



DESIGN, DEVELOPMENT AND RESEARCH CONFERENCE 2014 (DDR2014)

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THEME: ART AND DESIGN EDUCATION

THE ROLE OF DESIGN COURSES IN ENGINEERING PROGRAMMES: THE CASE OF THE UNIVERSITY OF BOTSWANA

S. J. Motshubi and R. Moalosi

Abstract: The University of Botswana offers five-year degree programmes in engineering and built environment, which cover among others: Architecture and Planning, Civil Engineering, Electrical Engineering, Mechanical Engineering and Industrial Design and Technology. In the first year, all students from the faculty do science based courses at the Faculty of Science. During the second year, all students do a common year in engineering and technology except the Architecture and Planning students. From year three up to five, students are allowed to venture into their areas of interest. It is worth noting, that during the second year of training all engineering and technology students have to take Workshop Technology course in semester 1 and 2. The course is offered by the Department of Industrial Design and Technology. In order to update the course to keep it aligned to international trends, an action research was conducted with the second year Faculty of engineering and Technology students. This paper seeks to highlight the role of design courses in engineering programmes. It also highlights the importance of design courses and suggests possible improvements that can be done based on how other Universities around the world have designed their engineering curriculum. Abstract

COGNITIVE AROUSAL AS INSPIRATION FOR DESIGN THINKING: SUSTAINING ECO-AWARENESS: ADOPTING A DEEP APPROACH TO LEARNING THROUGH FOUND OBJECTS.

P. George, M.K. M'Rithaa and G. D. Hattingh

Abstract: This paper is based on a study that aims at exploring the process of design thinking in the transformation of a found object of decay into an artwork, with a narrative of sustainability and life. The reason is to create awareness of the role and function of decayed objects by reusing these to give them new life. It draws on a qualitative design paradigm that includes *embodied experience* and *phenomenological* research. It also employs qualitative methodologies of *reflective journaling* and *lived experience*. The paper investigates the initial attraction to found objects, in addition to the decision-making process involved in how they are used in their 'regeneration'. The process of identification and appropriation of the discarded found object is explored through reflection on practicable psychological mechanisms such as motivation, cognitive arousal, and emotion. A sub-text of this paper is the dilemma encountered in attempting to establish clear delineations between art and design in both pedagogic and professional practice domains. Three issues are interrogated: the creation of awareness by using discarded banal found objects and giving these objects new life through design thinking; secondly, the creation of awareness around the critical concerns of sustainability and social responsibility; and, lastly, engaging curricula development in robust dialogue that advances the sustainability agenda in a multi-/cross-/trans-disciplinary context in the Faculty of Informatics and Design at the Cape Peninsula University of Technology in Cape Town, South Africa. In order to start off the robust dialogue, this study will in theory argue and propose that student learning can be enhanced through using a found object as catalyst to ignite creative expression and as a result positively contribute to the sustainability agenda. This study will also propose through means of arguments in literature that creative practical activities structured around found objects will allow students to adopt a deep approach to learning.

CONSTRUCTING' A BRIDGE BETWEEN LESS AND MORE

G. Westraadt

Abstract: When selected B Ed courses were subjected to an HEQC audit, reports from the panel expressed concern about curriculum overload. To address this and to carry out some of the other amendments that were suggested by the panel, the process for the re-design of the B Ed curriculum began, following the principle of 'less is more'. For some subjects, especially art education, this proved to be a matter of 'less is a mess', because there was less time for the nurturing into the art of teaching art, which required time to practice skills, time to focus and reflect on the potential for rich and varied learning that is possible through quality visual art education (Westraadt, 2010:30).

Most students entering the B Ed programme have not experienced quality art education while they were at school, so they did not have a thorough understanding of the subject that they needed to teach nor of the creative development of children and how art education could support this development.

In this paper comparative tables for the foundation phase that indicate how less time was allocated to subjects and more time to academic literacy, professional studies and education, will be discussed. The extent to which the marked decrease in time impacted on the art education subject knowledge of the students will be reported, as well as findings demonstrated by an art education project that was conducted with pre-graduates in the foundation phase to provide a solution to the mess caused by the less time for art on their time-tables.

To conclude, there will be some recommendations with regard to teacher training in art education, based on the literature study and findings from this research.

ENGAGING IN ART APPRECIATION: A DIGITAL AUTOBIOGRAPHICAL PERSPECTIVE

C. Livingston

Abstract: Autobiographical learning is defined as "storytelling" the curriculum, where one links specific curriculum content to personal experience. The purpose of this paper is to explore how autobiographical learning, using the vehicle of digital storytelling, can be used as a tool for improving the ability of B Education students to engage with the process of art appreciation. A narrative research design was selected in order to address the research question which had been posed. The data were analysed using content analysis of the digital stories and reflective essays, in order to identify narrative threads. The results indicate that art appreciation using the vehicle of autobiographical digital storytelling, concerns itself with the identification of a symbol within a painting, which morphs into a 'master metaphor', so that the retelling of an emotional personal experience becomes a journey in self-exploration, making sense of loss and finding a purpose in life, thus linking the curriculum content with personal experience.

INSTRUCTIONAL STRATEGIES FOR EFFECTIVE TEACHING AND LEARNING OF CREATIVE ARTS: THE DILEMMA OF GENERALIST TEACHERS IN GHANA

N. A. Opoku-Asare, E. Asare-Forjour and G. K. Ampeh

Abstract: Creative Arts was introduced into Ghana's primary school curriculum in 2007. Described as an amalgamation of Performing, Literary and Visual Arts, Creative Arts is designed to foster creativity among pupils in Ghana's primary schools. Unfortunately, the teaching and learning of Creative Arts is a major concern because the teachers who implement the Creative Arts syllabus are mainly generalist teachers who lack the specialized training, knowledge, skill and experience to identify appropriate activities for teaching Creative Arts in an integrated manner. To support generalist classroom teachers to effectively implement the Creative Arts, action research was adopted to guide 20 Classes 1 – 3 teachers in two primary schools to design activity-based lessons and engage 95 pupils to actively interact with materials, tools and processes to acquire creative skills. This intervention workshop proved that in-service training and education could

empower generalist teachers to improve their personal development and professional practice in the Creative Arts.

PHONE TO PHOTOSHOP: MOBILE WORKAROUNDS IN YOUNG PEOPLE'S VISUAL SELF- PRESENTATION STRATEGIES

T. Noakes, M.N. Walton, M.A. Venter and J. Cronje

Abstract: Relatively few young South Africans are equipped to enter the creative industries, since access to these occupations requires a combination of economic, social and cultural capital. The South African schooling system does little to assist students to overcome the income and class barriers to these industries. Increasing use of online portfolios for professional self-presentation in creative fields constitutes another key hurdle to tertiary studies at elite institutions and also to freelance employment, given the local context of unequal access to digital technologies.

While mobile phones are the most accessible form of digital media in the South African context, their use in portfolio creation necessitates extensive resourcefulness for mobile-centric students. This paper explores how mobile technologies are implicated in digital self-presentation and in the creation of e-portfolios, which involve both specific forms of cultural capital and specialised infrastructure. Similarly digital portfolio creation requires infrastructure which exceeds the capacities of most South African schools.

We document the barriers and opportunities presented by digital networking for two young South African Visual Arts students. These two students attended very different secondary schools but both learned to showcase their work in digital portfolios and develop professional self-presentation strategies. We describe the visual strategies they adopted as they negotiated an unequal education system in two different parts of Cape Town. Their experiences suggest that educators should be open to accommodating the mobile practices and genres that young people already use as they help them assume and challenge 'disciplined' identities in the visual arts.

THEME: DESIGN TO EMPOWER

INTO THE GREY: TOWARDS SUCCESSFUL IMPLEMENTATION AND EFFECTIVE EVALUATION OF "DESIGN FOR DEVELOPMENT" PROJECTS

B. Baldassarre and N. Micciché

Abstract: The present study originates from the consideration that the final phases of implementation and evaluation of "Design for Development" projects have not yet been systematically addressed by design literature. Consequently, the objective is to investigate which factors impact successful implementation and effective evaluation of "Design for Development" projects. The study has been performed with a qualitative approach. Six designers with relevant experience in the field of "Design for Development" were interviewed at the Industrial Design Engineering faculty of Delft University of Technology. The focus of the interviews was the implementation and evaluation phases of one of the "Design for Development" projects in which they have been directly involved. The main contributions of this research are: pinpointing several factors that underlie the successful implementation and effective evaluation of "Design for Development" projects; indicating a possible path to help design practitioners in these two final and critical phases of "Design for Development" projects; aiming to increase the impact of future "Design for Development" projects.

YOUTH EMPOWERING THE YOUTH THROUGH PARTICIPATORY SERVICE DESIGN

T. Ongwere, H. Iipito, S. Chivuno-Kuria and H. Winsieters-Theophilus

Abstract: Immediate and sustainable interventions are required as a result of an extremely high unemployment rate among youth in Southern Africa that is leading to many socio-economic ills. We postulate that the inclusion of youth into participatory service design activities can unleash their dormant potential of creativity, technological inclinations, as well as their energy to resolve youth related issues by themselves. We have conducted a series of participatory sessions, deploying a variety of techniques, with a selected group of unemployed youth in Windhoek. Having jointly explored and identified the socio-economic context, youth skills and preferences, the group has determined “self-actualization of youth” as the theme to be tackled over the next months through different actions. The actions include self-development, youth helping more vulnerable youth and the creation of a technical platform for communication, fund raising, project planning, and mobilization of other youth. The approach has demonstrated that given the opportunity and a conducive environment a group of unemployed youth have been engaged beyond our expectations in self-actualization activities to fight current societal troubles, such as abuse, crime, illness, etc. We have identified a substantial lack of youth services in Namibia. Thus the openness of participatory service design applied to the vast field of youth unemployment services, allowed the youth participants to identify and self-determine services to be developed and thereby take ownership of the action.

TOWARDS THE COMPARISON OF THE FUNCTIONAL CREATIVITY EXPECTATIONS OF VARIOUS SECTORS IN THE IT INDUSTRY WITH THE FUNCTIONAL CREATIVITY OF FINAL YEAR PROJECTS OF INFORMATION SYSTEMS STUDENTS.

A. Kruger, M. Mathee and M. Turpin

Abstract: Many organisations today invest in creativity workshops to enhance the creative abilities of their employees in order to produce innovative ideas, products and processes. This is also true of the IT industry where there is an increasing demand to recruit creative personnel to develop innovative systems. However, the question as to the importance of creativity in the design and development of information system remains. For example, do IT managers not consider usefulness as more important, or is this considered part of creativity? Also, how do these perceptions differ between the different IT sectors? In addition, what are the implications of these perceptions of the IT sectors for the teaching of Information Systems (IS)? These are the questions this research aims to address. This paper uses the Creative Product Analysis Model (CPAM) as an interview guide to elicit the importance and expectations of creativity in IS products by various IT sectors. It is found that the different sectors do not vary much in their opinion in what a creative IS product is. They consider the value, usefulness and understandability of the systems more than other aspects of creativity. In further research, the model will be used as a point of reference to look at final year IS students’ software projects to better understand how creative the projects are and how these projects relate to the IS industry’s expectations of creativity.

AN EMPIRICAL ANALYSIS FOR THE MOBILE LEARNING INFORMATION SYSTEMS USER EVALUATION

A. Bere

ABSTRACT: Extant literature on task technology fit has often emphasised task characteristics and technology characteristics as the prime determinants of effective task technology fit. Since any process of task technology fit cannot be conceived without considering user characteristics. The author argue that any pre-occupation with task technology fit from the perspective of task characteristics and technology characteristics that does not embrace the individual (User) characteristics is unrealistic and unauthentic.

Contributing to contemporary debates on task technology fit, this study provides perceived ease of use, perceived usefulness and social influence as antecedents providing enabling conditions for the sustainable uptake of emerging technologies. Drawing on these antecedents this study develops a factor model and empirically tests it on South African tertiary students to explore their task technology fit and including the performance enhancement of a mobile instant messaging system. The study, which involved 175 national diploma students at a South African University of Technology employed partial least squares for statistical analysis. Overall, the proposed model displayed a good fit with the data and rendered satisfactory explanatory power for mobile task technology fit. Findings of the study suggested that perceived ease of use, perceived usefulness and social influence are the drivers for task technology fit within the m-learning environment. The study also confirmed the statistical significance of the original task technology fit constructs.

UNDERSTANDING GROUP WORK IN HIGHER EDUCATION: ESTABLISHING A CULTURE OF DELIBERATION AMONGST DESIGN STUDENTS

V. du Preez, V. Barnes and R. Futerman

Abstract: This paper explores the perceptions of senior Industrial Design students about group work, and documents findings from a workshop with students to frame the issue. Skills required of a professional Industrial Designer include the ability to frame issues, explore creative and contextually relevant solutions, and critically assess possibilities and potential solutions. Democratic practices can give students a stronger hand in shaping their future. These practices can promote democratic values and stimulate the learning (Mathews, 2014:119) that allows students to combat many of their own problems.

In design education, focus is placed on collaborative projects and group work scenarios to facilitate and develop students' interpersonal and communication skills, including active listening and democratic decision-making. These skills are key in enabling empathetic and active participation between designer and community members (or users). The goal of this case study was two-fold; firstly to develop student issue-framing skills for application in community based projects, and secondly to identify and explore group work issues within the student community. Findings from the workshop informed the creation of an Issue Framework which can be used as the impetus for further research into the impact of democratic practices and deliberative dialogues in design education.

DEVELOPMENT OF PRODUCTS FOR PERSONS WITH DISABILITIES IN KENYA

L. Osanjo

Abstract: A recent survey established that very few graduates of design are providing products and services for the disabled in Kenya. Design researchers, professionals and students may be focussing their attention on an increasingly competitive area whereas there are opportunities and more critical need in providing services to the disabled persons in our society. With estimated 650 million disabled persons in the developing countries, we cannot continue to focus our products and services to abled persons. Universal design provides principles that should govern design of products & services that acknowledge the presence of and needs of the disabled. And, designers are well placed to provide the lead in applying these principles in providing products and services that favour the disabled persons especially in the design of low cost appliances, mobility aids and environments. Because very few design graduates are absorbed in this area, critical design services are inadequately addressed. As a result, the inclusion of the disabled into society is hampered. Wheelchairs for example, in Kenya are in one design and only two sizes. The assumption is that one size fits all. This paper discusses the absence of designers in the development of products and services for the disabled persons. It recommends ways in which design students, researchers and professionals can increase their involvement.

INTERNET OF HOPE: PERCEPTIONS OF INTERNET IN MARGINALISED COMMUNITIES OF THE CAPE OF GOOD HOPE

S. Pather and L. Bagui

Abstract: Khayelitsha and Mitchell's Plain (K&MP) are amongst the poorest communities in Cape Town – South Africa. These communities are plagued with social ills (poverty, crime, abuses, maladies, etc.). In addition, both these communities have very low levels of Internet penetration, with access driven mainly through public access points. Given the impetus of both national and regional policy to promote information society goals, the local government of the city of Cape Town is contemplating taking affordable internet access to these communities. This paper describes the preparedness of K&MP to adopt and use the Internet. Qualitative data was gathered in order to read a prediction of Intention to adopt and use Internet on the basis of three conceptual elements: experience of accessing and using computers and the Internet, the perceived usefulness of Internet, and the hope of betterment as a result of using Internet.

The key findings suggested that despite not being sufficiently exposed to computers and the Internet, K&MP residents are keen to adopt and use the Internet at home mainly on the basis of their perceived usefulness and the Hope they have for the future. These findings have theoretical and practical significance as they suggest a broadening of the scope of technology adoption research to also consider “Hope” as a precursor of intention to use the internet; and as they inform policy making about the change in mentality towards ICTs despite an inadequate prior exposure to the Internet.

THEME: DESIGN FOR SOCIAL INNOVATION, EMPOWERMENT AND SUSTAINABILITY

APPLICATION OF DESIGN THINKING IN THE DEVELOPMENT OF AN INFORMATION SYSTEM THROUGH A SCRUM METHODOLOGY

M.P. Makutsoane and R. Naidoo

Abstract: Many studies have sought to understand the failure of Information Systems projects and factors that make other software products more successful than others. Some publications have proposed modifying project management techniques and developing ad hoc software development methodologies to address these concerns. As a result, the Information Technology industry has invested in design thinking as an alternative to market research and as a solution for developing artefacts that are likelier to be accepted by end users. However, design thinking is sometimes applied in isolation and without consideration of the teams involved and as a result its return on investment is not well understood.

The paper is based on a research that introduces design thinking to a large scale software development project for the metropolitan city of South Africa. Design thinking capabilities and its core values are introduced to the scrum team from the conceptual phase of the project to the implementation phase. The paper evaluates the role and impact of design thinking within the context of a scrum team to evaluate the various team dynamics and the artefacts produced through this intervention.

DESIGN FOR SOCIAL INNOVATION IN FAVELA IN RIO DE JANEIRO: FROM OCCUPY WALL STREET TO "OCCUPY ALEMÃO"¹

A. Cipolla, R. Bartholo and R.C.M. Afonso

Abstract: This article aims to place the environment conducive to social innovation found in the favela in the city of Rio de Janeiro, showing and analyzing a case in the "Complexo do Alemão" inspired by Occupy Wall Street movement.

The favelas of Rio de Janeiro is undergoing a major transformation resulting from public policies. Official information from this intervention by the state in a territory previously dominated by drug trafficking show substantial improvements. However, their youth residents are frustrated with the limit of top down interventions while strong social capital in the territory created a favorable environment for designing a project undertaken by them, influenced by access to information enabled by ICT environment, reshaped and reinvented a new form of occupation, with adaptations to local culture. Looked at from the perspective of networks and social ties, the paper points to an anthropophagic appropriation of a movement, Occupy Wall Street, resulting in a new design, reinvented on strong local bases, the "Occupy Alemão".

CONTEXT SENSITIVITY AND PROCESS IMPROVEMENT AS INFLUENCERS TO EMR ADOPTION BY CLINICIANS: IMPLEMENTER PERSPECTIVES

G. Khan, L. Hanmer & M. Korpela

Abstract

Objective: The implementation of electronic medical records (EMR) in hospitals worldwide has had mixed success and concerns have been raised on issues of adoption by clinicians. The purpose of this initial study was to identify the factors which implementers of an EMR for public hospitals in the Western Cape Province of South Africa considered important for improving its adoption by clinicians.

Method: Interviews were conducted with 2 stakeholders in the implementation team to establish the factors they regarded as most beneficial to the adoption of an EMR by clinicians at public hospitals in the Western Cape Province. A change manager and an executive manager from the Western Cape Government Department of Health were interviewed determine the main elements which needed to be built into the EMR to enhance its adoption by clinicians.

Findings: Since doctors in South African public hospitals are overburdened and focussed on healthcare provision, the implementers developed a solution which changed the supporting administrative work practices to improve doctors' adoption of an EMR. The introduction of automation and improvements to work process timing and flow resulted in easily captured, complete and accurate patient records which linked to an existing hospital information system named Clinicom. A unique indexing system was combined with the scanned documents to provide both detailed and summary chronological patient histories which were searchable and could be easily accessed and navigated by clinicians. The limited changes to clinical work processes as well as the comprehensive patient records available via the EMR were key influencers to its adoption by the clinicians. The context focus and minimal change to clinician work processes were considered the most important factors to implementers for influencing the EMR adoption by clinicians.



This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 613169

Discussion: Two key factors emerged as important to the implementers for developing and implementing an EMR which doctors in South African public hospitals would adopt and use. Firstly, they considered a good understanding of the challenging and complex environment presented by public hospitals in South Africa to be vital for the customized technical solution that would be developed. This approach focussed change on the supporting administrative work practices by introducing automation and improving the timing to produce accurate, complete and timely electronic records for clinical decision making. The resulting low level of change to clinical work processes combined with the availability and completeness of patient information made the EMR attractive and useful to the doctors, thereby improving their adoption and use of the EMR.

Conclusion: The busy complex environment of public hospitals in South Africa called for an EMR which aligned well with its context and clinical work processes to improve adoption by its overstretched doctors. The implementers of an EMR at Western Cape government hospitals addressed these constraints by focussing change on the supporting operational processes instead of on the clinical processes. Implementers viewed this context focussed systems approach to be most suited to improving EMR adoption of the EMR by the clinicians. Future research to test these implementer perceptions against those of the clinicians is planned.

TOWARDS A COMFORTABLE, ENERGY-EFFICIENT OFFICE USING A PUBLISH-SUBSCRIBE PATTERN IN AN INTERNET OF THINGS ENVIRONMENT

L.L. Butgereit, C. Smith and T. Thomson

Abstract: The modern office is maintained by air conditioners, heaters, lights, smoke detectors, thermostats and other devices. Manufacturers are continually improving these various devices and adding more features – especially Internet connectivity. These new devices are often called *smart* devices. The Internet of Things is the new paradigm of more and more physical objects being connected to the Internet. As these objects begin interacting, mechanisms need to be in place to route data messages from the many objects to the correct applications which process that data. For example, the data from the thermostat in Office A must not be routed to the application controlling the temperature in Office B. One such mechanism is the publish-subscribe pattern often just called the pub-sub pattern. The pub-sub pattern enables applications to subscribe to data from certain resources. When a resource publishes data, the surrounding platform ensures that the data is forwarded to the correct subscribers. This paper describes an implementation of the pub-sub pattern specifically for an Internet of Things platform which operated at four levels – sensors (and actuator), Supervisors, Middleware, and application. This platform was specifically instantiated to control a typical office meeting room. The instantiation monitors the state of the doors and windows (open or closed), whether there are people in the room, the current temperature in the room, and the current electrical consumption. It then makes intelligent decisions as to how best to control the air conditioner in the meeting room.

STAFF TURNOVER WITHIN THE MICRO RETAIL SECTOR

S.C. Warden, X. Han and A. Nzawou

Abstract: Staff turnover is one of the leading challenges facing business owners and managers other than factors such as sales and marketing. Current literature is focused on driving factors of staff turnover for large retail businesses but lacks appropriate guidelines or principles to assist micro businesses to deal with this matter. Therefore, there is a need to provide micro retail business owners or managers with appropriate key principles to address the high staff turnover phenomenon. In this paper, the authors combined three theoretical frameworks namely; the universal turnover theory, limited modal representation theory and the subpopulation theory to guide the underlying quantitative research approach. The findings suggest that

there are specific internal and external factors which predominantly contribute to high staff turnover in the micro retail sector. The paper concludes by providing some recommendations to assist micro retail businesses on how to reduce high staff turnover. The paper contributes to literature of staff turnover with a specific focus on the micro retail sector.

EMPOWERING AND REWARDING INNOVATION IN THE MANUFACTURING INDUSTRY: MANAGERS' PERSPECTIVES

M. Jakovljevic, Radaš, M.J. Bushney and D. Čičin-Šain

Abstract: Orientation and motivation for the study: With rapid changes in technology and global competition, the success of many organisations had become increasingly dependent on the ability of launching innovative products and services. Croatian organisations are lacking a specific framework to guide the innovative knowledge exchange and sustainable rewarding systems.

Research purpose: The purpose was to examine current practices and innovative systems for stimulating and rewarding innovation in Croatian manufacturing companies.

Research approach and method: The study sample consisted of three manufacturing firms: a company A is involved in manufacturing components for the automobile industry, a company B is involved in manufacturing machinery parts, a company C is involved in manufacturing tools. This study demanded a qualitative approach and individual interviews to collect data from senior managers who were responsible for the implementation of incentives to reward innovative ideas of employees. The aim was to investigate experience of managers in terms of the stimulation and rewarding of innovation processes and outcomes.

Main findings: Findings highlighted a range of approaches for rewarding employees and management recommendations to improve the current reward system. A need existed to establish professional bodies to assist in managing innovations and developing a sustainable framework that empower employees' innovative engagements.

FINDING ERRORS CAUSATION IN DESIGN BY STUDYING OBSOLETE ENGINEERING DRAWINGS

Z. Tjiparuro

Abstract: Ideally, information communicated by engineering drawings must be complete and precise to prevent the making of bad parts in machine shops. That notwithstanding, errors and mistakes do occur. In an active design environment the result, invariably, is a massive collection of obsolete and superseded drawings. This paper shares preliminary findings of an investigation of the contents of one such copious collection of superseded engineering drawings from the product design office of the Rural Industries Promotions Company-Botswana. The collection was collated, inventoried and categorised according to what caused the changes thus rendering the initial drawings obsolete. Simultaneously, engineering change management literature (e.g. design and engineering change notes) was combed for concepts and causes of errors in engineering drawings. Finally, by integrating contributions from the survey with scholarly articles, a thesaurus of drawings-based engineering change management principles was built. It is hoped that from the nomenclature, a pattern would emerge from which future efforts in the reduction of design and drawing errors could be based.

A FRAMEWORK FOR THE DEVELOPMENT OF PARTICIPATORY ASSESSMENT IN PROBLEM-BASED LEARNING (PAPBLE)

E.F. Eshun

Abstract: The educational pedagogy in most Ghanaian higher education is lecturer-centered with lecturers as storehouse and providers of information and students as passive recipients of information. This approach

has impacted negatively on student's learning process. A collaborative learning approach that promotes students process of inquiry, critical thinking and skill development thus lacks in the context. To this end, to educate students to compete and become active participants in society to meet global competition requires teaching and learning processes that is underpinned by relevant theories and models. In this paper, I introduce a studio-based application, called Participatory Assessment in Problem-Based Studio Learning (PAPBLE), to support assessing students' development in professional skills in graphic design within large class-size situation. The model is based on using students to pedagogically support each other's learning through four creative process stages: research, concept development, prototyping and feedback. PAPBLE intends to rationalize the processes of peer assessments within the creative process. PAPBLE has been designed based on the theory of Model of Participatory Evaluation (PE), and thus can help describe the complex interactions among parties, knowledge, interest level, and strategies with which knowledge is gained and shared. I illustrate the workflow of PAPBLE and how PE is integrated into the peer assessment process. I also discuss the advantages of the PE-based assessment framework paralleled to a traditional assessment model.

IMPROVING THE UTILISATION OF SMART TECHNOLOGY IN SOUTH AFRICAN HOMES

L. Cilliers and S. Gaba

Abstract: Smart homes make use of technology to automate many of the tasks that are usually performed manually by the inhabitant. These smart technologies collect and analyse data in order to make inferences about the habits and preferences of the inhabitant. This information is then used in one of three areas within the house: security, energy consumption and management and lifestyle support. The aim of the article is to investigate the barriers for the utilisation of smart technologies in South African homes. A thorough literature review was performed of peer reviewed articles in order to identify possible barriers for the utilisation of smart homes around the world. Furthermore, the Technology Organization Environmental framework was used in order to group the barriers according to the various factors, and from this process critical success factors were formulated for consideration. There are five critical success factors that were identified in order to increase the utilization of smart technologies in South African homes. These include the provision of legislation to standardise smart home infrastructure in the country and regulate privacy concerns; involving the end-user in the designing of smart homes; increase the availability of smart technologies in South Africa, and decrease the costs associated with smart homes.

PERSONAL HEALTH RECORDS: DESIGN CONSIDERATIONS FOR THE SOUTH AFRICAN CONTEXT

A. Mxoli and N. Mostert-Phipps

Abstract: A Personal Health Record (PHR) is a set of internet-based tools that allow individuals to create, store and coordinate their lifelong health information in one place making it available to relevant parties. It typically contains the individual's demographic information, medical care providers' details, health summary, family history, list of past and current illnesses, symptoms, allergies, medication and so forth. A PHR introduces many advantages as far as improving the health status of people. These include better doctor-patient relationships, improved health knowledge, better monitoring of chronic illnesses and many others. The South African health system is in need of a more preventative approach to healthcare as opposed to its current system that is considered as a highly curative. South Africa's planned National Health Insurance (NHI) aims at achieving this. The South African Department of Health also aims at improving access to quality health care, increasing patients' participation and the dignity afforded to them, reducing underlying causes of illnesses, injury, and disability, to mention a few. A PHR can prove useful to achieve these health goals and more in South Africa.

There is, however, no PHR that is specifically aimed at the South African population and thus adoption rates in South Africa are typically low. There is also a lack of design guidelines for PHRs that are suitable for

the needs of South African consumers. This paper will highlight design guidelines and other factors that should be considered when developing a PHR for use in the South African context.

IS UCD APPROACH APPLIED BY INDUSTRY IN BOTSWANA? CASE STUDIES ON THE APPLICATION OF PARTICIPATORY APPROACH TO NPD.

M.G. Olyyn, R.J. Bibb and G.E. Torrens

Abstract: These case studies follow up the semi-structured interviews conducted previously in this ongoing study; with an aim of understanding how the user was involved in the product development process (PDP) of a selection of recently completed design projects. The assumption was the more the user was involved the better the resulting product was for the user. The case studies involved an observational study and the follow up semi-structured interviews that were run parallel to each other. These case studies were carried out on two companies from the Graphic and Advertising (GA) design industry that participated in the previous interview study. The questionnaire was derived from ISO 13407 (Human-centred design for interactive systems) and consists of 29 questions spread across five categories. The majority of the user-centred design (UCD) practices were carried out at the start of the PDP; moreover the majority of these activities were not documented. The majority of the documentation was found at “Specification of context of use” and “Evaluation of designs against user requirements: User testing” categories. Results suggest that successful use of a UCD strategy depends on an established PDP and the ability to review previous projects to identify opportunities. User involvement in a PDP has to be well organised to reap the full benefits.

DESIGN TO EMPOWER: A SYMBIOTIC RELATIONSHIP BETWEEN FORM AND FUNCTION (USER VALUE)

S. Patrick, and M.K. M'Rithaa

Abstract: Design is an important medium of communication that expresses values of systems within which it functions. The designers' creations incarnate the human spirit and also demarcate physical environments and lifestyles of people and the carrier of the culture (Ning & Liang, 2006). This highlights a fact that design affects people's livelihoods and promotes social connectivity. Though many design interventions have been made, their impact on society have arguably been minimal. Additionally, most of designers base their assumptions on the notion that design empowers. Through a qualitative case study approach the paper focused on Bulinde village found in Luweero district. The essence of this paper is to discuss and contribute to the issue of design to empower, to which should be a symbiotic relationship between form and function (user value). This paper is twofold purpose; firstly to discuss user values, design and culture, and design and context as a useful point of departure for understanding their importance in design outputs intended to empower users; and secondly, to analyse how design solutions are embraced in a community, act as an inspirational springboard for the designer to develop design solutions. Uganda is the context of study for this paper where in a number of solutions that have been proffered to engender some of these products with he potential to transform and emancipate collaborating communities.

THEME: EDUCATION AND TRAINING

A RHIZOANALYSIS OF LEARNING CONNECTIONS AMONG HIGHER EDUCATION LEARNERS

S-P. K. Aheto and J. C. Cronje

Abstract: This study is part of an ongoing doctoral study that seeks to explore the learning connections of higher education learners. Based on the first principle of Deleuze and Guattari's (1987) Rhizome Theory, connection, the study was motivated by what learners connect to and how they connect in the construction

of their learning in an ever growing technological environment. Actor Network Theory and the Rhizome Theory formed the theoretical framework that underpinned the study. Two questions that drove this paper were: what the connectors in learners' learning network are and how these connectors emerge to support learning. The study was a qualitative one which involved six participants who were by then higher education learners of different levels. Participants were selected using snowball sampling technique. Data collection methods included a focus group interview, observations and artefacts. The study revealed that learners were connected to very complex networks which continually multiplied through three basic rhizonomies that all behave as actors and actants; learners, machine(s) and technology. It was again found that apart from the learner-learner and learner-machine(s) connections; there also existed machine(s)-to-machine(s) and learner-technology connections in the personal learning networks of learners. Learners get connected to learning networks based on need, properties and nature of course studied. The research at this preliminary stage recommended an in-depth study to find out about characteristics of self-directed learners and how they construct meaning in a rhizomatic environment as opposed to existing industrial batch processing system that does not take individual differences into account.

MULTIMEDIA LEARNING AND NURSING INFORMATICS EDUCATION IN SOUTH AFRICA

R.D. Debrah, R. de la Harpe, S. Bhebe and D.M.K. Mugendi

Abstract: This article describes Nursing Informatics as a course to be implemented as part of midwifery education in a public university in South Africa. An online learning environment is being explored to facilitate the training programme. Instructional technology and its benefits to students which include critical thinking, learner satisfaction and Nursing Informatics, are discussed in this preliminary study.

Nursing Informatics, with competencies such as computer literacy skills and E-learning, are essential for the sustenance of emerging technologies for healthcare professionals in Africa. These competencies, facilitated by instructional technology, could enable midwifery students to actively participate in an online environment by experimenting with technology and devices that will sharpen their skills in informatics.

Service design methods such as co-design were employed to develop the training programmes in collaboration with nursing educators, using the TIGER model as a foundation to develop the core competencies. A key outcome of this preliminary study is the core competencies of the Nursing Informatics programme, starting from year one through to year four, allowing midwifery students to study in a multimedia learning environment as well as a face-to-face setting. Thus, a blended learning approach is being explored in this preliminary stages to facilitate student satisfaction, making learning flexible and easier.

MERGING PRINCIPLES OF DESIGN THINKING AND MEDIA LITERACY ON ROUTE TO AN INNOVATIVE APPROACH TO THE PEDAGOGY OF CRITICAL THINKING.

E.M. Pepler

Abstract: this paper contends that there are such close similarities and parallels in two contemporary subject disciplines, called design thinking and media education, particularly in terms of dynamic sequence and process. The purpose of the paper is thus to provide a simple formula, based on design thinking and media literacy approaches, with which critical thinking as well as creative brainstorming can be generated. Because both these subject fields are interdisciplinary and multi-layered, drawing on many other subject fields, there is a good possibility to find an ideal pedagogical axis for tertiary education in both these subjects. Not only does the processes of accessing, analyzing and evaluating the message or media text and consequently constructing an improved message correlate with design thinking phases, but critical thinking and creativity thus become the major drivers behind the subject fields of design thinking and media literacy education. What is critical, however, is to consider the younger generations' (Y and I) predilection for another type of

learning which could be realised through application of the pedagogical methods of media education as well as design thinking. While the members of these generations are supremely technologically savvy, the historical literacy characteristics of reading, writing and spelling have all but disappeared in the new age of 'Google and Wikipedia are King'. A self-developed matrix is offered in this paper where the steps and processes of design thinking and media literacy are compared and applied to a typical media text. In creative academic spheres, it is of semantic nature whether students become creatively involved and engage in critical thinking through the process of design thinking or media literacy production.

SUSTAINING CULTURAL HERITAGE THROUGH TRADITIONAL GAME DESIGN

O. Marope and R. Moalosi

Abstract: Traditional games as integral part of societies are ideal for use in sustaining indigenous knowledge in African societies. It is evident that African indigenous knowledge is gradually being eroded away by the Western culture. The paper discusses one of Botswana's traditional games called Mhele. Using traditional games, as a means of cultural edutainment will empower societies with approaches at addressing various social pitfalls. Mechanics and popularity of traditional games within societies could be explored and exploited to address issues as most of them have a narrative and socializing element within them. A single-case experimental design study was conducted with people who often play the game in Botswana. The findings show the game can be used to promote diversity and unity of different tribes so as to sustain cultural heritage.

THEME: E-GOVERNMENT FOR DEVELOPMENT

TECHNOLOGY AFFORDANCES AND DIFFUSION FOR MOBILE CONNECTIVITY AND APPLICATIONS IN ZIMBABWE

G. Kabanda

Abstract: The technology acceptance model (TAM) proposes that perceived ease of use and perceived usefulness predict applications usage. Affordances are the interactions between users and tool, i.e. properties of the world that are compatible with and relevant for people's interactions. Affordance offers a distinctive perspective on the use of ICT in education because of its focus on possibilities for action. The paper assesses the value-adding contribution of the concept of affordances, ascertains how its application provides new insights and enables innovation of mobile technology, and investigates how the notion of affordances can be used to assess the diffusion and explore possible applications of mobile technology into Zimbabwe. The main hypothesis being tested was: "*Technology affordances are related to the diffusion of mobile technology in Zimbabwe*". Examples of mobile phone applications used include WhatsApp, games and Ecocash, and potential applications to mobile learning.

The quantitative methodology was used as the research paradigm and a survey conducted on 15 selected Zimbabwean schools to evaluate the application of TAM to mobile technology and e-learning. Data on infodensity on 18 countries in Eastern and Southern Africa was analysed to assess the relative progress on mobile technology diffusion in Zimbabwe in comparison with other neighbouring countries for the period 2000 to 2012. The FRAME model for mobile learning is adopted as a framework for implementation to manage the process resulting from the convergence of mobile technologies, human learning capacities and social interaction. TAM was partially supported, and the results showed that perceived usefulness is more important in determining intention to use the technology than attitude toward using. However, the high cost of internet bandwidth is a major prohibitive factor to the diffusion of mobile technology and e-learning in Zimbabwe.

E-SKILLS FOR SUCCESSFUL M-GOVERNMENT IN THE WESTERN CAPE

Z. Mitrovic, K. Thompson, V. Klaas and F. Mabhele

Abstract: The main objective of any government is to successfully deliver services and improve the well-being of its citizens. In this era of the pervasiveness of information and communication technologies (ICT), governments use the notion of e-government over an Internet connection to accomplish this. In South Africa, this is seen as a problem as not many South Africans have access to the Internet either at home or through public access centres; hence the majority of citizens are inclined to use their mobile phones to access government services. However, there is no evidence that the citizens of the Western Cape, the empirical setting of this study, possess relevant ICT skills (e-skills) to effectively use mobile devices to benefit from government-supplied electronic services. Besides, there is no clear understanding on what e-skills government officials should have for successful delivery of m-government services or what e-skills WC citizens should possess in order to access and utilise these services and achieve benefits. This study, hence, identifies e-skills necessary for effective delivery and use of m-government and maps these e-skills to the potential benefits of these services.

INFORMATION SHARING IMPEDIMENTS IN GOVERNMENT DEPARTMENTS: A LITERATURE REVIEW

S. Hamunyela

Abstract: This paper discusses information sharing impediments in government departments. Information sharing is a core component of the e-administration part of e-government. The rationale of this paper is to discuss contexts influencing information sharing processes in government departments at different government levels. Contexts can be used to describe the efficacy of sharing information within government departments at different administrative levels, to indicate the level of information sharing needs in government departments. E-government in a Government to Government (G2G) component contributes immensely to information flows in and between government departments. The suggested conceptual model in this paper is based on a literature review of the papers and documents relating to e-government and investigates benefits and impediments to a successful implementation of e-government in developing countries. Technological, organisational, environmental and people are the main impediments that hinder effectiveness and efficiency of e-government in developing countries. The study suggests that, the model can be used to identify information sharing needs in government departments across different governing levels.

READINESS ASSESSMENT OF CLOUD-COMPUTING ADOPTION WITHIN A PROVINCIAL GOVERNMENT OF SOUTH AFRICA

L. Xi and Z. Mitrovic

Abstract: Cloud computing, as a shifting paradigm, is expanding its “bandwagon effect” across industries worldwide. This is due to the several advantages of cloud computing that have been revealed by the public sectors (empirical setting of this study), including improved levels of flexibility and mobility, lower total cost of ownership, reduced energy savings and carbon missions. Most importantly, cloud computing can free government from building, maintaining and upgrading its infrastructures and technologies, and focus more on serving the citizens with optimised resources. Hence, this paper focuses on the readiness assessment of cloud-computing adoption within the Provincial Government of the Western Cape (WCG), South Africa, which is in its cloud-computing embryonic phase. An extensive study of the literature on cloud-computing concepts, its characteristics, the possible non-technological readiness indicators for cloud-computing adoption, was conducted. This led to the identification of three main groups of readiness indicators: (i) Infrastructural indicators; (ii) organisational indicators; and (iii) environmental indicators. A conceptual

model was then developed, according to these three main groups, with twelve sub-indicators. This model was subsequently tested in the empirical setting of WCG by using the qualitative approach through the case-study methodology. The intended audience for this study are both academic and practitioners as it brings a conceptual model and the guidelines for assessing the government's readiness for the adoption of these cloud-computing technologies and services.

THEME: DESIGN EXPERIENCES

DESIGN LED PSS ADOPTION AS A COMPETITIVE APPROACH IN NON-DESIGN LED SMES IN BOTSWANA

Y. Rapitsenyane, T. Bhamra and R. Trimmingham

Abstract: This paper focuses on addressing the gap in supporting manufacturing SMEs towards Product Service Systems adoption. There is growing attention in developing Product Service Systems in manufacturing companies. There is almost no research that can help manufacturing SMEs in Botswana towards this service oriented business strategy. Competitiveness concerns of SMEs in Botswana can be addressed by following emerging trends in entrepreneurship development, which encourage resource efficiency at the same time. Low levels of design awareness in these companies can be a good opportunity to use new design capabilities to drive new directions for entrepreneurship development. Through a design capabilities approach, sustainable product service systems can be a competitive business strategy for SMEs where a clear supporting process has been defined as a guide. This paper discusses a case study research approach conducted with manufacturing micro SMEs in the leather sector in Botswana. The aim of the research was to identify effective and contextually appropriate means through which manufacturing SMEs in Botswana can address their competitiveness needs through design and sustainable Product Service Systems. The paper concludes by discussing a framework which has demonstrated one way of using design capabilities to demonstrate PSS benefits to micro SMEs in the leather sector with no prior design knowledge. The framework supports a conscious way of using design to support a shift towards PSS in SMEs.

THE DESIGN, DEVELOPMENT AND RESEARCH OF A MAKERSPACE

R. Branch

Abstract: A Makerspace is a special type of learning space. Makerspaces are venues dedicated to the collaborative process of design and development among a diverse group of people of all ages. The purpose of makerspace activities is to combine all types of tools and a variety of people in order to create items together that otherwise, could not be accomplished by a single individual. A makerspace democratizes the engineering design and fabrication process. Items fabricated in makerspaces are intended to be authentic and meaningful. While libraries and community centers have become the leading places for the location of makerspaces, there is interest in how universities can also become appropriate places for makerspaces. However, it remains unknown about the best way to design and develop a makerspace on a college campus. Thus, the purpose here is to present a framework for designing and developing a makerspace within an institution of tertiary education, and conducting research about the effectiveness of a college makerspace.

THEME: NANOSATELLITE APPLICATIONS TOWARDS SUSTAINABLE SOCIAL DEVELOPMENT

ELECTRICAL POWER SUBSYSTEM DESIGN PROPOSED FOR THE ZACUBE-2 3U CUBESAT NANOSATELLITE MISSION

M. Maleka, S.W.J. Cupido and D.F. Visser

Abstract: The French South African Institute of Technology (F'SATI) at the Cape Peninsula University of Technology (CPUT) offers a postgraduate programme in nanosatellite systems engineering where students are given the opportunity to be involved in the development of CubeSats. The first mission, a 1U CubeSat codenamed ZACUBE-1, has been completed and was launched on November 21, 2013. The second mission, a 3U CubeSat codenamed ZACUBE-2, is currently under development by F'SATI students. An EPS (electrical power subsystem) design is proposed herein, with the aim to implement the design for ZACUBE-2 EPS development. A comparative literature study of available EPS systems for CubeSat applications is presented. The study dwells on the topology used in different subsections which form part of a complete EPS, namely the energy extractor, power conversion, power regulation, power distribution and housekeeping. Careful design consideration is given to different ways of designing a fault tolerant system by coordinating existing EPS related research projects previously completed by postgraduates within the F'SATI nanosatellite systems programme. The EPS design incorporates three inputs to connect solar panels for energy extraction. A P&O (perturb and observe) MPPT (maximum power point tracking) algorithm is used to control a SEPIC DC-DC converter. The converter is driven by a high speed low-side MOSFET driver, which is controlled by a selectable digital or redundant analogue PWM (pulse width modulator) signal. Off the shelf voltage regulators are used for power regulation, and a reliable power distribution topology is included in the design for overcurrent protection.

AN EVALUATION OF LOW NOISE AMPLIFIER PERFORMANCE AT L-BAND FOR CUBESAT APPLICATIONS

E. Louw and C. Whaits

Abstract: Optimum communication can only be achieved with a very sensitive front-end section in the receiver on a satellite because the transmitted signal from the ground station must travel hundreds of kilometres through the earth's atmosphere to a low earth orbit (LEO) satellite. The design of a low noise amplifier (LNA) may appear to be a relatively simple exercise using modern EDA software, but finding the delicate balance between performance parameters with conflicting requirements presents a greater challenge. The decisions and performance parameter trade-offs pose various difficulties to the LNA designer such as simultaneously achieving good noise performance and high gain. This paper reviews the design and simulation of four LNAs, each of which uses a different active device technology for an L-band receiver operating at 1.265 GHz. The main objective of the LNA is to add as little noise possible to the received signal with minimum power consumption as well as provide sufficient power gain. Simulated results using *Agilent Technologies' ADS* for the HBT, GaAs pHEMT, e-pHEMT and BJT LNAs show noise figures of 0.66 dB, 0.47 dB, 0.7 dB and 1.7 dB respectively. For all the amplifiers the associated power gains exceeded the minimum requirement of 13 dB. The HBT amplifier performed best based on its low noise figure and superior power gain performance.

MAKING NANO-SATELLITES MORE SUSTAINABLE: INVESTIGATION INTO AN OPTIMAL COMMUNICATIONS PROTOCOL USING A NOVEL SIMULATION TOOL

J.H. Le Roux, A. Barnard and R. Wolhuter

Abstract: Many developing countries lack the tools and knowledge on proper design processes to effectively participate in nano-satellite development and design projects. Nano-satellites are great vehicles for enabling technological development, especially with the development of the CubeSat standard. In this paper we highlight the importance of CubeSat communication system design towards successful and sustainable satellite development. A new open-source discrete event network simulation tool named SatSim is introduced. SatSim is developed in Python to provide a user-friendly environment wherein developers can easily implement and test new and existing communication strategies and protocols. This promotes proper testing which is critical to reduce some of the risk factors associated with satellite development. SatSim is also utilised to simulate and test the performance of the AX.25 and FX.25 protocols. Both these protocols serve in terrestrial and satellite applications, although FX.25 has been used to a lesser extent. Simulations show that an optimal satellite communication strategy can be implemented by using a combination of AX.25 and FX.25. AX.25 with a CubeSat configuration performs well when the transmitter and receiver are in close proximity, but struggles over noisy channels. FX.25 on the other hand performs more reliably, but at a lower throughput compared to AX.25. By intelligently switching between the two protocols a more reliable and efficient strategy is proposed for CubeSat communication systems.

RESULTS FROM THE QB50 PRE-CURSOR LAUNCH CAMPAIGN

J. Erasmus

Abstract: Regular and affordable access to space is a critical prerequisite for advancing nanosatellite design. Though its ISL subsidiary the Dutch company ISIS-Innovative solutions in Space have been at the forefront of acting as interface between satellite developers and launch providers worldwide over the past more than 5 years. In 2013 ISL was directly involved in 11% of all nanosatellites launched.

The QB50 mission aiming to launch 50 nanosatellites into LEO from a single rocket launch presents unique challenges to nanosatellites launch providers and ISL have been developing a compatible launch interface system over several years culminating into a modular and generic system first launched with the QB50 precursor mission in May 2014. This paper presents a brief overview of the ISIS quadpack launch enclosure and the iMDC deployment controller also highlighting the South African contributions in preparing it for its first launch in a very short timeframe. Besides the history and design overview of the system some flight results will also be presented.

THE DESIGN OF A CAMERA SYSTEM FOR AN EARTH OBSERVATION CUBESAT MISSION

C.R. Jooste, J.R. Quibell and D.F. Visser

Abstract:

The proposed project investigates developing a camera payload for a CubeSat nanosatellite. The mission for such a satellite could provide low-cost imaging for less developed parts of sub-Saharan Africa. Communities in Africa without access to near real-time images of their environment are susceptible to being caught off-guard about natural disasters and do not have readily accessible information about population dynamics. Up to date information about the African environment will contribute towards social innovation and helping disadvantaged communities. Hardware requirements for the mission are discussed, with topics such as image sensors, memory, compression, lens design, controllers and a mock prototype being suggested. Earth observation is discussed, with various applications and benefits being presented.

THE PERFORMANCE EVALUATION OF DISTRIBUTED INTER-SATELLITE COMMUNICATION PROTOCOLS FOR CUBE SATELLITE SYSTEMS

R. Radhakrishnan, Q.A.Zeng and W. W. Edmonson

Abstract: The usage of small satellite systems is of great importance to the space community due to the reduced cost of space missions without a great compromise in performance. Small satellites flying in formation help to provide better spatial and temporal resolutions of the target and thus could be useful in science and environmental applications like gravity mapping, tracking of forest fires, finding water resources, and space weather. Inter-satellite communication is a key aspect when satellites fly in formation. This paper concentrates on designing and simulating suitable MAC and routing layer protocols for distributed small satellite network. Given that we use the Open System Interconnection (OSI) as a framework, this work represents a focus on layer 2. To validate our proposed system model, extensive simulations are executed. The performance of the proposed work is evaluated using three different parameters: throughput, average access delay and average end-to-end delay. These findings indicate that, the Leader-Follower and Constellation formation flying patterns have the maximum throughput and minimum delay, thus ensuring reliable communication and higher data rate with low cost.