.

R: There is a paucity of evidence to demonstrate when there has been a breach of security, and a lack of understanding on the part of the law. There is also no policy yet to prosecute transgressors and take further action.

CUT: As long as there are incentives for people to break into IP addresses, there will be no solution. We need to ensure a paradigm shift.

7. PARALLEL SESSION 2

Chairperson: Prof. Tjama Tjivikua, Rector: Polytechnic of Namibia

7.1   Towards a holistic service-oriented framework for digital forensic investigation in the cloud

Dr Addmore Machanja, Senior Lecturer, School of IT, Polytechnic of Namibia
Prof. Jill Slay, Executive Dean, School of IT, Polytechnic of Namibia
Dr Raymond Choo and Dr Ben Martini, Forensic Computing Lab, University of South Australia

7.1.1   Why are people moving to cloud computing? In any real sense cloud computing is connecting to the internet. Why is it different from connecting to any other website on the internet?

One of the reasons that we have cloud computing is resource sharing. A major problem in Africa is that we do not have adequate infrastructure. Organisations like universities, with really intensive computing activity, are limited by the amount of filing space that they get, where cloud computing can be one of the solutions. One of the negatives is that information can be compromised by criminals infiltrating the cloud.

Software and the development of software are very expensive activities. Computer companies are therefore developing general software that can be used by various companies, which can be shared all over the world with cloud computing.

Infrastructure and platforms: while it may sometimes be too costly to purchase multiple computers, one central computer can serve the needs of various people if cloud computing is used. The tendency nowadays is to buy the most powerful computers on the market; however, the power is being wasted if computers are not used optimally.

One type of cloud computing is "private cloud", whereby institutions say that they don't want to share their information platform and that their information might be compromised when used by other institutions.

A "community cloud" could house a number of organisations that might have a common interest, e.g. Universities of Technology. A "public cloud", like Microsoft, can be accessed anywhere in the world.

The last type of cloud is the "hybrid cloud". The "hybrid cloud" tries to bring together different technologies for different functions. If you have a server at your institution, then your institution may use hybrid cloud computing.

Problems faced in terms of cloud computing are illegal access to data, storage and distribution of illegal data (applied to the internet and the cloud) e.g. child

abuse material, password stealing by hackers, launching pad for electronic attacks.

Our research focused on how to combat some of these problems that make the cloud sometimes less than 100% safe to use, despite its advantages.

Challenges to cloud digital forensics are data location (many physical devices, many geographical places); data ownership; information auditing; data hiding techniques and anti-forensic tools (password protected files, steganography); time constraints; growing volumes of data to be analysed; business continuity; and no readily available computer and network data, including log files.

The requirements for a holistic approach should include a focus on the following elements:
• The legality of the data acquisition process;
• Identification and analysis of digital evidence;
• A standardised method of preserving and presenting digital evidence; and
• Overcoming the validation and verification challenges in relation to how data is preserved and how it is analysed.

7.2   DISCUSSION:

7.2.1   Q: You listed a lot of challenges. Is it really worthwhile getting involved in cloud computing at all?

Machanja: The actual inventors came up with a plan to accommodate only one person and then afterwards decided to invent a bigger place to accommodate more users. It was worthwhile because there was no risk involved. Besides the fact that there was no risk involved, the economics make it worthwhile to try and find possible solutions to the problems.

C: The vendors are working really hard to sell the cloud, but the forensic computing industry wants the community and particularly universities to be aware of the problems of the cloud. While we worry about the techniques and the software that we might use, the issue is that those using the cloud for storage should know the risks. An institution, for example, would have to carefully consider using the cloud versus internal closed storage systems.

Q: How do you foresee cloud computing taking over?

Machanja: I cannot predict if cloud computing will take over. What is happening now is that most of us are using cloud computing without even being aware of it. Our internal mails are sent using cloud computing, albeit internally. Cloud computing is a way of sharing resources and is gradually being developed.

Q: How do you foresee the competition between those running the cloud and

those running local services like SAP systems, Microsoft, etc. developing?

Machanja: In the presentation by Microsoft today cloud computing was highlighted as part of their innovative ideas, and they provide services on the cloud. They assume that the demand for this kind of storage will surpass private storage.

C: I think if we look internationally at some governments, like Australia, vendors have created the cloud market and not the technology drive. Vendors are taking over, leaving us no option but to move to the cloud. Laptops are now made without hard disk storage, based on the assumption that users will store directly in the cloud.

Q: You said that different countries have different legal frameworks surrounding the ownership of the data on the cloud, and that there are already challenges. Say a criminal is located in Namibia and the cloud is operated from the United States. Which rules will apply or what are the best solutions to the problem?

Machanja: Governments may come to an agreement on how to handle this. It is very difficult and costly to catch these criminals, meaning they often get away.

Q: You said that one of the challenges is the legal framework. Have you done some investigative work on the Legal Framework in Namibia?

C: Apparently there is legislation in the process of being approved on data protection, but not on cyber digital legislation. It is surprising that there has been such a delay, because most other countries have finalised similar legislation in 2001. There is an eleven year gap, but Namibia has recognised the need for it. The Institute of Forensic Science is the only forensic capacity in Namibia.

C: The Institute of Forensic Science is not dealing with digital forensics; its focus is on scientific forensics. We will have to look at developing a framework for digital forensics customised to Namibia's needs. That is a great challenge actually.

8. **PARALLEL SESSION 3**

   Chairperson: Mr Corneels Jafta, Registrar: Polytechnic of Namibia

8.1 **An evaluation of ICT usage in the Southern African higher education institutions through the HEQC's institutional audit reports**

   Ms Chichi Maimane, Director: Centre for Curriculum Development, Central University of Technology

8.1.1 The Council on Higher Education (CHE) had been established to advise the Minister of Education on the management and monitoring of the Higher Education

Sector. The Higher Education Quality Committee (HEQC) was established as a sub-committee of the CHE to conduct quality assurance functions in the higher education sector, namely institutional audits, programme accreditation, programme reviews and standards development. The presentation by Ms Mainmane focused on recommendations and commendations emanating from the HEQCs institutional audits conducted between 2004 and 2011.

UOT's face a number of challenges in ensuring efficiency and effectiveness in the management of their quality assurance systems. In view of the second cycle of Institutional Audits, institutions will not be able to conduct business as usual. All institutions are encouraged to consider their own and other institutions' audit reports to compile improvement plans and learn lessons from their experiences.

Conceptualisation of a UoT:
Programmes offered by UOT's must be both career- and technology-focused. Technology is viewed as an effective and efficient application of the knowledge, skills and expertise that, when applied, will result in the output of value-added products, processes and services. The Education White Paper similarly encouraged institutions to meet pressing national skills needs and to respond to new realities and opportunities. UoTs' focus areas should include the conceptualisation, development and commercialisation of technology in their curricula.

The following themes emerged from the analysis of audit reports:

Integrated ICT systems to assist with planning
Two UOT's and six traditional universities were highlighted as exemplars for the effective use of IT systems and management information to monitor the achievement of institutional strategic objectives. Apart from strong policies for the use of technology, these institutions also had access to accurate and relevant data by virtue of their use of ICT.

Institutional capacity to manage available MIS
An under-utilisation of the ITS system emerged at some institutions, some of whom favoured paper-based record keeping. Other concerns included a lack of usable systems, a shortage of capacity and a lack of training of staff members.

In the cases of two traditional universities, network capacity between campuses must be upgraded and ICT resources and staff skills must be reviewed. The absence of relevant management and administrative capacity to ensure that the institutional goals are achieved is a concern. Available technical tools are also not used to monitor and evaluate the achievement of institutional goals and objectives.

From the analysis of one comprehensive institution it emerged that a well-developed information management system was available, but under-utilised. The

division responsible for overall ICT infrastructure was also inadequately resourced.

Technology in context
The analysis also identified that there are no stand-alone criteria for ICT's. The need for benchmarking with local and international institutions emerged, in addition to surveys that should help UoTs clarify their identities and set clear goals with time frames.

In an audit report completed in 2010, relevant institutions were commended for the development of web technology supporting open and distance learning.

Observations & Conclusions
The UoT sector continues to experience challenges in defining themselves and the way they operate, due to different contextual factors and circumstances. This leads to a situation that might be described as 'business unusual'.

8.2   DISCUSSION:

8.2.1   Q: You spoke of the unequal distribution of resources between campuses. What are the contextual factors affecting the equal distribution of resources? Is this a result of measure and will institutions that are less resourced still be empowered and resourced?

Maimane: The contextual factors and circumstances within each and every institution that UOTs should be considered. Several audit reports highlighted that some institutions with multiple sites had an unequal distribution of resources, and questioned the impact that this had on teaching and learning. It is a given, looking at the histories of universities, that they do not share the same capacities. SATN has worked tirelessly to help identify specific, clearly articulated performance indicators for UOTs.

C: When UOT's were promulgated extensive effort went into identifying the characteristics that should define this grouping, and to generate indicators and key performance areas for this group of institutions.

Q: What about those UOT's you have not included in your analysis. Is the picture adequately comprehensive if not all UoTs have been interrogated?

Maimane: All audit reports were perused to identify recommendations and commendations. One should realise that there is a set of standard criteria that are to be checked against minimum standards. The bulk of information in audit reports focused on the use of technology for purposes of teaching and learning and not necessarily on the use of technology for administrative purposes.

9.   PLENARY SESSION: RESEARCH AND INNOVATION TECHNOLOGIES

Chairperson: Prof. Irene Moutlana, Vice Chancellor: Vaal University of Technology

9.1 **KEYNOTE ADDRESS: Speech technologies: research and innovation in action**

Prof. Etienne Barnard, Researcher: Multilingual Speech Technology Group (MuST), Faculty of Economic Sciences and IT, Vaal Triangle Campus, North West University

9.1.1 What are speech technologies, and why should we care?
- Information has become critically important in the world, but most of our citizens have limited access to information.
- Speech technology is a way to make access to information affordable, less demanding and less English-centric than it currently is.
- Speech technology uses computer systems that process human speech, to enable understanding of speech (automatic speech recognition), or to produce speech (text to speech).
- Affordability can be achieved through the use of a telephone. To make information less English-centric is the crux of the matter.

How do we create speech technology for a target language?
- Speech technology is already very sophisticated in the larger languages of the world, like German, French or US English. The same should be done for target languages relevant to the local context.
- The same processes can be used for all languages. The distinctive features are provided through an acoustic model, pronunciation dictionary, and the language model.
  o The pronunciation dictionary is developed by collecting a list of words in the target language, after which the basic sounds (phonemes) that occur in the language are developed. *DictionaryMaker* is used to create rules for pronouncing those words. We are now able to create usable pronunciation dictionaries in days or weeks.
  o Accoustic models are created by collecting a corpus, selecting a set of target utterances – questions to be answered, phrases to be read, topics to be discussed, etc. A group of first-language speakers – 50 to 200 speakers, age and gender inclusive - are solicited to pronounce target utterances, after which words are transcribed. Smartphones have helped to make this process much simpler.
  o Deriving a language model: language models are highly task-specific. There are two generic approaches, namely:
    ▪ Hand-craft a model using task knowledge; or
    ▪ Commute a statistical model using massive amounts of text for good performance.
- Speech recognition for the official South African languages has been enabled

by the DAC and the NWU.

A health information line for caregivers of HIV positive children in Botswana was one application of this project. Caregivers working under the auspices of the Botswana-Baylor Children's Clinical Centre of Excellence are able to use speech recognition or keypresses to refresh their knowledge or to access updated information. These caregivers found the OpenPhone system to be extremely useful, but ended up not using it because call costs were prohibitive, and because they viewed it as a solution that was not integrated into their daily lives or part of their mental models. Most users actually prefer to press buttons over using speech recognition, because of the sensitivity of the topic.

OpenPhone was also used to search the Web by voice. US English was the only supported language initially, and this process was expanded to include a number of local languages, with significant use of Afrikaans and SA English. However, isiZulu did not have enough Web content to make it practical.

The development and application of speech technology in SA has been a mixed bag. There have been unexpected challenges, such as resource collection, service costs, and content creation. There have been some surprising successes, namely tools such as DictionaryMaker and Woefzela, although many of the earlier hopes have not yet materialised such as the widespread uptake of telephone-based information services. There is an appreciation of the ways Speech Technology can improve the lives of our fellow citizens. In pursuing these goals, great value has been created through powerful tools and awareness about Speech Technology.

The excellence that was originally aimed for emerged as a context-dependent concept. The capabilities of the team, the constraints of the environment and the needs of the society all have a role to play. It would be necessary to make significant investments in a few dedicated areas (backing a few winners), but also to change course should it appear necessary. Research, teaching and societal impact can be mutually reinforcing.

9.2   Mobile platforms for rural innovation in Southern Africa

Dr Christian Toelg, Director: Research and Development, Namibia Business and Innovation Centre, Polytechnic of Namibia
Dr Kasper Jensen, Deputy Director/ Associate Professor, Software Engineering Department, School of IT, Polytechnic of Namibia

9.2.1   The Namibia Business Innovation Centre (NBIC) has the mission to foster entrepreneurship and innovation, through a number of programmes. We believe that because a large part of the population live in the rural areas, they come up with their own solutions, and we want to see what these are, how we can support them, and how they can be commercialised.

Anil Gupta asked a number of questions a number of years ago about innovations, namely whether innovations are only taking place in developed countries. Rural innovations are innovations derived in rural areas, which include indigenous or traditional knowledge, or grassroots innovations. These may include knowledge about plants and their application for food or medicinal purposes, and are typically shared by a community or cultural group passed down from one generation to the next.

Documenting rural innovations makes it possible to share them on a local level if the innovator agrees, after which they can be implemented by others. It also helps to ensure the protection of the intellectual property by filing patents where possible, or blocking outsiders from doing so. This ensures fair benefit sharing if commercialisation is possible.

What is needed:
- Scope;
- Processes for capture, dissemination and commercialisation of rural innovations;
- Stakeholder involvement and roles;
- Benefit sharing models;
- IP ownership models;
- Benefit sharing;
- In India the Honeybee Network scouted more than 150 000 ideas, innovations, and traditional knowledge patterns.

What has this got to do with universities? There are numerous roles that universities, research labs and innovation centres can play in these processes. A model for the data capture and processing has been developed, incorporating capturing of the data on a database where the innovation is assessed by a reviewer, after which commercialisation, patenting or sharing is made possible. Honeybee follows the same strategy.

Challenges to the Honeybee Network's success include scouting, which is a paper-based process meaning that paper forms may not be available when needed, applications are not submitted or may get lost, and access that is limited to the internet only, which may not be available in rural areas.

Mobile phones are able to capture many types of data including text, audio, pictures, video, location, orientation, time, etc. It is possible to store large amounts of information until proper uploading can be done, based on network availability. It will also be possible to support new interfaces so that the user interaction can be tailored to specific contexts.

Open-source solutions are going to be important in the future. An example was cited of capturing indigenous knowledge using mobile phones to create a massive data set for a geospatial model.

The project is still at an early stage in Namibia. Initial testing has proven that it is possible to conduct similar processes, but the need to develop and implement standardised processes for scouting, documentation, assessment, dissemination, IP protection and commercialisation remains to be explored further. Training for field staff of partner organisations has to be conducted, and a mobile application to map, access and search the rural innovation database has to be developed.

9.3 DISCUSSION:

9.3.1 Q: Is it feasible to do speech recognition on our current phone networks?

Barnard: These processes are very dependent on internet connectivity and telephone connectivity. There is an open-source toolkit under development which should be available soon.

Q: Stephen Hawkins is unable to speak – how is speech recognition used to convert his gestures into sounds.

Barnard: They used gestures to create sequences of phonemes that in turn created sentences – in essence a reversal of the process that we use. That is one of the challenges pertaining to our languages in South Africa.

Q: Keeping in mind that the biggest language in Southern Africa is broken English, how will the system compensate for people who don't speak mother-tongue English?

Barnard: We had to cover all the different languages in South Africa to collect different dialects, one of the major challenges for the system.

Q: You mentioned acoustics in capturing the language, but even within isiXhosa there are different dialects – can the system accommodate that?

Barnard: When I say that our speech collections have to be representative; that is exactly what I mean. This also has to be done across generations – younger people speak differently from the way that older people do.

Q: How can the speech detection system recognise different words in a sentence? How do you cater for differentiated understandings of a word – is there an average predictability ratio?

Barnard: The language model tells you not only what the individual words of a language are, but also how they are strung together. We aim not to look at individual words, but at the contexts in which they appear. That enables more accurate recognition of words. As a consequence, we can deal with really large vocabularies. A typical speaker uses about 2 500 to 3 500 words in their daily working life, but our vocabulary recognises 30 000 words. In our world we use robust systems or toolkits that are flexible. Neural networks are coming back into favour.

Q: How do you collect the corpus from the 11 official languages in South Africa?

Barnard: We were sponsored by the DAC, and a requirement was that the corpus must be freely available. You can access it on the Web from the end of this year. We sent people out with handset telephones and requested people to speak into

the phone to get the corpus correct.

Q: I have a question about the limitations of the mobile phones to store data. Digital data collection also requires massive bandwidth.

Jensen: Yes, they take up lots of space, but you can now buy massive data cards at a very affordable price. We are hoping that these issues will improve over time, both for our project but also for speech recognition. One could also do physical uploading of data.

Barnard: As a person who is not aware of the technological innovations – when I did my PhD one of the most important achievements was the fact that I brought a whole computer back to the University of Pretoria, with a capacity of 300 megabytes. Today we have phones with more capacity. There is a curve of increasing capacity. 32 gigabytes is a fair amount of information – we should not be blinded by the current limitations.

Q: Are you going to need support in other languages in the work that you do?

Toelg: At present we work mostly in English, which is fairly easily translated. We tend to make use of a lot of graphics, which also helps to make it easier, but we will definitely need assistance in the local languages in future.

FIFTH ANNUAL SATN CONFERENCE 2012
ICTs AND UNIVERSITIES: THE STRATEGIC ADVANTAGE

HOSTED BY: POLYTECHNIC OF NAMIBIA, WINDHOEK, NAMIBIA
31 AUGUST 2012

1.   PLENARY SESSION
        Chairperson: Prof. Tjama Tjivikua, Rector: Polytechnic of Namibia

1.1   Development of a national strategy to increase engineering graduate output
        Dr Oswald Franks Pr Eng, CEO, ECSA

1.1.1   Dr Franks provided an overview of an initiative undertaken by the Engineering Council of South Africa, in conjunction with other role players in higher education, to increase engineering graduate output.

ECSA is a professional body with the purpose of promoting the health and safety interest of citizens and the environment in relation to work conducted by engineering professionals. The Council has to accredit engineering programmes at a number of universities, and register professionals and candidates. Engineering practice is regulated through a code of conduct, by investigating complaints and maintaining discipline, and by providing continued professional development.

ECSA's discretionary functions include taking measures to protect public health and safety, conducting research into the engineering profession, and advising any Minister of national government on matters relating to the engineering profession (including Science and Technology, Public Works, etc.) The organisation also interacts with a range of other stakeholders and voluntary associations to promote the interests of the engineering sector.

Shortly after his appointment the Minister of Higher Education and Training set a target for graduate outputs in Engineering to double to approximately 15 000 in 2014. This target is going to be very difficult to achieve without an informed strategy that each of the higher education institutions can follow.

In April 2011, a review of ways to improve throughput in the Engineering Bachelor's degree was commissioned. ECSA followed this review with a study to determine the barriers holding back throughput in engineering – this review report will be published in November 2012.

The barriers to student success that have to be addressed include:
• Improving the talent pipeline from schools;
• Improved student selection;
• Coherent, integrated and timely student support;
• Flexible curriculum and foundational support;

- Improved teaching and learning;
- Staffing;
- Funding;
- WIL;
- Articulation between FETs and the higher education sector.

As a result of this review, a national dialogue will take place on 16 October 2012 where a national strategy will be developed to increase engineering graduate output. It is hoped that UoTs will participate in this dialogue in order to ensure that their experiences are also shared. Following the dialogue, reports from the discussion groups will be consolidated into a report to the Minister, after which the DHET will engage other stakeholders.

1.2   **SPECIAL GUEST LECTURE**
Curiosity
Dr Japie van Zyl, Associate Director: Project Formulation and Strategy, NASA Jet Propulsion Laboratory

1.2.1   Dr van Zyl made a presentation on the recent NASA mission to Mars, and shared some of the findings made during this visit.

The Jet Propulsion Laboratory (JPL) is both federally funded through NASA while being university operated, courtesy of Caltech. Many students are working with JPL to do their graduate work. JPL was established in 1936, and today operate 24 spacecraft and 10 instruments across the solar system and beyond. Two Voyager spacecraft, launched in 1977, are still in operation. JPL has visited all planets in our solar system except Pluto, but a spacecraft is on its way there.

Earth and Mars share several features. Mars has a polar cap, similar to the earth, and grand canyons similar to those on earth. Mars has large volcanoes, just like we have on the earth. Geology on Mars is similar to those on earth, with sedimentary layering indicating that there once had to be water on Mars, as there is conclusive evidence of ice on Mars. Layered sedimentary rocks further support the conclusion that there must have been water on Mars, supporting the conclusion that there must be minerals on Mars that would form in the presence of water. Hematite was found, further supporting this understanding. Photographs taken over a period of time also proved that there is water slowly seeping through the surface of Mars.

A vehicle named 'Curiosity' was developed to traverse the surface of Mars. The Curiosity Rover will, over the next two years, attempt to drive up a mountain that is approximately 6 km high, in order to take geological samples. It is hoped that very exciting scientific discoveries will start coming back from Mars in the near future.

1.3   **DISCUSSION:**

1.3.1   Q: What will the next steps be after making any discoveries on Mars?

Van Zyl: What next? If we find that there might have been past life on Mars all hell will break loose, because people will be arguing about that for a long, long time, and we will only be able to settle the matter once we can analyse a rock back on earth. Experiments conducted in the 1970s concluded that there were no signs of past life. Since then, people have repeated that same experiment in a desert (where we know there to be life), and they found no life. We all believe that life is special and only exists on earth, but there are so many stars out there that one has to allow for some chance of other life out there.

Q: What is the definition of life?

Van Zyl: I imagine life to be something with multiple cells that can reproduce – requiring water, some energy source, and either carbon- or silicon-based background.

Communication from Mars remains challenging, so we are working on developing laser-based communication.

Q: When can we expect the first man to visit Mars?

Van Zyl: That will require an enormous amount of money. We may be able to do so technologically by around the mid-2030s, but I doubt that the US will be able to afford it. We will have to find a way to generate oxygen and rocket fuel on Mars to send any humans back to earth. It will be an enormous and hugely expensive thing to do, and we will not have the same returns on investment than we do with the rover.

Q: What is the current thinking about what happened to the water on Mars?

Van Zyl: There is a notion that at some time about half of Mars was covered by water and the question is what happened to its atmosphere and surface water. There are three planets with similar atmospheres, namely Venus, Mars and Earth. We are trying to find out what happened on these planets so we prevent the same thing happening on Earth.

Q: What would happen if there were to be an accident with the rover currently on Mars?

Van Zyl: Well, a previous rover did get stuck in the sand, which was difficult to resolve. We tell the rover where we want it to end up, and it has cameras on-board to navigate itself. We have tested that software very carefully.

Q: How are you managing the expectations around the mission to Mars, giving people the assurance that the pictures were actually taken there and not just in Oranjemund?

Van Zyl: There are people that think this is a huge hoax, but all we can do is to give them the data. Also, you cannot spend $ 2.5 billion without some oversight and

governance.

The actual landing on Mars was a very emotional moment. The room went completely silent, and when we actually knew that we had landed, people went crazy. Some of those people worked on this project for years and years, so they have a lot of pride and emotional investment in the project. It was an amazing experience.

Q: Could you share what the contribution of your team was to the larger project?

Van Zyl: I worked in radar before my current job. If the radar does not work, the landing will not work. The interesting thing is that if the parachute did not open, the landing would also not have worked. There are a number of different aspects that had to be right for the project to work. Anything can go wrong.

Q: If you cannot send back samples, can you send back data?

Van Zyl: We have very sophisticated instruments on board, so we can do analysis using mass spectrometers. We don't do much computation on board; we send the data back to earth for analysis.

2.   ICTs IN PRACTICE: STUDENTS AND ACADEMICS AS AGENTS
Chairperson: Prof. Tjama Tjivikua, Rector: Polytechnic of Namibia

2.1   ICTs in practice: students and academics as agents
Prof. Shirley Alexander, DVC and Vice-President (Teaching, Learning and Equity), University of Technology, Sydney

2.1.1   This is a very interesting time to be involved in education in the world. MOOCs (Massive Open Online Courses) are shaking up the world's universities, with many online courses available for free. Predicting the future is however very difficult. There is a hype cycle for the evolution of new technologies; there is a peak of inflated expectation during which the new technology is viewed as the absolute answer to every problem, followed by a trough of disillusionment during which expectations are dashed. This is followed by a slope of enlightenment and a plateau of productivity. The lesson from the history of technology is that it is users who ultimately transform technology into something that is useful to them.

UTS is situated in Sydney, with a population of 30 000 students. A new engineering and IT building is under construction, with the aim to build learning for the future.

What does it mean to be a university of technology? The most basic understanding is to view technology as tools, with the implicit understanding that the tools must be the very latest and always in working order. At a second level, technology has to be viewed as the interaction between professional practice and the use of tools, to shape the ways that the professions operate. Thirdly, technology should be viewed as a system, where we continually look at whether we should be using technology to shape practice.

To determine how to move forward, we should firstly ask who the learners are, and how the curriculum should be designed to suit their needs. Thereafter, we can ascertain which technologies support the aims we identified, and which learning spaces support the curriculum and the technologies we chose to use.

One of the aspects that has changed over the years has been the hours that students spend on campus; with these times getting increasingly shorter most students now spend only an average of 3 days a week on campus. Planned enrolments versus actual attendance also showed that students are attending fewer classes.

The UTS model of learning includes:
- An integrated exposure to professional practice through modes of practice-oriented education;
- Professional practice should be situated in a global workplace;
- Learning should be research-inspired.

Learning contexts for developing practice and future oriented attributes are dependent on active engagement of learners with what and why they are learning. This is enforced by authenticity, focusing on diversity of practice contexts and issues. Learning face-to-face and online should be balanced. Where authenticity is measured, lectures score the lowest, with work-based learning earning the highest scores.

Looking at the kinds of technologies that would support learning the following were identified:
- ePortfolios;
- Field trips – virtual or second life;
- Simulation and role plays – online;
- Blogs and wikis;
- Multi-media case studies, including student produced work;
- Podcasts;
- For most students the most important aspect is assessment, and this is generally the prompt that students need to guide their willingness to engage with the learning material.

Various technology-based assessment methods are available to lecturers to assess student performance. SPARKplus is used to develop engineering judgement and the capacity to learn. SPARKplus is used in contexts where group work is required, and where students rate their group members on their effectiveness in the group. This tool has been widely adopted throughout Australian institutions.

Students were asked to comment on their own preferred level of involvement in course learning activities that use technologies. Students indicated the greatest need in terms of finding information using search engines. What was found lacking was the level of students actually listening to podcasts. Students indicated that their preferred modes of communicating with students and staff were e-mail and face-to-face.

Given this kind of curriculum and the use of technology, what kind of spaces do we need? From a study done in 2007, it emerged that student performance is directly linked to spaces on campus. Students were asked to keep photographic diaries of where they found themselves, and it emerged that quiet, neat spaces were favoured as good places to learn. Noisy buildings with bad lighting were viewed as not conducive to learning. A post-occupancy evaluation was conducted to find out what students like versus what they do not like. Hybrid learning areas are equipped for group work, with electronic white boards and Wi-Fi. Students are informed about which spaces are available to them, and what kinds of technology are available on which sites. Each of the spaces has their own Facebook pages, so that students can comment on the spaces. 92% of students like the newly created spaces.

In a recent interaction, students were asked to comment on what their expectations are about learning in the future. Different options were presented to students, namely:

- Business as usual – lectures, provided by what is known as the 'super teacher', but also supplemented by technology such as Blackboard and other technologies.
- Flipped learning – making use of the increasing open educational resources.
- Individualised learning – new data allows us to customise learning to suit a learner's needs, using technology and students' individual dashboards. Students can be assisted by dedicated tutors, to provide just-in-time and just-for-me learning.
- Hybrid learning – students could go around the world to do a semester in one location, another semester somewhere else and maybe an online course somewhere, being verified to gain a qualification by a single dedicated institution.

Of these options, the traditional, business-as-usual method got the highest vote. Students preferred flipped learning as a second option. Despite technology, students appear to favour some human contact.

To ensure that students would enjoy learning but still use technology, the use of large collaborative learning spaces and group-work spaces will have to be supported by technology. A systems approach should link curriculum with technology and learning spaces in a continuous feedback loop.

2.2   DISCUSSION:

2.2.1   Q: You say that one of the options is 'business as usual', but you also mentioned the use of various technological advances. How would you go about stimulating this kind of approach?

Alexander: We have pockets of excellence, with some staff using technology to the best possible and most innovative standards. Half of the challenge is to bring those staff members who resist technology and insist on face-to-face teaching into the fold. We have very exciting projects where students from different disciplines have to collaborate and learn from each other and the different contexts in which they operate.

Q: We know that students are spending less time in class – how much learning takes place outside of the classroom?

Alexander: We send students surveys about six weeks after graduation to find out how they fared in getting a job. We found that those who studied part-time and worked part-time had better success getting a job, versus those that studied fulltime. We have done a lot of work in terms of e-portfolios to ensure that students have some workplace exposure, and capture that experience in a more formal manner. Some of the more generic skills, such as working in a team, can be documented in this way. We also have sandwich degrees, where students are required to spend time in the workplace.

Q: At a practical level, how do you get different role players to participate?

Alexander: I persuaded our VC to give me large amounts of money but in a focused way, linked to a model of learning. It is very easy to run around and spend large amounts of money on technology, without getting any of the benefits that one would expect. I love lectures, but the problem is that all students don't learn as much as they could from the experience. I had to persuade others (our buildings and grounds people) to buy into my vision. Since we have introduced 24-hour spaces, we have had our cleaning bills tripling, and we also spend a lot of money on maintaining the technology. We have also put together a booklet to persuade academics of the benefits to be gained from open, workable learning spaces and the use of technology.

Q: I'd like to know more about the use of assessment programmes. What mechanisms are included in the SPARKplus product to ensure objectivity? What challenges are likely to accompany the introduction of e-portfolios?

Alexander: SPARKplus was developed by academics, for the assessment of group work. One of the biggest problems for students is the free-loader – the student who does not contribute. We have a booklet for academics, to help them put students into groups. They have to decide how the different tasks will be assessed, so that all students will know what activities are required, and how they will contribute to the project. They all know that their peers will give them an anonymous ranking and comment on their participation. This allows a free-loader to get the marks he or she deserves, and those who have done the work are not disadvantaged. The comments also help to ensure that the academic can monitor the interaction. One of the biggest challenges has been that there are many tools on the market for e-portfolios. We have been using a system called 'Chalk and Wire', which has also had its challenges – most notably getting students to actually keep the portfolio updated. We actually try to encourage students to keep their portfolios active after graduation.

Q: Have you asked students why they preferred business as usual versus any of the other options? Have you had students coming to you wanting to be assessed for elements that they collected at other institutions?

Alexander: We were trying to think about future implications, and our last option was

just one of a few scenarios. I've also seen that there are a number of distance education institutions that came together to form an open distance university for students who live anywhere in the world. They are trying to find ways of credentialing the learning attained in this way. There is a university in Australia that is considering doing the credentialing of learning.

Students really crave face-to-face learning, and I have lots of evidence to support this understanding. Most people want what they already have. It was a big surprise to me, I can tell you.

3.   PARALLEL SESSION 1
       Chairperson: Prof. Tjama Tjivikua, Rector: Polytechnic of Namibia

3.1   The Durban University of Technology's experiences of open educational resources
       Dr Alex van der Merwe, Senior Lecturer, Economics, Durban University of Technology

3.1.1   The sale of proprietary content seems destined to become an obsolete model, following the trends established in publishing and music. Universities may in future offer value through the ability to provide (sell) effective support to students through practical sessions, tutorials, OERs, intelligent assessment, and accreditation. The reality and demands that higher education faces are exactly what current educational models do not anticipate.

The higher education landscape is changing. Individuals expect to work, learn, socialise and play whenever they want to. "Openness" in terms of content, data, resources, transparency, and easy access to data and information is moving from a trend to a value for much of the world. Legal concepts relating to ownership and privacy are also becoming increasingly blurry.

The term Open Educational Resources (OERs) was coined at the UNESCO 2002 Forum on the impact of Open Courseware for Higher Education in Developing Countries. OERs comprise teaching, learning and research resources that reside in the public domain, and include:
- Open courseware and content;
- Open software tools;
- Open material for e-learning capacity building of teaching staff;
- Repositories for learning objects;
- Implementation resources and intellectual property licenses.

The world's knowledge is viewed as a public good. Technology (and the internet in particular) offers an extraordinary opportunity to share, use and reuse knowledge. It should be easy to collaborate while ensuring that individuals receive credit for their contributions. Concepts and ideas are linked in unexpected ways, and not necessarily in linear fashion.

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Definitions of OER have progressed from an initial description of the material to include tools needed to support OERs and eventually to a philosophy. The OER movement aims to transform conditions of teaching and learning by advocating the power of resources inviting collaboration and enabling contributions to be combined, disassembled and shared.

Openness is defined by 4 'Rs', namely:
- Re-use;
- Redistribute;
- Revise;
- Remix.

Open licences are necessary to define the usage rights attached to OERs, due to copyright in respect of reusing creative works. The most popular framework governing the licensing of OERs is offered by Creative Commons, which specifies the rights of usage indicated by the four "Rs"; defining the degree of openness governing use.

The potential of OERs include:
- Higher returns on public funds invested in education, by reusing resources and sharing development costs among institutions and professional communities;
- Creating of networks for production and sharing of educational resources;
- Peer review leads to educational quality of content through quality control, feedback and improvements within communities and networks who share content;
- Promote lifelong learning and social inclusion through easy access to resources.

Some OER initiatives available include the OpenCourseWare (OCW) Consortium, which has 2 500 courses available. In France, more than 2 000 educational resources from around 200 teaching units are available from the twelve member universities of the ParisTech OCW project. OER Africa is an initiative of SAIDE to promote the use of OERs in Africa, supporting individuals and organisations in creating OERs. In the Western Cape, UCT and UWC are also collaborating on an OER initiative.

Some general OER experiences include:
- Individuals who are neither teachers nor students in formal programmes access OERs. OERs afford them opportunities for both independent study and instructor learning.
- Quality of materials was rated as good as, and often better, than prescribed text books.
- OERs injected a high level of flexibility into the teaching and learning process.
- OERs facilitated a problem solving instructional approach with diverse learner groups.
- OERs spawned a community of practice.

A Dutch university survey identified that some staff were hesitant to be involved in the project, citing workload and time constraints. At end 2008, the site was recording a total of 800 hits per day, with 12% return visitors. At the time of the study, 24 courses

were available on the site under a Creative Commons licence format. The users of the university's OER site indicated that 9% of users stated that they went on to enrol in formal programmes.

In Mauritius, OERs were used to reduce the cost of developing courseware. It allowed the university to reduce some tuition fees, and increased prospective enrolments. Responses from faculty to OER workshops and presentations were generally lukewarm, citing tight work schedules and a preference to focus on research rather than on teaching. There was also a lack of incentives for staff to leave research and get involved in developing OER materials. There were other concerns about copyright and quality, in addition to staff indicating that they were operating outside their comfort zones.

Government and higher education role players should ensure that policy is developed to create an environment conducive to successfully developing and propagating OER. The Green Paper for Post-School Education and Training recognises the pedagogic and economic attractions of OERs. However the openness of ICTs is likely to affect seamless uptake of OERs. South Africa is one of the first African nations to adopt a policy on free and open source software, but it would be necessary to consider implications of intellectual property rights.

A study was conducted at DUT, using an online survey of staff across the five campuses and six faculties. The questionnaire comprised a biographical section, and a section on OERs in the classroom. The survey was administered in the second half of 2011, and 80 responses were received. The sample comprised fewer males than females, with an average age of 43.11 years.

The findings identified the following:
- The average number of students per class taught by respondents was 58;
- Each respondent was involved in teaching at least one or more levels;
- Most respondents (79%) indicated that their students were in the lower-to-middle income bracket;
- 57% of respondents confirmed that they use OERs;
- On average, about 20% of instructional materials comprised OERs;
- The materials used included exercises and quizzes and parts of courses, with relatively little online free courses being used; there is also relatively little evidence that free software and programmes were being used.
- The quality of the resources used was rated as reasonable (39%) and generally good (22.64%). 16.98% were uncertain, while 18.87% did not answer the question.
- The comfort and confidence of users in terms of ICT was tracked, with a mean level of comfort indicated at 7.8.
- The majority of staff relied mostly on textbooks and materials that they produced themselves, followed by the library stock. Faculty in general are not as free to use the materials developed by their colleagues.
- In terms of the software usage rights reported, the majority of staff reported that they use proprietary software. The types of software mostly used include the office

suite provided by Microsoft, as well as learning management systems like Blackboard and WebCT, Moodle, etc.

In conclusion:
- The study found that staff members at DUT are generally open to using OERs, with more than half indicating that they already use OERs to some extent.
- The quality of OERs is viewed as reasonable, but that OERs only comprised only about 30% of total stock which may indicate a lack of confidence.
- The fact that only 16% of colleagues' materials are used may indicate an overall reticence to share.
- Most of the computer operating systems and programme software employed are proprietary, and in order to reap the full strategic advantage of ICTs, institutional policies must address issues of intellectual property rights.

3.2   Information technology tools for teaching QSAR and vitamin chemistry at a South African university

Dr Roman Tandlich, Lecturer, Faculty of Pharmacy, Rhodes University

Dr Tandlich tendered his apology for absence

3.3   DISCUSSION:

3.3.1   Q: Are any local institutions producing OERs? If they use them, are they used as is, or are they adapted?

Q: You did research among your colleagues, but what are your experiences in your own teaching about using OERs?

Q: We know that the Green Paper is supportive of OERs, but in my institution copyright and IP issues have not been addressed. It would be interesting to see how other institutions would deal with these issues.

Q: It would be interesting to hear how we as UoTs could contribute to challenging the government to support us to adopt OERs as part of a systemic solution.

Van der Merwe: DUT will certainly try to find a way to make OERs an institutional view. This is almost an ideal platform to agitate for increased use of OERs, and I hope that the feedback from this forum will get back to the Vice-Chancellors. All the institutions that matter are already doing it, so it will not be only my lone little voice.

As to whether staff members use OERs versus producing OERs, I only surveyed use so far. I have not yet contributed to OERs, but I have got access to open resources and use them on an on-going basis. I have also looked at ways to use the Creative Commons platform.

4. PARALLEL SESSION 2
Chairperson: Prof. Anthony Staak, DVC: Cape Peninsula University of Technology

4.1 An Investigation into the use of Information Communication Technologies by students at the Central University of Technology (CUT), Free State.
Mr Watson Manduna, Computer Science Lecturer, Central University of Technology, Free State

4.1.1 In a previous session looking at the use of ICTs, we were informed that 70 % of students do not own laptops for their own usage at home.

We all know the importance of ICT in education as a catalyst for change, as a means to open up access to information to anyone, anywhere and anytime.

We looked at some data from universities that are using ICT, focusing on second and third year students. Our objective was to establish the degree to which students are engaged in collaborative projects, etc.

Access for students is always difficult, because of the inadequacy of lab facilities, the hours of operation, old or faulty computer equipment, software incompatibility and limited bandwidth.

The ability of students to actively participate in learning was limited, because 93.6 % indicated that they were never invited to a conference; no special training was provided to them in the use of ICT; 73 % were not aware of any ICT policies at their University; and the unavailability of multi-media software. 73.3 % asserted that they have never used multimedia applications. 18.8 % students were comfortable with using or creating web sites, and 91.3 % of students have never engaged in any tele-collaborative projects. Lecturers are not encouraging students to use ICT. Students indicated that they are able to use communication platforms on their mobile phones, but that they cannot use other ICT applications.

The result is that the lack of access and the unavailability of computers were the biggest problems.

4.2 DISCUSSION:

4.2.1 No questions were posed to Mr Manduna.

4.3 Factors contributing to technology-enabled distraction in the classroom: a case of college students in Namibia
Prof. H.N. Muyingi, Associate Dean, School of IT, Polytechnic of Namibia
Prof. Ravi Nath and Dr Leida Chen, Department of Business Intelligence & Analytics, College of Business Administration, Creighton University

4.3.1   After hearing about the benefits of technology in the learning environment at Universities, and the use of digital equipment to enhance, facilitate and improve learning I would like to share another perspective.   These same devices can be used in class for activities that are totally irrelevant to learning.   I am talking about smart phones, mobile devices, computers, connecting to the internet, etc.

If one investigated digital disruption or internet addiction, one will find a number of links, especially from the medical care side.   In the context of universities, we know what benefits digital technology have.   Digital devices in the classroom enable lecturers to engage students, facilitate faculty-student interactions and create active learning opportunities.   Criticism against their use state that there are no objective measures of learning; they are likely to cause cognitive overload; addiction and attention distraction.

The objective was to determine the extent to which Digital Technology Distraction (DTD) is prevalent among our students at the Polytechnic of Namibia and to identify factors/variables significantly associated to this behaviour and to provide some recommendations to lecturers, managers and students to minimise its effects.

The level of in-class digital distraction of a student is influenced by the extent of the student's addiction to the internet, student learning style, lecturers' teaching styles and other individual factors.

Internet addiction is defined as an uncontrolled and excessive need to use the internet, affecting individuals' effectiveness, health, happiness and relationships.   For example when someone has an internet use problem, it is because of depression, diminished impulse control, and distraction (procrastination and avoidance).   These are documented by a number of researchers.

Learning styles include:
- Sensing that learners prefer facts and things related to the real world, using a common approach;
- Intuitive learners are more bound to learn theory, using innovative, creative approaches;
- Visual learners like to learn by seeing things (pictures, diagrams);
- Verbal learners like to learn textual representation (written or spoken);
- Sequential learners prefer to use logical steps to solve problems in a linear approach, interested in detail;
- Global learners will get the whole picture, but have trouble with the details, overview approach, holistic;
- Active learners would prefer communication and working in groups;
- Reflective learners will not prefer communication and rather work alone.

Learners will have a preference for one of these learning styles, and as lecturers we have to try and accommodate these as far as possible.   Non-engaged teachers in theoretical subjects will not be able to stimulate interest in students. From the learning

styles it shows that the majority of students using the internet are visual, sensing and intuitive learners.

Our research showed that overall men experience higher levels of internet addiction than females. 59.3% has frequent problems due to internet use and 5.4 % have significant problems due to internet use. It can be inferred that more male students have problems due to internet use than female students. The main reason for this is that computer/mobile phones are allowed in classrooms.

There is an urgent need for developing and implementing policies for the use of digital devices in the classroom. Suggestions are to enforce strict codes of conduct, and to block and allow access when needed for classroom use.

4.4   DISCUSSION:

4.4.1   Q: The problem does not appear to be technology in the classroom; it seems to be the way in which the classroom is facilitated. I would like to hear your comment on perhaps rephrasing your thesis to "students are not distracted, but facilitators are not using everything available at their disposal to make lecturers more effective"?

Muyingi: Courses and curriculums can be adapted. That is one of the recommendations: that the lecturers should engage students and keep their attention focused on the course; lecturers should be aware that we have a problem.

Q: My question is about the use of a jamming device. I'm not sure if you are allowed to use a jamming device in this country.

Muyingi: One of the recommendations is that we allow these devices. One of the ideas in managing the problem is to request students to switch off their devices or at a higher level to switch off Wi-Fi, but this is difficult because one class may need access to it for work while the other may not. We propose strict policies to be enforced in the classrooms, but not at individual lecturer level.

Q: I am working at the same institution as you are and I'm telling you that if there is an institutional rule that these devices may be used in the classroom, as a lecturer I will still not allow any student to write emails or browse the Internet. I don't care what the institutional rule is, because these devices are distracting me from what I am supposed to do. It is just a matter of good behaviour to turn these devices off, as one is expected to do in any other meeting.

Muyingi: You are completely right. You do it like that, but another lecturer may not agree.

Q: The policy could provide for context-based evaluation, allowing the devices to be used for the students' development. One can incorporate them in the classroom and demonstrate how they can be used constructively. But they are not allowed to use

their devices for anything else but for the relevant discussion.

Muyingi: That is correct. There is a need to consider the policy and procedures.

Q: It would be necessary to clarify what can be viewed a distraction/disruption? When students are using their mobile devices in class for anything that is not related to the actual lecture, they are distracted and not focused on the main goal, which is to learn. Can you clearly define the terms of distraction?

Muyingi: We considered a number of variables. We used SPSSS to compute and tried to find correlations between the significant value and ended up with a number of variables that I have showed in the table of my presentation. We showed the sequential global learning style, student age, school year, etc.

Session closed due to time constraints.

5. **PLENARY SESSION: CONFERENCE CLOSE**
    Chairperson: Prof. Thandwa Mthembu, Chairman of SATN and Vice-Chancellor, Central University of Technology

5.1 Prof. Thandwa Mthembu summarised the conference proceedings as follows:

Six areas emerged during the two days from which those working in the UoT sector may draw lessons, along with three major challenges.

First, the conference started on a high note, dealing with a number of philosophical questions affecting UoTs. There was a strong emphasis on the role of UoTs and technology-enhanced education as part of the constructivist approach to student learning. UoTs were called upon to play a cutting-edge role in the use of and research into ICTs. Similarly, UoT graduates should be able to use ICTs to conduct research. UoTs should be using ICT tools in combination with a range of other aspects shaped by their contexts. ICTs should be used as part of a larger system, taking into account the background of learners and their readiness to use ICTs so that the curriculum and learning spaces can be adapted accordingly.

Secondly, opportunities that can arise from the use of ICTs were addressed. The device agnostic environment was cited, and the need to multiply knowledge rather than dividing it was highlighted. When we engage with technology we must understand that only through engagement would its limitations emerge, prompting UoTs to collaborate and optimise the use of ICTs. These represent a number of research opportunities.

Digital video technology was highlighted as a mechanism to provide solutions that would not only meet students' needs, but also those of staff. Just-in-time and anytime training is possible through the use of video.

Results suggested that students preferred the 'business-as-usual' teaching model,

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which must be blended with ICTs to optimise opportunities. It would be necessary to ensure that both staff and students realise that there are benefits to be gained from the use of ICTs.

ICTs in the classroom can be used to improve student performance, and to achieve the continued professional improvement of teachers. The pedagogically theoretical and the practical have to be combined, which emerged as a question in a number of sessions. Making the most appropriate choices, and determining how learning spaces should change to accommodate them, emerged as valid points. Case studies were presented to demonstrate the optimal use of ICTs to benefit society, moving away from the classroom and application in communities. It emerged that our systems would have to be redesigned to cope with all these re-designed interventions, most notably Open Educational Resources. In line with this, the question should be asked whether UoTs are thinking about using technology to shorten the time required by students to register for their courses.

Science and technology in action demonstrated that a lot can be done in our own contexts to harness the benefits of technology to advance our objectives.

Challenges continuing to face the UoT sector include:
* Management and administrative capacity to be enhanced through the use of ICTs;
* How do we take stock of progress from one conference to the next? The big challenge is to determine how far the system has evolved over the years since the first round of quality audits were conducted by the HEQC starting in 2003. Since last year, the sector has been publishing peer-reviewed articles in a selected journal, and a similar strategy will be followed after this conference. What is the SATN supposed to do between conferences, and what should drive its agenda going forward? How should these issues inform the work of the individual UoTs?
* The infrastructure within universities to ensure the optimal use of ICTs emerged as a particularly pressing issue. Academics could do more as part of their research and innovation work to address this issue.
* Lastly, at a systemic level it should be clearly stated that to be able to use any technology, required levels of bandwidth should be a non-negotiable.

5.2   EIFFEL-CORP AWARD FOR BEST PAPER AND CLOSURE

5.2.1   After an adjudication process, Mr Pradesh Ramdeyal of MUT was congratulated on delivering the best paper and was awarded the Eiffel-Corp Award for the best paper.

The conference was closed with a vote of thanks to all parties involved in ensuring its success.