



University of Nairobi

College of Biological and Physical Sciences

School of Computing and Informatics

Annual Report

2014

1. Introduction

The School of Computing and Informatics (SCI) was formally established in 1977 as the Institute of Computer Science whose mandate included academic as well as university ICT services. In the year 2002, and in the interest of realizing more focused management and efficiency of the two functions, ICS was split into two units i.e. ICTC and SCI. The School takes its name from the core competencies that it seeks to nurture: *Computing*, to cover the theory and science of computation and *Informatics* to exemplify the practical outworking of this theory in technology and application. The School is a regional leader in research, research and development (R&D) and advanced education in computing. It was the first to offer Bachelors and Postgraduate degrees in Computer Science in the region.

The core mission areas are: Teaching and Learning, Research, Consultancy, Research and Development and Extension Services

Teaching and Learning

Our objective in teaching and learning is to produce high quality, well-rounded, sophisticated graduates who are productive, innovative, and capable of lifelong learning. Our courses are therefore developed and delivered to a high standard of educational and technological competence.

Research

We aim to institute a dynamic programme of aggressive research in our core areas of competence: information systems, distributed systems and artificial intelligence, in line with national and regional priorities.

Consultancy

We seek to engage productively with the public and private sector to solve problems of national or organizational economic importance in order to foster progress in our environment. A number of our academic staff members are involved in consultancy work through UNES.

Research and Development and Extension Services

Based on sound research, relevant teaching, and problem-solving experience gained through consultancy opportunities, we develop training programmes, policies, methodologies and information technology software and hardware products for the local, regional and international market and increase awareness of the same in the community at large.

Thematic Areas

The research mandate of the School of Computing and Informatics is carried out under three research groups in the following thematic areas:

1. ICT for development (ICT4D)
2. Computational Intelligence
3. Distributed Computing

2. Programmes Offered

| Programmes | Year Started | Summary |
|---|---------------------|--|
| B.Sc. Computer Science, Diploma in Computer Science | 1993 | This is the School's flagship programme. Continues to attract high caliber students. In the last two years we have admitted a second class at Kenya Science campus in addition to the class based in Chiromo campus. Curriculum has been reviewed 4 times. Most recent review in 2010. |
| M.Sc. Applied Computing | 2013 | This is an evening programme targeting applicants with Computer Science or Information Technology or any related discipline. Mode of study is coursework and project. |
| M.Sc. Computational Intelligence | 2013 | This is an evening programme targeting applicants with first degree in Computer Science or related Engineering, Mathematics or Statistics discipline. Mode of study is coursework and project. |
| M.Sc. Distributed Computing Technology | 2013 | This is an evening programme targeting applicants with first degree in in Computer Science or a related discipline (e.g. Engineering, Mathematics and Physics). Mode of study is coursework and project. |
| M.Sc. Information Technology Management | 2013 | This is an evening programme targeting applicants with first degree in Computer Science or Information Technology or a related discipline. Mode of study is coursework and project. |
| Ph.D. Information Systems, Ph. D. Computer Science | 2000 | These are Ph.D. purely by research. The programmes have produced 8 graduates so far. Currently 13 students are registered. |

Undergraduate Enrolment

| Year of Study | Number of students | | | | | | | | |
|----------------------|-----------------------------|--------|------------|----------------------------|--------|------------|---------------|--------|------------|
| | Government Sponsored | | | Privately Sponsored | | | Totals | | |
| | Male | Female | Total | Male | Female | Total | Male | Female | Total |
| 1 | 77 | 13 | 90 | 57 | 5 | 62 | 134 | 18 | 152 |
| 2 | 25 | 9 | 34 | 28 | 5 | 33 | 53 | 14 | 67 |
| 3 | 27 | 10 | 37 | 32 | 5 | 37 | 59 | 15 | 74 |
| 4 | 23 | 3 | 26 | 18 | 6 | 24 | 41 | 9 | 50 |
| Total | 152 | 35 | 187 | 135 | 21 | 156 | 287 | 56 | 343 |

Postgraduate Enrolment Masters Programmes

| Year of study | | | | | | | Number of students | | | | | | Total |
|---------------|---------------------|------|-----------|-------------------------|------|-----------|--------------------------------|------|-----------|--------------------------------------|------|-----------|-------|
| | M.Sc. IT Management | | | M.Sc. Applied Computing | | | MSc Computational Intelligence | | | MSc Distributed Computing Technology | | | |
| | Female | Male | Total | Female | Male | Total | Female | Male | Total | Female | Male | Total | |
| 1 | 51 | 14 | 65 | 4 | 14 | 18 | 0 | 23 | 23 | 9 | 35 | 44 | 126 |
| 2 | 8 | 32 | 40 | 1 | 14 | 15 | 3 | 13 | 26 | 3 | 51 | 54 | 135 |
| Total | 18 | 63 | 81 | 5 | 28 | 33 | 3 | 36 | 49 | 12 | 86 | 98 | 261 |

PhD

| Level | Male | Female | Total |
|-------|------|--------|-------|
| 1 | 17 | 1 | 18 |
| 2 | 21 | 3 | 24 |
| Total | 38 | 4 | 42 |

3. Number of Graduates

| <i>Programme</i> | <i>Number of Graduates</i> | | |
|--------------------------------|----------------------------|---------------|--------------|
| | <i>Male</i> | <i>Female</i> | <i>Total</i> |
| Diploma Computer Science | 64 | 14 | 78 |
| B.Sc. Computer Science | 36 | 11 | 47 |
| PGDip. Information Systems | - | - | - |
| M.Sc. Information Systems | 32 | 8 | 40 |
| M.Sc. Computer Science | 48 | 11 | 59 |
| MSc. Applied Computing | 1 | 1 | 2 |
| M.Sc. Applied Computer Science | - | - | - |
| Ph.D. | 3 | | 3 |
| Total | 184 | 45 | 229 |

4. Research Projects/Collaborations

| Title | Partners |
|---|--|
| Research and Pedagogy related Transport Infrastructure Design & Development | Centre for Sustainable Urban Development, Earth Institute , Columbia University |
| Research Grants Innovative Application of ICTs in addressing water –related impacts of climate change (ICTCCW) | Asian Management & Development Institute (AMDI), VIETNAM |
| The promise of Fibre-optics Broadband: A pipeline for Economic Development in East Africa | University of Exford; Economic and Social Research Council |
| Liberation Technologies program-design thinking | Stanford University, Nokia |
| Kenya Centre of Excellence partner Institution for ITES/BPO Industry – Technology Project | Kenya ICT Authority with funding from World Bank, IBM, CAPITA,KeMU consortium |
| Health Information Systems for Kenya (HI4Kenya) | Ministry of Health; USAIDAfyaInfo; I-Tech |
| Towards a centre of Excellence for Distributed Computing and Modelling: A UNESCO-HP Brain Gain Project | UNESCO, HP |
| ICT for Education | VLIR |
| Labour Market analysis to assess possibilities of creating employment opportunities for poor and vulnerable populations... in Ghana, Kenya and South Africa | University of KwaZulu-Natal; Rockfeller Foundation |
| Catalyzing the new Mobility in cities | Centre for Sustainable Urban Development, Earth Institute, Columbia University ; Rockfeller Foundation |
| Cloud Strategy | Microsoft |
| Kenya Innovation Forum | ICT Authority |
| Digital Matatus | |
| Forgaty | University of Washington/UON |
| Mobile phone-based patient record system | Swedish Institute and Vetenskapsrade |
| HIV Capacity building (UNITID) | UNITID |
| Consultancies | |
| Technical Support for MoH | MoH |

5. Publications

| Staff Name | Title of the Paper | Journal |
|----------------------------|--|---|
| C. A. Moturi | Mobile based Notifiable Disease Surveillance – Case for Kenya | International journal of Computer Applications |
| Prof. Waema | ICT Pathways to poverty Reduction: Empirical evidence from East and Southern Africa | International development Research Centre |
| Prof. Wagacha, C.A. Moturi | Intelligent System for Predicting Agricultural Drought for Maize crop | International Journal of Technology Enhancement and Emerging Engineering Research |
| Prof. Wagacha, Dr. Oboko | Students' perceived challenges in an online collaborative learning environment: A case of higher learning institutions in Nairobi, Kenya | The International Review in Research Open and Distance Learning |

PhD Theses

| Name | Title | Supervisors | Date |
|----------------------|--|---|------------|
| Dr. Lawrence Muchemi | "Natural Language Access To Relational Databases: An Antology Concept Mapping (Ocm) Approach | Prof. Peter Wagacha Dr. Wanjiku Nga'ng'a | 30/07/2014 |
| Dr. Austin Owino | Dynamic Subset Difference Revocation Using One Binary Tree | Prof. Okelo-Odongo | 26/11/2014 |
| Dr. Stephen Mburu | A Model for Design and Deployment of Mhealth Solutions Fit For Low-Resource Settings: Case of Maternal Health Care | Prof. Okelo-Odongo | 28/11/2014 |

MSc Computer Science Projects

| No | RegNo | Names | Title |
|----|----------------|--------------------------|---|
| 1 | P58/64346/2011 | Akuku Kelly Omondi | Multi-agent Based System For Vehicle Routing And Scheduling Based On Traffic Monitoring |
| 2 | P58/63702/2011 | Mburu Rahab Wanjiru | Mining of Judicial Data-A Case of the Kenya Judiciary |
| 3 | P58/64511/2011 | Gathogo Richard Muraguri | Community EAgriculture Application |
| 4 | P58/63384/2011 | Onyango Kennedy Abuje | Secure Collaborative Manuscript Management System |
| 5 | P58/63383/2011 | Masila Catherine Koki | Item Response Theory (IRT) Management System For Item Banking In Highstake Examinations |
| 6 | P58/63169/2011 | Kimeu Martin Muli | How Do Exposure To And Use Of ICTs In Schools Affect Future Employment? |
| 7 | P58/63760/2011 | Wambua Ruth Nthenya | Elearning Portal For The Physically Challenged: Case Of Low Vision |
| 9 | P58/65002/2011 | Anindo Michael | Predictive Modeling Of Prostate Cancer Patients' Clinical Outcomes Using Machine Learning Techniques |
| 10 | P58/61437/2010 | Addero Edigar O. | Using Machine Learning To Optimize Resource Allocation For A Cloud Computing Environment For Data Services,A Case Study Of Safaricom Ltd. |
| 11 | P58/63388/2011 | Orwa Horace Owiti | Use Of Game Theoretic Multi-agents With Reinforcement Learning In Solving Job Shop And Parallel Machine Scheduling Problem |
| 12 | P58/63063/2011 | Liech James Gor | Agent-based Interoperability System In Health Insurance |
| 13 | P58/62281/2010 | Etene Yonah | A Multi-Agent Based System for Implementing Algorithms to Support E-Learning |
| 14 | P58/70599/2008 | Kuria Martin Wainaina | SMS Based Response System |
| 15 | P58/73066/2009 | Adede Alfayo Oyugi | Implementing Data Integrity and Confidentiality In Cyber Foraging System |

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|----|----------------|---------------------------|--|
| 16 | P58/75541/2012 | Muia Peter Mainji | A Public Key Infrastructure(PKI) For A Higher Education Institution In Kenya - A Case Of University Of Nairobi |
| 17 | P58/75639/2012 | Wahome Denis Wandaiini | Use Of Ontology-based Multiagent System In Development Of Public Service E-procurement Shared Services |
| 18 | P58/75646/2012 | Kamau David Biaru | A Model Of Two-Factor Authentication Using Password And Facial Recognition In Banking Applications: Biometric Authentication Using EigenFaces For Recognition. |
| 19 | P58/63388/2011 | Orwa Horace Owiti | Online Job Shop Scheduling With Game Theoretic Multi-agent Algorithm |
| 20 | P58/63441/2011 | Ngei Tabitha Mbete | Investigate How A Knowledge Management System Can Affect Organisational Performance |
| 21 | P58/63741/2011 | Ngugi Anthony Mwangi | Agent Based Coordination of Security Information Exchange |
| 22 | P58/75653/2012 | Ndeithi Perminous | Multi Agent Based Stock Price Prediction Model For NSE |
| 23 | P58/75743/2012 | Simatwa Peter Arkut | A Smartphone App Approach To Benchmarking Quality Of Experience (QoE) Offered By Kenyan Mobile Service Providers. |
| 24 | P58/75764/2012 | Otieno Oyuech Christopher | Decision Tree Model For Predicting Avoidable Re-Hospitalization Of Breast Cancer Patient In KNH |
| 25 | P58/75853/2012 | Dende Kennedy | Sentimental Analysis In Crime Detection And Prevention. |
| 26 | P58/75862/2012 | Nyaboke Consolata Obwogi | Supporting Patients Flow In A Hospital By Data Mining: Case Study Kenyatta National Hospital |
| 27 | P58/75863/2012 | Ijaa Wilfred | Design of Agent-Based Bidding Application for Mobile Phones |
| 28 | P58/75880/2012 | Githinji Christopher D.N | Traffic Simulation And Mapping Of Bus/matatu Routes For Eldoret City |
| 29 | P58/75902/2012 | Kangethe Stephen Mungai | Application Of An Association Rule Mining Algorithm In Discovering Patterns In The Stability Of Medical Diagnosis For A Standardized EHR (Electronic Health Records) Implementation. |
| 30 | P58/75904/2012 | Ondara Bernard Omoi | A Multi-agent System For Decision Support In Managing E-channels Performance In Banks |
| 31 | P58/75939/2012 | Osongi Felix | An Agent Based Model For Network Performance And Monitoring For Internet Service Providers |
| 32 | P58/75964/2012 | Guya Mourice | Analysis of Cloud Computing Security In Nairobi And Development of Agents Data Security Model Using Data Classification |
| 33 | P58/75968/2012 | Muli Julius | An Investigation in the Use of Thin Client Technology for Effective Learning: A Case Study for County Schools in Kenya |
| 34 | P58/76112/2012 | Ileri Andrew Muriithi | A Data Mining Approach To Private Healthcare Services Demand Forecast In Nairobi County |
| 35 | P58/76263/2012 | Muturi Moses | Multi-Agent Based Wireless Sensor Telemedicine Network For E-Health Monitoring Of HIV Aids. |
| 36 | P58/76265/2012 | Ngaruiya Njeri Mary | Use Of Data Mining Techniques To Check The Prevalence Of Prostate Cancer: A Case Study Of Nairobi County. |
| 37 | P58/76363/2012 | Anyim Julianne Akinyi | Using Data Mining Methodologies To Discover And Analyze Patterns In Educational Data : A Case Study Of The University Of Nairobi |
| 38 | P58/76392/2012 | Wekesa Bongo | Agent-based Simulation Of Web Application Security Features In Kenya Government Websites: Threat Impact Assessment |

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|----|----------------|------------------------|--|
| 39 | P58/76399/2012 | Mundia James | Mobile Phone Fraud Detection Using Artificial Neural Networks Implemented On A Grid Computing Environment |
| 40 | P58/76432/2012 | Ruugia Kithinji Samuel | Application Of Geo-Spatial Data Analysis In Auto Risk Segmentation And Modeling: A Case Study For Nairobi County-Kenya |
| 41 | P58/76479/2012 | Onsomu Jared | Real Time Traffic Monitoring And Congestion Hot Spot Identification Using On-board GPS Data. |
| 42 | P58/76612/2012 | Mbirika Douglas | Particle Swarm Optimized Artificial Neural Network For Diabetes Diagnosis |
| 43 | P58/76972/2012 | Omwoma Vincent | Baysian Models Of Word Alignment For Machine Translation In Language Translators |
| 44 | P58/77292/2012 | Majanga Vincent | A Model For Public Transport Traffic Flow To Predict Traffic Congestion Around Nakuru Town Using Location Based GPS Data. |
| 45 | P58/83911/2012 | Muli Elizabeth | Agent Based Self Study System |
| 46 | P58/9173/2006 | Iraya James | Modeling And Simulation Of An E-Voting System. |
| 47 | P58/75540/2009 | Linnet Keli Maundu | Agent based knowledge management system for learning psychomotor skills in Technical Institutions |
| 48 | P58/70483/08 | Kennedy Amwoyo | Practical Approach: Securing and Enabling 2-Factor Authentication (using OTP) and Integrating Mobile Money on online systems |
| 49 | P58/70440/2008 | Muthiga Edward | Social Media and its Implications |

MSc Information Systems Projects

| No | RegNo | Names | Title |
|----|-----------------|---------------------------|---|
| 1 | P56/8128/2006 | Musika M. Fredrick | Spatial Analysis And Visualization Of TB Case Of Kitui County |
| 2 | P56/60946/2010 | Moro Pamela Atieno | What Is The Gender Impact Of ICTs In Education On Access, Use Of, Attitudes Toward, And Learning Outcomes. |
| 3 | P56/72334/2008 | Ope Justus Ochido | Investigating Information Systems Security In Kenya Government State Corporations |
| 4 | P56/7311/2006 | Muriuki Nahashon Gachagua | The Influence Of Education On The Performance Of M-commerce In Kenya .A Case Study Of Kiambaa District. |
| 5 | P56/7311/2006 | Muriuki Nahashon Gachagua | The Latent Role Of Mobile Phone Applications In The Success Of Small And Medium Size Enterprises. A Case Of SMEs Providing Financial Services In The Kiambu Sub County. |
| 6 | P56/8831/2005 | Githinji Ruth Wanjiru | Challenges Facing Telecommuting In Kenya |
| 7 | P56/p/7942/2002 | Riunge Michael | An Empirical Analysis Of Critical Success Determinants Of Ict Business Incubation In Kenya |
| 8 | P56/61526/2011 | Mugai James K. | Factors Affecting The Adoption Of E-governance In Public Institutions (a Case Of Nema-kenya) |
| 9 | P56/62001/2011 | Matete Johnson | Real Time Geographical Information System For Sugarcane Availability In Kenya.[Case Study Of Mumias Sugar] |
| 10 | P56/71138/2008 | Mwamba Owino D. | SMS Gateway For Nairobi Area Police Security Enhancement: A Prototype |
| 11 | P56/71725/2008 | Mbiwa Prester Nzasi | Information Systems In Saccos: A Multi-Criteria Suitability Evaluation Tool |
| 12 | P56/72143/2011 | Mwangi Thomas Mbogo | The Future Of Cloud Computing In School Managenet Systems In Kiambu County |
| 13 | P56/72684/2012 | Kiongo Francis | Enhancing Early Detection And Management Of Terminal Disease Through Mobile Cloud Computing. |

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|----|-----------------|------------------------|---|
| 14 | P56/72700/2012 | Wahinya Victor | The Application Of Data Mining To The Monitoring Of Controlled Medicines In Kenya |
| 15 | P56/72736/2012 | Mwaura Augustine | Develop A Framework To Assess The Success Of Integrated Financial Management Information System (IFMIS) In Business Improvement And Service Delivery. A Case Study Of The Ministry Of Finance |
| 16 | P56/72747/2012 | Kinuthia Ngugi Simon | A Model Driven Scheme For Quality Of Service Evaluation In M2m Based Remote Monitoring Networks. |
| 17 | P56/72903/2012 | Mongeri Marriane | A Case Of Security In Health Informatics |
| 18 | P56/73063/2012 | Wafula Daniel | Automated Rainfall Data Extraction From Satellite Imagery For Crop Index Insurance |
| 19 | P56/73068/2012 | Rashid Mwamboni Ali | Adoption Of Mobile Government (M-Government) Services In Developing Countries: The Case Of Kenya |
| 20 | P56/73128/2012 | Dorothy Aluoch | Evaluating the effectiveness of digital games in teaching mathematics standard 3 under the 8-4-4 syllabus in Usire primary school Siaya county- A case study |
| 21 | P56/73381/2012 | Nicholus Mwunda | Factors affecting the adoption of ICTs in Teaching/Learning process in secondary schools. The case of Machakos District |
| 22 | P56/73404/2012 | Wanjawa W.b | Using Neural Networks To Predict Stock Market Prices At The Nairobi Securities Exchange |
| 23 | P56/73424/2012 | Makori Onywoki Benson | A Framework For Adoption Of Bio-Metric Authentication In Kenyan Banks |
| 24 | P56/73481/2012 | Sammy Soita Gimoi | Adoption usage and implications of Social Media in Corporate Organisations in Kenya |
| 25 | P56/73661/2012 | Lumumba Jenina W. | Identifying Best Practices For Security In Patient Health Information System |
| 26 | P56/73703/2012 | kiptum chepyator | M-money intermediation framework and security |
| 27 | P56/73861/2012 | Kiplagat Victor | Mobile Money Intermediation And Security |
| 28 | P56/73909/2012 | Murithi Loyford | Inter-Organizational Electronic Information Sharing Framework For Civil/Persons Data In Kenya |
| 29 | P56/78997/2009 | Gathogo James Karanu | Adoption Evaluation Model Of Public EHealth Services: The Case Of Non-state Actors In Kenya |
| 30 | P56/p/7277/2005 | Kitavi Titus Makau | Evaluating The Effectiveness Of Service Delivery Frameworks In Organizations: The Case Of ITIL Service Delivery Framework At Kenya Airways |
| 31 | P56/p/8407/2003 | Somba Steve | Real Time Multi Agent Financial Institution Fraud Detection And Prevention Tool |
| 32 | P56/73561/2012 | Rosemary Njeri Ngwenyi | Measuring the outcomes of e-health solutions delivered through the Internet and telecommunications: A case study of Nairobi County |

6. Human Resource

| <i>Designation/Grade</i> | <i>No of Staff</i> |
|---------------------------------|--------------------|
| Professor | 1 |
| Associate Professor | 3 |
| Senior Lecturer | 8 |
| Lecturer | 8 |
| Tutorial Fellow | 4 |
| Assistant Registrar | 0 |
| Senior Administrative Assistant | 1 |

| | |
|---------------------------------|---|
| Admin Assistant | 0 |
| Senior Secretary | 1 |
| Secretary | 1 |
| Technologists | 5 |
| Library Assistant | 1 |
| Records Clerk | 1 |
| Office Assistant | 0 |
| Receptionist/Telephone Operator | 2 |
| Cleaners | 2 |
| Driver | 1 |