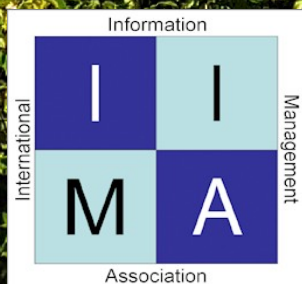




# Securing the Internet and Cloud Technology – Where Cutting- Edge Science meets Business

ABSTRACTS FROM  
IIMA/ICITED JOINT CONFERENCE 2018





# **Securing the Internet and Cloud Technology – Where Cutting-Edge Science meets Business**

## **ABSTRACTS**

**from**

***INTERNATIONAL INFORMATION MANAGEMENT  
ASSOCIATION CONFERENCE***

**and**

***INTERNATIONAL CONFERENCE ON INFORMATION  
TECHNOLOGY AND ECONOMIC DEVELOPMENT***

**(IIMA/ICITED Joint Conference 2018)**

**held at Prairie View A & M University, USA from 8 to 10  
October 2018**

Edited by:

Emmanuel U. Opara, Prairie View A&M University (euopara@pvamu.edu)

Jaymeen Shah, Texas State University (jaymeen.shah@txstate.edu)

Abel Usoro, University of the West of Scotland (abel.usoro@uws.ac.uk)

Louis Ngamassi, Prairie View A&M University (longamassi@pvamu.edu)



## Foreword

The second joint conference of the IIMA and ICITED organizations aims to promote the dynamic exchange of ideas among leading researchers, educators, developers and practitioners who share their research and disseminate innovations in education, business, and government. For **academic researchers**, this is a great chance for discovering new research directions, interacting with other researchers and professionals. For **students**, this is a great time for learning latest technology and research trends and finding job opportunities. For **industrial professionals**, this is a wonderful opportunity for inspiring new ideas, recruiting students, and networking with researchers.

Prairie View A&M University hosted the 2018 IIMA / ICITED conference. Thanks to the university administration, faculty, staff, and students. It was a great engaging, rewarding, challenging, and thought-provoking conference. Here are some takeaways from the conference.

- Using Sococo for virtual collaboration
- Maltego software for data analysis, big data and penetration testing methodologies
- Evaluating security policy compliance
- How to manage and reducing teaching workload
- Valuating social robots' capabilities.

Some members of the conference who were recognized for their services and dedication are:

- Pascal and Huei for their work in publishing the JITIM journal.
- Ramesh and Shoshana for bringing back to life the CIIMA journal.
- Pascal for serving as president of the IIMA
- Abel, Jaymeen and Louis for being program chairs for this conference
- Emmanuel for his dedication and hard work in hosting the conference via the Prairie View A&M University and being the conference chair

As keynote speakers, Professor Ian Allision, discussed, “Bringing Cutting Edge and Business Together: A Model for the University of the 21<sup>st</sup> Century” while Dr. Dave Clark, a hospital executive, talked about, “The challenges in protecting hospitals from life threatening cyber-attacks”. Mr. Clint Walker, the Information Technology Director at the Hereford Regional Medical Center was there for support. Mr. Ned Pendley, a director from NASA gave the team a thrilling overview of NASA’s activities as they plan for a trip to Mars. The team later visited the Space Center Houston in Clear-Lake, where some of the rockets and capsules were visibly on display. The team were amazed at the NASA space program—past and present. Announcement was made for the venues for the 2019, 2020 and 2021 conference.

Professor Emmanuel U. Opara, D.B.A; F.I.I.M.A  
Conference Chair

Professor of Management Information Systems

Research Area: Cyber Security-Network/Digital Media Forensics

Prairie View A&M University, Prairie View, Texas 77446, USA

euopara@pvamu.edu

## Acknowledgement

The conference that produced this book of abstracts would not be possible without the team work and financial support of many. We are very grateful to the President of the University Dr Ruth J. Simmons, Dr Corey Bradford, Senior Vice President for Business Affairs, Dr James M. Palmer, Interim Provost and Senior Vice President for Business Affairs, Dr Ali Fares, Interim Vice President for Research, Innovation and Sponsored Programs, Dr. Munir Quddus, Dean, College of Business, Dr Betty Adams, Dean, College of Nursing, Dr Gerard D'Souza, Dean College of Agriculture and Human Sciences, Dr Camille Gibson, Interim Dean, College of Juvenile, Justice and Psychology, Dr Danny Kelly, Dean, Marvin D. and June Samuel Brailsford College of Arts and Sciences, Dr Pamela Obiomon, Dean Roy G. Perry College of Engineering, Dr Ikhlas Sabouni, Dean, School of Architecture, Dr Tyrone Tanner, Executive Director, Prairie View A&M University Northwest Center, Ms Kimberly Gordon, Assistant Dean, College of Business. To be appreciated too are the Program Chair Dr Jaymeen Shah, Texas State University, Co-Program Chair Dr Abel Usoro, University of the West of Scotland, Co-Program Chair Dr Louis Ngamassi, Prairie View A&M University and Dr Sarhan Musa, Co-Program Chair, Prairie View A&M University.

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**Monday, October 08, 2018**

**Stream: Cybersecurity and Forensics**

**End-users Compliance to Information Security Policy: A Comparison of Motivational Factors**

Peter Straver, Pascal Ravesteijn  
HU University of Applied Sciences Utrecht  
Netherlands  
peter@straver-ict.nl; pascal.ravesteijn@hu.nl

Business information, held within information systems, is critical for most organizations. To protect these critical information assets, security controls should be deployed. Information Security Policies (ISP) give direction to end-user behaviors. Organizations should focus on conditions likely to promote so-called motivational factors influencing the end-users' intentions to perform the desired behavior of compliance to ISP in order to protect these information assets.

In total, six motivational factors, applicable to intentions on compliance were found during research and were measured within five organizational contexts. It was learned from the measurements and analysis is learned, that the degree to which these factors relate differs per factor and per context. Two of these factors were found to always relate in such a degree to compliance intentions that even without measuring the degree for a particular organization, applying these factors can be very effective for any organization or context. The other four factors have shown to be effective within particular context(s), meaning measurement of the context is needed before utilizing these factors within an organization to optimize the effect of efforts.

**Keywords:** Security, Information security, Security policies, Motivational factors.

## **Memory Forensics – Putting Digital Forensics into Practice – The Changing Pattern on Cyber-Espionage**

Emmanuel Opara  
Prairie View A&M University  
USA  
euopara@pvamu.edu

Soluade Oredola  
Iona College  
USA  
osoluade@iona.edu

Memory forensics has come a long way in just a few years. Digital, memory and media forensics can be extraordinarily effective at finding evidence of worms, rootkit technologies in network, sockets, URLs, IP addresses, open files etc. The study will show how digital, memory, and media forensics technology are employed to identify abnormal behaviors such as memory artifacts, code injection and rootkit behavior, suspicious network activities, unknown services, unusual OS artifacts, and evidence of persistency while finding evil within the cyber platform. The study will conclude by recommending pragmatic solutions to incident responders by exposing injection and hooking techniques that would otherwise remain undetected. These analyses will be performed to get more information that are not available through static analytical process of a system.

**Keywords:** Memory, Media, Digital espionage, Cyber security, Abnormal, Evil.

## A Multilayer Secured Messaging Protocol for REST-based Services

Idongesit Eteng  
University of Calabar  
Nigeria  
idongesitessien@yahoo.com

Oluwafemi Oluwaseun  
Lachrife Technologies  
Nigeria  
femisheun@gmail.com

The lack of descriptive language and security guidelines poses a big challenge to implementing security in Representational State Transfer (REST) architecture. There is over-reliance on Secure Socket Layer/Transport Layer Security (SSL/TLS), which in recent times has proven to be fallible. Some recent attacks against SSL/TLS are: POODLE, BREACH, CRIME, BEAST, FREAK, etc. A secure messaging protocol is implemented in this work. The protocol is further compiled into a reusable library which can be called by other REST services. Using Feature Driven Development (FDD) software methodology, a two-layer security protocol was developed. The first layer is a well hardened SSL/TLS configuration. The second layer is a well-designed end-to-end protocol that handles authentication, authorization, encryption and message integrity as well as timing and replay attack prevention. The end-to-end protocol uses HMAC-512 and a hybrid encryption system using the AES and RSA algorithms. The protocol was then compiled to a reusable library using C# language. Two different tests were carried out on this protocol: Penetration test and SSL/TLS configuration test. The Penetration Test was carried out using the Open Web Application Security Project Zed Attack Proxy (OWASP ZAP) application and Fiddler Web Debugger. The SSL/TLS test sought to test the SSL/TLS layer of the protocol for known vulnerabilities using a popular SSL/TLS test tool known as SSL Lab. The raw and scaled scores obtained from SSL Lab were 95% and 93% respectively. The results of Implementation test show that the protocol is implementable. The protocol is also resistant to such attacks as Unauthorized, Timing and Replay as shown by the result of the penetration test. The grade obtained from the SSL/TLS test is "A+". The result also shows that the implementation is not vulnerable to currently known SSL attacks. The library can be reused by .NET applications and the implementation steps can also be followed by other REST services developers using other platforms.

**Keywords:** Protocol, Secure messaging, Encryption, Signature, Confidentiality, Message integrity.



## A Conceptual Model for DevSecOps in Cloud-enabled Delivery

James Jenkins  
Seattle Pacific University  
USA  
jimj@spu.edu

The software development industry is going through a change in the way it delivers systems to market with a convergence driven predominantly by newly adopted agile methodologies and cloud-based infrastructures initialized through scripts (i.e., code as infrastructure). This new SDLC concept, termed DevOps, focuses on the flow of code through a continuous integration and continuous deployment (CI/CD) pipeline. Information security functions are struggling in their transformation, called DevSecOps, primarily due to the velocity of updates, through the CI/CD pipeline. Tasks that once were accomplished in days now need to be completed in minutes. In this presentation, we will present a framework for organizations to aid in their understanding the subject of 'DevSecOps'. This framework provides clarity on which information security functions are involved and discusses the level of integration in cloud-enabled organizations.

**Keywords:** DevSecOps, Conceptual model, Cloud delivery, Deployment, SDLC, DevOps.

## **Application of Huffman Data Compression Algorithm in Hashing Computation**

Lakshmi Narasimha Devulapalli Venkata, Mustafa Atici  
Western Kentucky University  
USA

lakshmi.devulapallivenkata974@topper.wku.edu; mustafa.atici@wku.edu

Cryptography is the art of protecting information by encrypting the original message into unreadable format. A cryptographic hash function is a hash function which takes an arbitrary length of text message as input and converts that text into a fixed length of encrypted characters which is infeasible to invert. The values returned by hash function are called as message digest or simply hash values. Because of its versatility, hash functions are used in many applications such as message authentication, digital signatures, and password hashing. The purpose of this study is to apply Huffman data compression algorithm to the SHA1 hash function in cryptography. Huffman data compression algorithm is an optimal compression or prefix algorithm where the frequencies of the letters are used to compress the data. An integrated approach is applied to achieve new compressed hash function by integrating Huffman compressed codes in the core functionality of hashing computation of the original hash function.

**Keywords:** Message digest, Cryptography, Hashing.

## **Users' Input Validation in Websites Security Analysis**

Izzat Alsmadi  
Texas A&M University-San Antonio  
USA  
alsmadi@gmail.com

Websites and web applications continue to evolve in terms of how they are developed and used. Different types of components in those websites and applications communicate with users through inputs taken from the users and outputs displayed to those users. Users, intentionally or unintentionally, may provide improper inputs. In this project we propose a model to investigate the behavior of websites when dealing with invalid inputs. From security perspectives, invalid inputs should be detected and rejected as early as possible. An invalid input is considered as a form of a successful attack if it is processed by the website code or back-end database. Based on this assumption, we proposed a list of indicators that tested invalid inputs are processed. A tool is developed to implement this model. We tested the model through evaluating several websites selected randomly. Our tool has no special credentials or access to any of the tested websites. We found many SQL injection vulnerabilities based on our proposed model. Upon the manual investigation of the web pages that showed such vulnerabilities, we found few instances of False positives. We believe that this can provide a systematic and automated approach to test websites for vulnerabilities related to improper input validation.

**Keywords:** Vulnerability testing, Injection vulnerability, Websites testing.

# Implementing Network Monitoring in a Hybrid IT Environment

Mark Mcdougald  
East Carolina University  
USA  
mcdougaldm15@students.ecu.edu

Yesterday's network monitoring methods do not work well in today's multi-cloud environments. In order to provide a scalable solution, and to improve both availability and performance, many corporations look for ways to expand their footprints without incurring exorbitant costs. One way to accomplish this goal is for businesses to consider transforming their traditional on-premise data centers into a multi-cloud environment. Adding new hardware and people is not an acceptable solution these days, and with cloud offerings that provide services like Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and/or Software as a Service (SaaS), corporations are having to re-think their strategies for expansion and how to meet the needs of their customers. With these new environments come new challenges for the traditional Security Operations (SecOps) group. SecOps is normally stretched beyond their budgets and capacity which creates more tension and load on this group. They need a way to provide network monitoring in these hybrid IT environments and which is the motivation for this paper. There are several options that come to mind, and one of them is a new delivery model called Monitoring as a Service (MaaS). This service proclaims to have the right solution for this type of infrastructure combination, combining the benefits of cloud computing technology with the traditional on-premises infrastructure. This paper will discuss the challenges faced by the enterprise that is implementing a network monitoring solution and ways to overcome these challenges. Multi-cloud environments are part of the fabric for future growth of enterprises, and network monitoring models will need to embrace this change in order to meet the needs of these customers.

**Keywords:** Network monitoring, Cloud, Hybrid, Infrastructure as a Service, Platform as a Service, Monitoring as a Service.



**Monday, October 08, 2018**

**Stream: E-Business**

**Exploring Critical Drivers of Collaborative Commerce**

C. Christopher Lee, Rebecca Lee, Laura Dutil, Youngseon Kim  
Central Connecticut State University  
USA

christopher.lee@ccsu.edu; rebeccal@my.ccsu.edu; laurapizarro@my.ccsu.edu; ykim@ccsu.edu

Because the research on collaborative commerce has been limited, this study is looking to provide additional empirical evidence about the factors affecting collaborative commerce usage intention and platform loyalty. This study investigates what the impact of age is on perceived value and relationship quality in collaborative commerce; it also explores how perceived value, relationship quality, and service quality affect the usage intention and platform loyalty in the collaborative commerce service industry. The sample data (n=176) was collected via survey at a regional public university on the east coast. ANOVA models and linear multi-variate regression models were developed to test the hypotheses. Pearson's correlation, Cronbach's alpha and principal component analysis were used to test internal reliability and construct validity. The results indicated that age is not a good predictor of perceived value or relationship quality. Multivariate regression models showed that perceived value and platform quality were the best predictors to collaborative commerce usage intention. Platform loyalty is best predicted by perceived value, relationship quality and platform quality.

**Keywords:** Collaborative commerce usage intention, Perceived value, Platform loyalty, Relationship quality, Platform quality.

## **Project Service Automation for Customer Relationship Management**

Huei Lee  
Eastern Michigan University  
USA  
Huei.Lee@emich.edu

Kuo Lane Chen  
University of Southern Mississippi  
USA  
Kuo.Chen@usm.edu

The purpose of this paper is to discuss project service automation (PSA) for customer relationship management applications. A case using Microsoft Dynamics 365 will be presented in this paper. This paper discusses features such as opportunity management, resource management, expense and time management, as well as team member collaboration. Microsoft Dynamics 365 is a cloud-based enterprise system which combines Microsoft Dynamics enterprise resource planning systems (Dynamics AX and NAV) with customer relationship management (Dynamics CRM). Customer engagement applications is a new term for CRM. Other similar products include Salesforce.com and SAP CRM.

Project Service Automation (PSA) is one of the major functions for dynamics 365 which includes features of Microsoft Project. PSA is under Project Service in Dynamics 365. Similar to Microsoft Project management, you can create a project and break down a project into different tasks.

**Keywords:** CRM, PSA, Customer engagement, Microsoft Project.

## **Factors Affecting Online Streaming Subscriptions**

C. Christopher Lee, Pankaj Nagpal, Sinead Ruane, Hyoun-Sook Lim  
Central Connecticut State University  
USA

christopher.lee@ccsu.edu; nagpalp@ccsu.edu; ruane@ccsu.edu; hlim@ccsu.edu

As digital media continues to expand, we have observed an increased amount of competition between cable television and online streaming services. Acquiring customers today takes more than just advertising; it is tailoring the business objectives to the needs and wants of consumers. There have been numerous studies involving key variables such as cost, ease of use, and social trends which affect adoption of cable and online media. This study explores a number of variables which consumers consider when choosing cable television and online streaming options. Sample data was collected through a survey questionnaire at a large public university. Multivariate regression models were developed to identify factors affecting each option. Both models showed statistical significances. The regression model for cable TV showed additional purchase, social trend, cost and customer service factors as statistically significant. In contrast, only social trend and available options were significant. Media options were marginally significant. In demographics, gender played no clear role while age showed marginal role in online streaming over cable television.

**Keywords:** Cable television, Cost, Customer service, Social trends, Media options, Ease of use, Available options, Additional purchase.

## **Blockchain-Based Healthcare: Three Successful Proof-of-Concept Pilots Worth Considering**

Rebecca Angeles  
University of New Brunswick Fredericton  
Canada  
rangeles@unb.ca

This paper features the use of blockchain technology in the healthcare industry, with special focus on healthcare data exchange and interoperability; drug supply chain integrity and remote auditing; and clinical trials and population health research. This study uses the research method of analyzing the published case studies, academic articles, trade articles, and videos on MEDRec, Patientory, and the AmerisourceBergen/Merck alliance with SAP/CryptoWerk. The “blockchain” concept was introduced around October 2008 when a proposal for the virtual currency, bitcoin, was offered. Blockchain is a much broader concept than bitcoin and has the following key attributes: distributed database; peer-to-peer transmission; transparency with pseudonymity; irreversibility of records; and use of computational logic. Three healthcare use-cases were taken up for proof-of-concept pilots by MEDRec, Patientory, and the AmerisourceBergen/Merck collaboration with SAP/CryptoWerk. The first case study was healthcare data exchange and interoperability; the second, drug supply chain integrity and remote auditing; and the third, clinical trials and population health research.

These cases indicate that MEDRec and Patientory will continue to solicit the participation of more healthcare organizations: care providers, hospitals, pharmaceutical firms, insurance firms, U.S. government bodies, healthcare startups, etc. Regulations like the 2019 deployment of the Drug Supply Chain Security Act (DSCSA) in the U.S. will drive blockchain use. Alliances such as the SAP/CryptoWerk collaboration are very useful blockchain as a service setup that specific firms such as small- and medium-sized organizations can benefit from. While blockchain technology has a promising potential for specific use cases in the healthcare industry, there are major challenges to deal with as well.

**Keywords:** Blockchain technology, Smart contracts, Healthcare industry, Distributed peer-to-peer networks.



**Monday, October 08, 2018**

**Stream: E-Learning and IT Curriculum**

**Enhancing IT Skills via Communities of Learning and Practice**

Ahmed Mahfouz  
Prairie View A&M University  
USA  
aymahfouz@pvamu.edu

Teaching information technology concepts and skills can be challenging to both educators and learners. This present study examines learning experiences and learner engagements of IT education at an institution of higher learning. How learners know about and integrate a new IT idea or concept into their existing knowledge impacts their learning experiences and understanding of the newly acquired information. These learning styles affect how new knowledge is retained and later applied for deeper comprehension. Different learning styles and theories are discussed, as well as practical techniques to match different learning styles, such as wikis, reflections via journals, reciprocal questioning, jigsaw classroom activities, and structured controversies. Discussion of individual and team methods to deepen the learning process and further engage student learning are also shared with practical examples and their ensuing outcomes. Such techniques build communities of learning and practice whereby students learn IT skills from each other and share their direct experiences as individuals and as a group.

**Keywords:** IS education, Learning styles, IT curriculum, Student engagement.

## Experimental Learning Using Financial Information Technology

Yi Zhang  
Prairie View A&M University  
USA  
yizhang@pvamu.edu

Experimental learning bridges the often-criticized gap between education and real-world experience. This paper examines how financial information technology can improve student learning through experimental learning. This paper introduces and analyzes hands-on learning using two technologies in finance: Bloomberg (a comprehensive financial information system which includes market & financial data and analytical tools) and StockTrak (simulated security trading platform). Curriculum design, pedagogical approach and application examples are presented. Student learning outcomes are examined to test the effectiveness of experimental learning.

**Keywords:** Information technology, Experimental learning, Financial education.

## Experience of Integrating an SAP Enterprise Systems Curriculum

Ahmed Mahfouz, Emmanuel Opara  
Prairie View A&M University  
USA

aymahfouz@pvamu.edu; euopara@pvamu.edu

SAP, the global leader in enterprise systems solutions, through its SAP University Alliances (UA) program, gives institutions of higher education a structured program of course content to teach enterprise resource planning (ERP) concepts, implemented hands-on through SAP software solutions. Currently, there are over 250+ member universities in the SAP UA in the United States. Typically, it takes a minimum of 3 years to build a SAP program. Most research shows that the experience is very challenging, and many times does not succeed during the first attempt, taking at least 5 years to accomplish the initial goals.

This research maps out the experience and challenges of integrating SAP into the business curriculum at a Southwestern institution of higher education in the United States, as a case study, and potentially serves as a road map for future institutions planning to adopt SAP. There is less than a score of scholarly studies which detail an institution's journey in implementing SAP into the business curriculum. There is a hunger for this research to learn how the actual implementation of an SAP curriculum integration process works. In addition to the actual case study of the research, this work presents findings based on a review of 50+ US SAP programs. The study also gives a primer to this adoption, recommendations, and lessons learnt.

**Keywords:** SAP, ERP, Enterprise systems, Business curriculum, IS education, Case study.

**Monday, October 08, 2018**

**Stream: IT for Economic Development and E-Government**

**Factors Influencing Mobile Government (m-government) Adoption in Nigeria**

Abel Usoro  
University of the West of Scotland  
UK  
abel.usoro@uws.ac.uk

Anietie Ekanem  
Federal Ministry of Science and Technology  
Nigeria  
anietiese@yahoo.com

Olugbenga Adejo  
University of the West of Scotland  
UK  
olugbenga.adejo@uws.ac.uk

Santiago Matalonga  
University of the West of Scotland  
UK  
Santiago.matalongo@uws.ac.uk

There is an increased use of mobile devices in developing countries like Nigeria. These devices present a good potential for citizens' engagement with their governments who can find it more convenient and less costly to supply essential services. This study seeks to investigate the factors that would influence mobile government (m-government) services adoption in Nigeria. Most technology adoption studies are focused on commercial activities and where there are governmental, there are on e-government. Though an offshoot of e-government, because of its infancy, research on m-government is scanty especially in the context of developing countries. At the same time research has shown that the mere availability of technology does not result in its adoption, thus a few adoption theories (e.g. Unified Theory of Acceptance and Use of Technology and Theory of Planned Behaviour) have been developed. These theories cannot be applied in every situation without contextualising them. This study aims to contextualise some aspects of these theories in Nigeria and in the context of m-government.

In terms of methodology, this research has developed a theoretical framework from existing theories before operationalising into a questionnaire that will be administered to a suitable sample of potential m-government users. The questionnaire is mostly closed-ended using a 5-point Likert scale. Respondents will not be required to write their names (and addresses) except they want to get the outcome of the research. Data will be kept confidential and only for research purposes and will be treated in aggregates without reporting on individual data or breaking

confidentiality. Data analysis using SPSS software will provide findings of the factors and their influence, therefore providing recommendations to the bureaucracy, professionals and researchers in information/knowledge management with specific target on m-government.

**Keywords:** m-government, Technology acceptance, e-government, Nigeria, Developing economy.

# Modeling and Simulation of Low-Cost and High-Efficiency Solar Cells for the Microgrid

Ali Husainat, Warsame Ali, John Attia, Penrose Cofie, Matthew Sadiku, John Fuller, Richard Wilkins, Sarhan Musa

Prairie View A&M University  
USA

ahusainat1@student.pvamu.edu; whali@pvamu.edu; joattia@pvamu.edu; pscofie@pvamu.edu; mnsadiku@pvamu.edu; jhfuller@pvamu.edu; rtwilkins@pvamu.edu; smmusa@pvamu.edu

A Microgrid is a subset of the centralized power system that generates, distributes, and regulates the flow of electricity. It can operate either traditional grid connected or disconnected from the traditional grid and operate autonomously. A microgrid can be powered by distributed generators, batteries, and/or renewable resources such as solar panels. Solar photovoltaic (PV) cells are renewable power generation for microgrids. This paper provides the optical and electrical modeling and simulation of Hybrid organic-inorganic Perovskite Solar Cells (PSCs). This study explores the Power Conversion Efficiency (PCE) using Methylammonium Lead Halides (MALHs) Perovskite  $\text{CH}_3\text{NH}_3\text{PbI}_3$  (active layer) with different contact materials (Au, Ag, Al) for solar photovoltaic (PV) cells in order to improve the power generation in the microgrid industry.

**Keywords:** Modeling, Simulation, Microgrid, Solar cell, Perovskite, Power conversion efficiency.

# **Factors Influencing the Adoption of Building Information Modelling in Africa: A Case Study of Ghanaian Construction Industry**

Gideon Ayim-Mensah, Isaiah Ewuzie, Olugbenga Adejo, Bassey Orok, Abel Usoro  
University of the West of Scotland

UK

gideon.ayim-mensah@uws.ac.uk; isaiah.ewuzie@uws.ac.uk; olugbenga.adejo@uws.ac.uk;  
bassey.orok@uws.ac.uk; abel.usoro@uws.ac.uk

Building Information Modelling (BIM) has been used extensively to improve information communication in architecture, engineering, and the construction industry. The successful implementation of BIM in developed countries has provided the opportunity for implementing BIM in developing economies. However, research indicates that African and other developing economies are yet to embrace BIM and the benefits of its implementation. This research seeks to empirically assess the readiness of African construction industry in accepting or adopting BIM using Ghana as a case study. This paper extends the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) model by the addition of BIM modified TOE (BIM-TOE), Security and Training to develop the research model. Data collected for the study were obtained using both qualitative and quantitative data collection methods. Surveys in the form of questionnaire were sent to practicing construction professionals in Ghana including Architects, Quantity Surveyors, Engineers, and Artisans from both the construction industry and academia. Availability of training, security and government regulation are seen as important factors in adopting BIM in Africa. The research contributes to knowledge in the sense that it combines the perception of adopting BIM from various professionals within the building industry and academia and it also extended the existing theories of technology adoption to provide a robust empirical evidence of factors influencing BIM adoption in African construction industry.

**Keywords:** Building Information Modelling, Adoption, Construction industry, Africa, Developing economies.

**Monday, October 08, 2018**

**Stream: Organizational Culture, Technology and User Behavior**

**The Psychology of Passwords and Addressing Related Poor Behaviors**

Camille Gibson  
Prairie View A&M University  
USA  
cbgibson@pvamu.edu

Ainsley Gibson  
Howard University  
USA  
ainsley.gibson@gmail.com

This paper describes the literature on people's password construction patterns and the psychology behind these behaviors. It also presents the results of a survey of tertiary students on the content and nature of their password creation practices. It was expected that patterns in password creation would vary by gender and by age. It was also expected that most respondents would indicate knowledge of proper password creation practices but would indicate an option of convenience over best practices in their own password formations. Data were analyzed with descriptive statistics for patterns and differences among the sample. Suggestions are offered regarding how to encourage specific segments of people to engage in prescribed password creation practices.

**Keywords:** Passwords, Cybersecurity, Network security.



## **Team Performance in Information Systems Enabled Organizations**

Jaymeen Shah, Hsun-Ming Lee, Ju Long, Peiqin Zhang  
Texas State University  
USA

jaymeen.shah@txstate.edu; samlee@txstate.edu; julong@txstate.edu; pzhang@txstate.edu

Work teams are pervasive within organizations and teamwork is the norm for completing tasks within organizations. There is significant reliance on teams within organizations as it is difficult for an individual to singlehandedly complete complex organizational tasks within given time constraints. As organizations have reorganized around teams, in many organizations more than half of the organizational work is done by teams. Thus, how well teams work affects the overall organizational performance. Due to this, there is continued interest in research related to understanding and improving team performance. This study examines the effect of trust, sense of belonging, role assignment and consensus on team performance.

Trust is defined as the “willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party”. Trust among team members is important for team effectiveness. The sense of belonging indicates team members’ feeling of being part of a team. Positive relationships between team members improve sense of belonging. The role assignment attribute measures members’ satisfaction with assigned roles. Perception of inappropriate role assignments can result in feelings of unfairness and conflict within a team, which negatively affect team performance. To achieve success and high performance within teams, it is imperative that role assignments within teams are appropriate. Consensus is defined as a general agreement among all or most of the team members regarding how to complete tasks at hand. It measures members’ perception regarding the extent to which their team reached consensus for completing tasks to achieve team goals.

For this study, data was collected by administering questionnaire to students at a public university in the United States. The questionnaire contained items to measure the sense of belonging, consensus, trust in team members, role assignment, and team performance. Seventy-seven students enrolled in a senior-level Enterprise Resource Planning Systems course were divided into teams. Each team had three to five members. Team members were self-selected by participants. ERPsim was used as the business simulation game environment. In ERPsim, actual SAP ERP system is the interface between the participants and the simulation game. It creates a realistic business environment with business processes that require intra-team cooperation to successfully complete tasks. Each team was responsible for running a company that competed with companies managed by other teams. Each team’s performance was measured by the scores of survey items for team performance.

Results of data analysis indicate that sense of belonging, trust and role assignment have significant positive effect on consensus, and trust and role assignment have statistically significant positive effect on team performance. However, the sense of belonging and consensus did not significantly affect team performance.

**Keywords:** Team performance, Sense of belonging, Trust, Role assignment, Consensus, ERPsim.

## Data Breach and the Blame Games

Qiang Fei  
Prairie View A&M University  
USA  
qifei@pvamu.edu

According to a new research from Kaspersky Lab, on average, a data breach costed enterprises \$1.23 million in 2018, compared to \$992,000 in 2017. This increased cost will ultimately reflect in the firm's financial performance. Literature has shown a significant negative financial impact from data breaches, especially customer data breaches. But how can we alleviate the impact of such a severe negative event?

There are many factors that can moderate the above negative impact. Some empirical evidence has been found that employee productivity helps firms in the event of data breaches. However, very little research has been done on how firms can react to mitigate the above negative effects. There are only a couple of empirical studies on how firms can react to alleviate a negative impact from data breaches. It has been suggested that there is some small leeway for firms to time their data breach disclosures and they often chose to bundle the disclosure with more good news to alleviate the negative impacts. Firms' actions after information breaches have been investigated and it has been found that offering apologies increased firm performance volatility.

The paper adds to the current literature by carefully examining firms' organizational changes and communication strategies after the data breach events, and how the above factors can impact firms' performance in the short and medium terms. It has been found that in a product recall situation, the blame attributions are associated with different consumer reactions. In other words, the market (product market and financial market) is going to react to on whom the blame is laid. Customers are less dissatisfied if the service failure is blamed on specific employees than on the company itself. More specifically, our paper scrutinizes the top management/leadership changes and the tones and contents of the communications after the event. The organizational change is both an indicator of the blame game and part of the process improvement. In addition, by changing the leadership, the firm is showing the market how serious it is about changing for the better.

For the study, we are going to compile a data set from SEC filings and the firm's press releases. Content analysis will be used to decide the tones of the communication. Key variables will be tested on the firm's financial performance two quarters, one year, and two years after the breach event.

**Keywords:** Data breach, Corporate communication, Marketing-finance interface, Information security.

**Monday, October 08, 2018**

**Stream: Social Networking**

**A Study on Attitude Toward Facebook and Facebook Use by University Students in Guam**

Sathasivam Mathiyalakan  
Winston-Salem State University  
USA  
mathiyalakansa@wssu.edu

George Heilman  
Winston-Salem State University  
USA  
heilmang@wssu.edu

Kevin K.W. Ho  
University of Guam  
Guam  
kevinkho@triton.uog.edu

Wai Law  
University of Guam  
Guam  
wlaw@triton.uog.edu

Facebook is the world's dominant social networking site. By the fourth quarter of 2017, the number of monthly active users was estimated to have risen to 2.2 billion. Many studies on Facebook use are conducted in the US; however, too much focus on a single country may pretermit the important role that culture can play in adopting technology, communicating self-descriptive expressions, and individuating information and psychological attributes. Hence, there is a need to explore issues pertaining to Facebook use in countries other than the US and in cultures that are not typical of the US.

This research was conducted in Guam. Guam is unincorporated territory of the US with a population of about 160,000 and an economy driven primarily by US military spending and tourism. As of 2016, it had an Internet penetration rate of over 76% (vs. more than 88% for the US) and a Facebook penetration rate of over 61% (vs. more than 62% for the US). Using data derived from a survey, we investigate Attitude toward Facebook and examine Facebook use by a diverse set of University students. Our results provide insights into how people from different cultures view and use Facebook.

**Keywords:** Adoption, Culture, Facebook, Guam, Social media, Students, Technology use.

## **Social Media for Crisis Management in Underserved Communities: Design Considerations**

Modupe Ojumu, Omolola Gbade-Oladiran, Louis Ngamassi  
Prairie View A&M University  
USA

mfojumu@pvamu.edu; ogbadeoladiran@student.pvamu.edu; longamassi@pvamu.edu

This work in progress is part of a larger research agenda, which seeks to investigate the use of information technology for crisis. Every year, natural disasters cause significant economic losses and social impacts. Last year, Hurricane Harvey caused unprecedented damage in Texas. Information & Communication Technologies (ICTs) like social media can aid disaster preparedness, response, recovery, mitigation. Social Media is emerging as important information-based communication and collaboration tool in disaster management. Traditionally, dialing 9-1-1 has been the best way to seek and receive emergency assistance. However, when natural disasters strike, this emergency system may be overwhelmingly congested with high call volumes. Due to the congestion of the 9-1-1 emergency system during disasters, people often turn to social media for help and information. Many rescue operations are made possible by the use of these social media through the launching of different disaster management apps, enabling those needing rescue to be linked with rescuers. However, one major challenge that emerged during rescue missions after Hurricane Harvey was the issue of uncoordinated first-response. Better coordination would facilitate a seamless rescue operation.

This paper explores the challenges and opportunities of social media use for disaster management in the underserved communities. These communities face a series of challenges when it comes to using technology. Specifically, using a blend of the Information Visualization Reference model and the Sensemaking model the paper examines social media visual analytics design considerations for improved and enhanced disaster management in the underserved communities. Visual analytics combines automated analysis techniques with interactive visualizations for an effective understanding, reasoning and decision making on the basis of very large and complex data sets. This study has both theoretical and practical implications. From a theoretical perspective, this study contributes to enrich the scanty literature in social media and crisis management in the underserved communities. From a practical perspective, this study will contribute to design and develop social media systems that would help to address some of the specific challenges faced by the underserved communities.

**Keywords:** Disasters, Social media, Emergency management, Underserved communities, Visual analytics.

## Gen Y and Gen Z College Students

Mahesh Vanjani  
Texas Southern University  
USA  
vanjanim@tsu.edu

For institutions of higher education the current target market and entering student population for Bachelor's degrees is Gen Z and for Graduate degree programs it is Gen Y also known as the Millennials. Generation Z is the latest demographic cohort and is generally considered to comprise of those born during the mid-1990s to early 2000s. Generation Y refers to the cohort of individuals born, roughly, between 1982 and 1994. While Generation Z are true "digital natives" both cohorts have advanced technical and multi-tasking skills. They are voracious consumers of technology and use it for education and entertainment. While they share similarities, there are differences that will impact strategies used to attract and educate them. Millennials are more budget conscious. Generation Z is questioning the value of a college degree. Both generations are increasingly relying on information provided by their peers. Educational Institutions and Educators will need to adapt to cater to the needs of these generations of students considering and entering college campuses. Educational institutions will need to revisit their marketing and retention strategies. Educators will have to get creative in leveraging technology to engage, motivate, educate and, entertain these generations of students. Each generation has a different set of experiences and values that drive their choices, goals, and, approaches to learning and, their thoughts, perceptions and views about higher education and the value thereof. Institutions of higher learning need to understand how to communicate and connect with their students, ergo there is a need to evolve and adapt to stay relevant for these current and incoming generations of students.

**Keywords:** Generation, Gen Y, Gen Z, Millennials, College.

## The Impact of the Web and Social Media on Nonprofits' Performance

Namchul Shin  
Pace University  
USA  
nshin@pace.edu

The nonprofit sector has been steadily growing. Approximately 1.41 million nonprofits were registered with the Internal Revenue Service (IRS) in 2013, and the nonprofit sector contributed an estimated \$937.7 billion to the US economy in 2014, which made up 5.4 percent of the country's gross domestic product (GDP). The nonprofit sector of the U.S. would rank as the sixteenth largest economy among the 199 nations tracked by the World Bank (National Council of Nonprofits, 2017). According to the 2016 Charitable Giving Report, online giving in the U.S. was 7.2% of all fundraising in 2016. However, it grew 7.9% in 2016, compared to 2015 while overall charitable giving was just up 1.0%. Although overall giving is still dominated by fundraising through traditional channels, such as direct mail, online donations have continually grown.

The Internet permeates every part of public life, and it is increasingly used by nonprofits to communicate with the public and increase charitable giving. In a market with increased competition, greater demand for services, and fewer resources, nonprofit organizations (NPOs) need diverse ways of achieving their social goals. Fundraising on the Web has been used by NPOs with varying degrees of success.

However, there has been limited research on nonprofits' use of the Web and social media for fundraising. To fill the gap, we empirically examined the impact of nonprofits' use of the Web and social media on their performance, as measured by total revenue, including income from public support. By doing so, this research adds new knowledge to the literature on IT value in the nonprofit sector for charitable giving.

For the empirical analysis, we employ two data sources: 1) Top Nonprofits (TN), top 100 nonprofits on the Web and 2) GuideStar, an organization reporting on U.S. nonprofits' financial information. The TN data set includes nonprofits ranked on their web traction. We employ multiple measures for how extensively nonprofits draw the public on their websites and social media, which are based on web traction data, such as Alexa's traffic rankings, Moz Page Authority and Linking Root Domains (homepage), Facebook Likes, and Twitter Followers. We collect financial data from GuideStar, such as total revenue for nonprofits included in the TN list.

This research is in progress: we are currently at the stage of data collection and will conduct the data analysis soon after the data collection is completed. We plan to present the results of our analyses and their implications for nonprofits' fundraising and communications with the public at the conference.

**Keywords:** Nonprofit organizations, Performance, Web traction, Social media, Charitable giving.

**Monday, October 08, 2018**

**Stream: Technological Innovations and Emerging Trends**

**Emerging Computing Technologies and Applications – Part 1**

Matthew Sadiku, Shumon Alam, Sarhan Musa  
Prairie View A&M University  
USA

sadiku@ieee.org; shalam@pvamu.edu; smmusa@pvamu.edu

This paper presents a brief introduction to emerging computing technologies. These include grid computing, fog computing, neural computing, and mobile computing. Our goal in this paper is to identify these technologies and examine how they can dramatically impact on our lives. For each of these computing technologies, we briefly describe what it is, its applications, benefits, and challenges. Some of these technologies are pervasive and ubiquitous, allowing users and businesses to have access to applications from anywhere in the world at any time. Our goal in this paper is to identify these technologies and examine how they can dramatically impact on our lives. It is expedient for researchers to stay on top of these emerging technologies and anticipate future ones.

**Keywords:** Grid computing, Fog computing, Neural net computing, Mobile computing.



# Topics and Trends in Industrial Internet of Things (IIoT)- A 10 Year Patent Data Outlook

Usharani Hareesh Govindarajan, Amy Trappey  
National Tsing Hua University  
Taiwan  
hareesh.pillai@ie.nthu.edu.tw; trappey@ie.nthu.edu.tw

Charles Trappey  
National Chiao Tung University  
Taiwan  
trappey@faculty.nctu.edu.tw

The Internet of Things (IoT) is an ecosystem to collect, process, and share data for real-world objects. Industry 4.0 is the recent manufacturing initiative with an emphasis on promoting intelligence in manufacturing. Industrial IoT (IIoT) is the use of IoT technologies in a manufacturing setting. IIoT enables manufacturers with automation, efficiency, and competitive benefits using data across the value chain. Global industry forecast indicates IIoT use case to grow by 23.7% annual growth rate between 2017 and 2025. This exponential growth has led to pockets of fragmentation leading to integration and management problems. Patents contain published science and technology information unobtainable elsewhere. The analysis of patent data has expanded to different tactical, strategic, business, research, and policy-making activities at global, national, and enterprise levels. This research is a continuation of an ongoing objective to understanding the underlying IIoT fragmentation using patent data analytics. Machine learning algorithm is used to outline 10-year global patenting topics and trends for IIoT. Topic groups identified are used to summarize and identify areas of opportunities in IIoT. The research outcome delivers business intelligence for actionable decision making towards potential competitors, partners, and licensing for open innovation.

**Keywords:** Industrial internet of things, Patent topic discovery, IIoT topics, Patenting trends, Patent analytics.

## Emerging Computing Technologies and Applications – Part 2

Matthew Sadiku, Shumon Alam, Sarhan Musa  
Prairie View A&M University  
USA

sadiku@ieee.org; shalam@pvamu.edu; smmusa@pvamu.edu

This paper presents a brief introduction to emerging computing technologies. These include social computing, creative computing, wearable computing, and crowd computing. Our goal in this paper is to identify these technologies and examine how they can dramatically impact on our lives. For each of these computing technologies, we briefly describe what it is, its applications, benefits, and challenges.

The computing technologies described in this paper are relatively new. Some of these technologies are pervasive and ubiquitous, allowing users and businesses to have access to applications from anywhere in the world at any time. Our goal in this paper is to identify these technologies and examine how they can dramatically impact on our lives. It is expedient for researchers to stay on top of these emerging technologies and anticipate future ones.

**Keywords:** Social computing, Creative computing, Wearable computing, Crowd computing.

**Tuesday, October 09, 2018**

**Stream: Big Data and Analytics**

**Data Mining Blockchain Ledgers and Exploring Cryptocurrencies**

Conrad Manske, Keith Sparling, Ramesh Subramanian  
Quinnipiac University  
USA

conrad.manske@quinnipiac.edu; keith.sparling@quinnipiac.edu;  
ramesh.subramanian@quinnipiac.edu

Cryptocurrencies have come a long way since the inception of Bitcoin in 2009. In late 2017, Bitcoin saw a dramatic increase in popularity and valuation. This led to a market correction, where the price of a Bitcoin fell from over \$19,000.00 USD per Bitcoin to below \$7,000.00 USD per Bitcoin. With the increase in valuation and popularity, Bitcoin saw a dramatic increase in transaction volume, blockchain (general ledger) size, and transaction costs. Our group has been tasked with understanding the trends in cryptocurrency pricing and how scalability and network impact affect pricing and transaction costs, understanding the users who purchase and use cryptocurrencies, and how this information can be utilized. Cryptocurrency mining is not data mining, but with data mining our group may find trends in valuation, correlate valuation to transaction volume, network impact, and fiat currencies, and learn how cryptocurrencies can better target the general public for adoption.

**Keywords:** Cryptocurrency, Blockchain, Currency, Fiat, Bitcoin.

## Develop a Recommendation System for Smart Patent Search Using NLP Algorithms

Amy J.C. Trappey  
National Tsing Hua University  
Taiwan  
trappey@ie.nthu.edu.tw

Charles Trappey  
National Chiao Tung University  
Taiwan  
trappey@faculty.nctu.edu.tw

H. I. Hsieh  
National Tsing Hua University  
Taiwan  
s105034516@m105.nthu.edu.tw

Recommendation systems have been widely applied in many fields, e.g., e-commerce product search, audio and video digital content search. This research develops an intelligent recommendation system for smart patent search to provide researchers, engineers, and/or IP professionals an efficient e-discovery system when searching for relevant patents in global patent corpora. The proposed recommendation system uses natural language process (NLP) algorithms, such as word-embedding and doc-embedding to conduct patent content analyses. For example, word2vec and doc2vec algorithms are adopted to extract keywords from high cited patents. Thus, relevant patents can be accurately and efficiently identified and recommended to the users. In the era of pursuing Advanced Manufacturing (also called Industry 4.0), smart machinery related technologies (e.g., Internet of Things, IoT; Cyber Physical Systems, CPS; intelligent sensors; intelligent controllers) have become the critical technologies for the development of Industry 4.0. The domain of smart machinery is defined as advanced machines with certain degrees of artificial intelligence (AI). This research demonstrates the practical application of the intelligent recommendation system for the case of “smart machinery” patent search. The recommendation system helps companies and R&D teams accurately find relevant “smart machinery” patents. The system benefits R&D teams by identifying relevant patents with prior arts, avoiding infringing on others’ patents, and protecting their own intellectual properties.

**Keywords:** Recommendation system, Natural language processing, Artificial intelligence, Smart machinery, Industry 4.0.

## **Bioinformatics Data Mining – Help Wanted**

Brian Baker, Beth Fioretta, Ramesh Subramanian  
Quinnipiac University  
USA

bakerb39@live.com; beth.fioretta@quinnipiac.edu; ramesh.subramanian@quinnipiac.edu

Rapid developments in molecular research technology within the last few decades have produced a tremendous amount of biological data. The application of statistical and data mining techniques on these huge datasets continues to advance the understanding of biological processes and has evolved into its own field within the domain of biological analysis called bioinformatics.

The emerging field of bioinformatics enables researchers to address the need to store, extract, organize, and interpret biological information for the purpose of accelerating academic research and providing commercial uses such as personalized medicine. Through the advancements from bioinformatics, doctors are now able to provide better disease prevention, more accurate diagnoses, safer drug prescriptions and more effective treatments for many of the prevalent conditions that are in our society.

The article begins by introducing the purpose, methods, and applications of bioinformatics within the context of its historical development. It then proceeds to describe how educators have recognized and begun to address the significant skills gap that exists between traditional biological researchers and the practitioners within the domains of computer science, mathematics, and engineering. The article culminates the discussion by explaining how educators are confronting this challenge to properly prepare students for a career in bioinformatics.

Bioinformatics has a promising future and can be attributed to the tremendous growth in available biological data, the steady advancement in big data technology and methods, and the level of commitment shown across a wide spectrum of institutions including universities, organizations, and online resource providers.

**Keywords:** Bioinformatics, Data science, Data mining, Career, Genomics, Personalized medicine.

# Crude Oil Price Prediction with Decision Tree Based Regression Approach

Engu Chen, Xin James He  
Fairfield University  
USA

engu.chen@student.fairfield.edu; xhe@fairfield.edu

Crude oil is an essential commodity for industry and the prediction of its price is crucial for many business entities. While a few conventional statistical models forecast its prices, we find that there is not much research using decision tree models to predict crude oil prices. In this research, we developed several decision tree models with R to forecast crude oil prices. In addition to historical crude oil price time series data, we also use some variables that would potentially affect crude oil prices, including crude oil demand and supply, and such economic indicators as GDP and CPI for the monthly data during the period 1992 through 2017 with a total of 312 observations. In this research, we first deploy a classification and regression decision tree model to split the data into different groups and then generate different predictive models on each of the groups respectively. We use an algorithm to fine-tune the decision tree model by changing the splitting rules and classification thresholds. We find that the classification decision tree model developed in this research is expected to have higher forecasting accuracy measures than that of such econometric statistical benchmark models as multiple linear regression and time series autoregressive integrated moving average (ARIMA).

**Keywords:** Crude oil prediction, Decision Tree based regression, ARIMA.

# Mining Useful Information from Big Data through Semantic-based Process Modelling and Analysis

Kingsley Okoye  
University of East London  
UK  
u0926644@uel.ac.uk

Over the past few decades, most of the existing methods for analysing large growing knowledge bases, particularly Big Data, focus on building algorithms to help the knowledge bases automatically or semi-automatically extend. Indeed, a vast number of such systems constructing large knowledge base continuously grow, and most often, they do not contain all of the facts about each process instance or elements that can be found within the process base. As a consequence, the resultant process models tend to be vague or missing value datasets. In view of such challenges, the work in this paper demonstrates that a well-designed information retrieval system or process mining technique should present the results and discovered patterns in a formal and structured format being interpreted as domain knowledge as well as support further enhancement of the existing information system. In other words, this paper shows that a common challenge with computational intelligent systems or methods is the demand for an effectively well-designed and fit-for-purpose system that meets the requirements and needs of the intended users. In turn, the paper proposes a method for semantic based process modelling and analysis, or better still, information retrieval and extraction system - that is capable of detecting patterns or unobserved behaviours within any given knowledge base through the use of the process mining technique. The work illustrates this using the case study of Learning Process. The goal is to discover user interaction patterns within a learning execution environment, and respond by making decisions based on semantic-based analysis of the captured users data. Practically, the approach applies semantic annotation and ontological representation of the learning process domain data and the resultant models in order to discover patterns automatically by means of semantic reasoning. Thus, the proposed approach is grounded on the semantic modelling and process mining techniques. To this end, this paper applies effective reasoning methods to make inferences over a learning process knowledge-base that leads to automated discovery of learning patterns or behaviour.

**Keywords:** Big data, Process mining, Semantic modelling, Learning patterns, Semantic annotations, Process models.

## **Data Mining and U.S. Politics**

Lulzim Ameti, Timothy McCarthy, Ramesh Subramanian  
Quinnipiac University  
USA

lulzim.ameti@quinnipiac.edu; tkmcCarthy@quinnipiac.edu;  
ramesh.subramanian@quinnipiac.edu

Data mining techniques have been used in United States political campaigns for decades, where potential voters are clustered according to party affiliation and geographic location to predict likely voting behavior. However, with increased data and computing power, data miners are increasingly identifying and clustering potential voters at increasingly granular levels, where such behaviors as consumer buying preferences, magazine subscriptions, and online activity are being used in conjunction with traditional variables to predict likely voters at the individual level, with political marketing strategies highly tailored to the individual. This intense and increasing use of data mining in U.S. politics promises to increase knowledge about American voters and the issues most important to them. It also promises to increase voter participation and engagement, by delivering to voters the information they find most important, in language and tone they most prefer. But it also threatens to further exclude traditionally disenfranchised groups, as well as to splinter the American electorate by eliminating a shared sense of common facts and political reality, all by using algorithms and data that is not shared with the public. The authors conclude that mitigating the risks of data mining likely requires legal measures to ensure transparency of data mining efforts, enforcement measures to ensure that parties do not gather or use data illegally, and that voter registration and casting of ballots is made as easy for the American public as possible, if for no other reason than to ensure that citizens appear in datasets and so are not ignored by political campaigns.

**Keywords:** Clustering, Microtargeting, United States politics, Psychographics, Voter franchise.



**Tuesday, October 09, 2018**

**Stream: Cloud and Mobile Computing**

**Exploring Simulated Virtual Environments Through Sococo Virtual Office**

Shoshana Altschuller  
Iona College  
USA  
saltschuller@iona.edu

Raquel Benbunan-Fich  
Baruch College  
USA  
rbfich@baruch.cuny.edu

The term “virtual office” might, at one time, have been used to describe a physical location from which a knowledge worker could communicate with coworkers and access work-related resources remotely to allow him to complete office work from afar. A more contemporary vision of a virtual office describes a virtual work environment that multiple coworkers share from wherever they might physically be located. Decades of computer-mediated communication and virtual team research have helped elucidate what forms of technology might help coworkers communicate effectively and remain productive despite physical distance. Research in this area has identified which types of tasks require what forms of interactivity and have informed how to organize virtual teams and the work processes they experience to achieve required outcomes. However, research in virtual team collaboration has often been fragmented among various types or combinations of technology support. The purpose of this work-in-progress is to unlock the means to a better understanding of the specific virtual environments that represent simulations of real work spaces. These are a single software tool that electronically portray the presence and activities of a collaborative group in a simulated work environment. Using Sococo Virtual Office as a guide, the current work organizes the concepts relevant to the various dimensions of the simulated collaboration environment and highlights areas for future research.

**Keywords:** Virtual teams, Electronic collaboration, Simulated work environment.

# **Load Balancing Mechanism in On-premises and Cloud Infrastructures: A Case Study**

Isaiah Ewuzie, Olugbenga Adejo, Bassey Orok, Gideon Ayim-Mensah, Abel Usoro

University of the West of Scotland

UK

isaiah.ewuzie@uws.ac.uk; olugbenga.adejo@uws.ac.uk; bassey.orok@uws.ac.uk; gideon.ayim-mensah@uws.ac.uk; abel.usoro@uws.ac.uk

To support thousands of concurrent users in accessing data and web infrastructures, most organisations use on-premises and multiple cloud storage facilities. This does not only ensure flexibility, security, service availability and reduction in the peak demand for accessibility but also improves the overall efficient performance of the organisations network. However, for most of these organisations, balancing and efficient distribution of load across these different locations can be a serious challenge. Load balancing is fundamental and critical to the performance of an organisation especially those with multiple storage centres.

This paper empirically investigates the mechanism and procedure used in load balancing by Higher Education Institutions (HEI) with multiple storage locations. Primary data were collected from selected Universities across Scotland and analysis was carried out using SPSS to determine the efficient loading mechanism. The paper also investigates the challenges of load balancing between these multiple storage locations and seeks to proffer solutions that would achieve effective load balancing in HEI data centres.

**Keywords:** Cloud computing, Load balancing, Higher education institutions.

## Information Security Perspectives on Moving to the Cloud: An Ethnographic Story

James Jenkins  
Seattle Pacific University  
USA  
jimj@spu.edu

Organizations moving their information technology systems to the cloud rarely take the time to look beyond the benefits presented by cloud providers even though there is clear caution given on the challenges of migration. Technology immaturity in cloud systems and supporting technology, resource skill gaps moving to new hosting paradigms, and process challenges in supporting an amorphous cloud infrastructure create an environment where migration efforts have an increased probability of project failure. Working with a team in the Pacific Northwest of the United States, we provide the information security perspective in the form of an ethnographic story for the migration from two geographically separated on-premises data centers to a cloud and co-location environment. While challenges and complexity are prevalent, there are a number of key learnings from the project that we enumerate in this presentation, in an effort to start the conversation on the need for greater research into how to guide organizations to create more successful cloud migration projects.

**Keywords:** Cloud, Cloud migration projects, Co-location migrations, Ethnographic story.

**Tuesday, October 09, 2018**

**Stream: Cybersecurity and Forensics**

**Data Authentication and Security: A Panacea for Effective Financial Statements Auditing**

Aniefiok Williams  
Akwa Ibom State University  
Nigeria  
lexyspint@yahoo.com

Effective financial statements are factual, free from bias and any material misstatements, and reflect the substance of the financial transactions of an organization. These statements have a standardized format and should be prepared in accordance with the applicable financial reporting framework. External audits provide reasonable assurance to the owners and managers of the organization on to the extent to which financial statements are free of misstatements whether due to error or fraud. Recently, sources of financial data in most organizations in Nigeria are handled by ERP (Enterprise Resource Planning) systems, which triggered out the manual handwork. The applied ERP systems are different in organizations according to the size and the transaction flows of the organization. When it comes to a small or middle-sized organization, many of them uses one generic system, which operates both the OLAP (online analytical processing) and the OLTP (online transaction processing) functions. There is a common risk to overwrite the master data, which can influence the reliability of financial statements. A lot of control procedures assure that the contained data are valid and show the true and fair financial state of the organization. This paper reviews the influence of financial data authentication and security on the quality of financial statement auditing, with reference to large organization.

**Keywords:** Data security, Financial statement, Organization.

# **What are Taught by Instructors vs. What are Wanted by Employers: A Content Analysis on Cybersecurity Course Syllabus and Cybersecurity Job Advertisements**

Shaoyi He, Frank Lin, Jake Zhu  
California State University, San Bernardino  
USA

she@csusb.edu; flin@csusb.edu; jzhu@csusb.edu

Cybersecurity education has been a more and more important and interesting topic in both academic research and professional practice in recent years. There has been a growing need for cyber security professionals in all industries including banking, financing, homeland security, insurance, and medicine. In order to ensure the quality in cybersecurity education, a rigid cybersecurity curriculum is needed to provide a balance between what are taught by instructors in the classroom and what are wanted by the employers in the real world. On the one hand, when looking at classroom teaching of fundamental concepts, cybersecurity education should enable the students to understand fundamentals of various components, such as computer science, information technology, social organizations, law, culture, ethics, mathematics, behavior, psychology, and writing skills. On the other hand, when looking at practical skills, cybersecurity education should enable the students to have additional knowledge and skills through training and practice directly related to particular information security areas. But, we do not really know whether those fundamental concepts and practical skills are the ones wanted by employers. This is to say, what are taught in the classroom may not be what are wanted by employers. Therefore, we should not only know very well what are taught by instructors in the classroom but also know very well what are really wanted by employers in the real world. Only in this way could we include the fundamental concepts and practical skills that are really wanted by employers when developing the curriculums for cybersecurity education. In order to do so, this research conducts a content analysis on: 1) the course descriptions and objectives of 100 cybersecurity courses, and 2) the major responsibilities and technical skills required in 100 job advertisements. By identifying and categorizing the fundamental concepts and practical skills in both cybersecurity course syllabus and cybersecurity job advertisements, this paper will answer the following questions:

1. What fundamental concepts and practical skills have been identified in the cybersecurity course syllabus?
2. What fundamental concepts and practical skills have been identified in the cybersecurity job advertisements?
3. Which fundamental concepts and practical skills are included in both cybersecurity course syllabus and cybersecurity job advertisements?
4. Which fundamental concepts and practical skills are included in cybersecurity course syllabus, but not in cybersecurity job advertisements?
5. Which fundamental concepts and practical skills are included in cybersecurity job advertisements, but not in cybersecurity course syllabus?

Based on the answers to the above questions, this research will make some recommendations on how to develop a comprehensive and relevant cybersecurity curriculum that would cover both fundamental concepts and practical skills that meet the needs of employers in the real world.

The significance of this research is two-fold: it not only provides the first-hand findings on what are taught by instructors in the classroom and what are wanted by employers in the world, but also shows the importance of developing a cybersecurity curriculum that will enable the students to acquire the fundamental concepts and practical skills that are needed for their future career in cybersecurity.

**Keywords:** Cybersecurity education, Fundamental concepts, Practical skills, Content analysis, Course syllabus, Curriculum development.

## The Future of Application Programming Interface (API) Security

Alison Munsch  
Iona College  
USA  
amunsch1@earthlink.net

Peter Munsch  
Fordham University  
USA  
munschp@gmail.com

With the evolution of Cloud-based Microservices, Software as a Service (SaaS) solutions, “Internet of Things” (IoT) and the new push towards “serverless” services, the potential for Application Programming Interface (API) cross-communication between disparate service vendors and new technology services are increasing exponentially. Businesses and consumers need to ensure these communications are encrypted as they traverse the Internet eg through establishing a point-to-point Virtual Private Network (VPN) connection between the customer and service vendor. If not secured properly, these transactions could be vulnerable to “Man-in-the-Middle” attacks (MITM), where an attacker can impersonate the intended recipient and potentially alter the data.

Technology vendors do provide API Management tools for customers, and there are API security standards that are established methods for securing API transactions (Malinverno & O’Neill, Gartner 2016). Given the effort to keep APIs open and easy to implement for Business to Business (B2B) and Business to Consumer (B2C) communications, security standards must be part of API management. As such, security is in direct conflict with the intent of the API standard to further communications between B2B and B2C by making integrations open and easy. However, with any new trend in technology comes new vulnerabilities, such as IoT Request Forgery and Distributed Denial of Service (DDOS) attacks on API endpoints. The Open Web Application Security Project (OWASP) identified two API vulnerabilities in their 2017 Top 10 report; A7 – Insufficient Attack Protection and A10 – Under-protected APIs.

Therefore, this study will explore these issues addressing the following research questions:

*Primary Research Question* - Are the API security standards in place robust enough to remediate new threats?

*Secondary Research Question* - What security standards are on the horizon to secure B2B and B2C API communications?

To address these questions, at least 10 one-to-one semi-structured in-depth interviews will be conducted. The ending sample size of 10 will be achieved if the researcher’s perception that the level of saturation had been achieved (Seidman, 2006). The respondents’ profiles for the

research will be Cyber Security Providers, Cloud Providers and Cloud Customers. This cross-section of profiles represents the spectrum of API functionality. The semi-structured one-to-one interviews will be designed to understand the security issues from their organizational role perspective. The questions will explore the security products that are presently offered by both Security and Cloud providers and what new products are in the pipeline to address new threats. For Cloud Customers, we will explore some B2B and B2C workflow use-cases.

The expected outcome for this research is to (a) highlight the paradox between the open nature of the API standard and security, (b) gain insight into the increasing and diverse use of the API standards, and (c) ascertain the emerging communication workflows and gain direction of best practices to remediate threats.

**Keywords:** Security, API vulnerabilities, Emerging threats.



# **Towards Implementing NICE Framework in Cyber Security Programs**

Izzat Alsmadi  
Texas A&M University-San Antonio  
USA  
alsmadi@gmail.com

The job market for cyber security related jobs is growing and is expected to reach peak demand in the next few years. Statistics shows that US has an overall national workforce shortage. Additionally, there is a need for education methods in this field in particular to evolve to accommodate market demands. In this path, NICE Cyber security education framework was introduced several years ago. In this paper, NICE framework is evaluated from an educational perspective. Issues and challenges related to the utilization of such framework to guide future cyber security programs are discussed in detail. One of the most significant challenges observed is related to the lack of a unified method to estimate KSAs. Different KSAs vary widely in their level of details. Additionally, the same KSA can be interpreted in different cyber security classes or programs differently. This means that estimating how much of course time such KSA should be allocated can widely vary from one school or program to another.

In this paper we introduced our own assessment for NICE framework proposed recently to help accommodate rapid changes in Cyber security. Second main goal is to help US national market fill the needs of cyber security professional and have a common ground for companies, job recruiters and education institutes to speak with a common language and terms. There is no doubt for the reality and seriousness of those issues and that NICE framework was able to approach actively such issues. However, the framework is far from being perfect or final and hence we showed some issues on the framework from education perspectives. We showed also how can such framework be used to guide the design of cyber security courses and programs.

**Keywords:** NICE framework, Cyber security education, Cybersecurity curriculum design.

**Tuesday, October 09, 2018**

**Stream: E-Learning and IT Curriculum**

**Enhancing Learning Experiences in an Accounting Information Systems Course  
with a Community-Engagement Project**

Minnie Yen, Wei-Ying Hsiao  
University of Alaska Anchorage  
USA

ylyen@uaa.alaska.edu; whsiao@alaska.edu

Community-engagement learning has been playing a major role in the fields of higher education in recent years. Accounting programs across the country have been challenged to better prepare students for the accounting profession, especially in the areas of dealing with unstructured problems and how to prepare students with real world experiences. The Accounting Education Change Commission (AECC) notes that students should be active participants in the learning process and not passive recipients of information. AACSB (2013) Standard A6 specifies that the accounting curriculum should address (1) critical-thinking and analytical skills, (2) internal controls and security, and (3) project and engagement management. The AACSB's (2010) guidance for applying the Business School Conceptual Framework notes that external engagement (such as community outreach and providing services to the community) can bring important benefits to the institution and support a business school's delivery of learning experiences and generation of intellectual capital. For accounting students to learn these skills and at the same time gain the real-world experiences with external engagement, it would be helpful to design a curriculum and implement learning processes through experiential learning, community service learning, and project-based collaborating learning.

This paper is to evaluate the community-engagement learning experiences by using information system analysis techniques in an Accounting Information System (AIS) course. Sixty participants completed a survey after finished their community-engagement AIS analysis projects. The qualitative and quantitative data provided information of participants' learning experiences and reflection of their beliefs in learning through the real-world community projects.

**Keywords:** Community engagement, Experiential learning, System Analysis, Accounting Information Systems.

## **Active Learning Space Design and Implementation: Practices Done on a Campus and Questions Answered in a Survey**

Michael Chen, Jake Zhu, Shaoyi He  
California State University, San Bernardino  
USA

mchensa@csusb.edu; jzhu@csusb.edu; she@csusb.edu

Providing students with active learning spaces in the classroom has been a very important issue for both instructors and students in American universities. For example, some studies showed the impact of space design features on teaching and learning, some researchers developed evidence-based criteria for active learning spaces with technology tools, and some scholars provided principles and assessments for active learning space design. Since 2014, the Academic Technologies & Innovation Office of California State University, San Bernardino, has been working on active learning space design and planning. In the summer of 2015, the first active learning classroom was set up as an incubator classroom open to campus. It had active furniture of different designs and functions, six displays on three sides of the room, writable walls, mobile and personal whiteboards, wireless BYOD group presentation support, and a zoned sound input/output system. In the fall of 2015, a staff/faculty training area was renovated with the same principles and a computer lab in the Health and Physical Education building was converted into an active classroom. These classrooms with active learning spaces were so well received that other departments and colleges started to implement active learning spaces in both classrooms and labs. Right now, there are more than ten active learning classrooms with various components that promote active learning. In the meantime, active learning space design has been applied to faculty and staff development/training areas, collaborative staff working spaces, and common areas around the campus, including a 24/7 study space in the library, study areas in the college of business building, and various open lab areas and atrium areas in buildings. In addition, active learning space design principles are now incorporated into the design of the new Global Innovation building scheduled to open for 2019 academic year and into the east wing expansion of the Jack Brown Business Building.

In this paper, we will share the valuable experience we gained and important lessons we learned for active space design and implementation, AV/technology integration, promotion of active learning principles, end user consultation, and continued exploration of emerging trends. Also, we will share the results of a survey done by both instructors and students on their feedback and assessment of various active space designs and implementations, aiming to provide answers to the following questions:

1. What are the most important perceptions of improved teaching and learning practices and student learning outcomes?
2. What are the most efficient active learning principles in active space design and implementation?
3. What are the most popular information technologies used in an active classroom?

4. What are the most obvious relationships between active learning spaces in both classrooms and labs?
5. What are the most interesting evidences of increased student interpersonal competencies, engagement, and team work?
6. What are the most common behavioral indicators related to learners' engagement in active learning spaces in both classrooms and labs?
7. What are the most important connections between active learning spaces and student learning outcomes?
8. What are the promising emerging trends in active space design and implementation?

The significance of this paper is two-fold: 1) providing actual evidence for active learning spaces design features that impact teaching practices and learning outcomes and, 2) providing answers to various questions related to different aspects of active space design and implementation for teaching and learning in both classrooms and labs.

**Keywords:** Active learning spaces design, Active classroom, Active learning principles, Content analysis, User feedback.

**Tuesday, October 09, 2018**

**Stream: Organizational Culture, Technology and User Behavior**

**Using Information Management to Reduce Workload**

Diana Boekman  
University of Applied Sciences Utrecht  
Netherlands  
diana.boekman@hu.nl

At the University of Applied Science Utrecht (UASU) workload is a point of concern. Lecturers who teach courses are dissatisfied about the workload. Management has tried to reduce the workload, but figures show there has been no measurable impact as a result of these efforts.

Last year at IIMA 2017, the first case study was presented on a new approach where information management was used to influence the workload of two groups of lecturers. In this case study the results are presented on the influence of information management on seven groups of lecturers.

Every two years the UASU conducts a survey measuring different factors to determine how the lecturers appreciate their work at the university. One of these factors is the workload. Despite all efforts the university is conducting to get a better workload the numbers are still far below the average in the Netherlands. These efforts usually have a so-called “soft approach” like talking about the felt workload, talking about how you can work more efficiently and sending employees on courses to learn how to work more efficiently. In this case study a different approach is discussed using information management as a tool to influence workload.

In 2010 this research started with analyzing the curriculum of a 4-year course at our university and adding the information to an information management system where 6 basic tasks of a lecturer’s job were translated into hours and mapped on the academic year calendar. These 6 elements are: (1) lecturing, (2) preparations, (3) administration, (4) development, (5) student counseling, and (6) coordination. After all the numbers were available, the work was divided among the lecturers (15 people) resulting in a personal work plan using the following guidelines:

1. giving them all equal parts of the 6 elements: (1) lecturing 30%, (2) preparations 15%, (3) administration 10%, (4) development 10%, (5) student counseling 25%, (6) coordination 10%
2. checking the work load throughout the year where peaks were prevented as much as possible. Every year these hours and the resulting personal work plan is checked again.

In 2013 a second 4-year course (30 people) was added to the information management system using the same requirements and standards.

In 2017, three additional groups of lecturers were added to the research. The same requirements and standards were used. Next to this approach the university introduced a new management system for workload planning. All the five courses and groups of lecturers were added to this system; so more data to analyze the whole process became available.

The university's surveys show that the five groups of lecturers are more satisfied about their workload than the year before, but not all groups show the same improvement. The newly added groups seem to show more improvement than the groups that have been working with the approach for several years.

The conclusion of this case study is that information management has improved the workload in the five groups of lecturers that the method was used on. Further research needs to be done to determine the usability of the method in other groups.

**Keywords:** Information management, Information analysis, Human resource management.

## **Development of Online Collaborative Tool for Research and Innovation in the University**

Idongesit Eteng, Samuel Oladimeji

University of Calabar

Nigeria

idongesitessien@yahoo.com; samoladimeji@gmail.com

For our universities to match global demands for research and innovation, the absence of viable collaboration platforms that encourage continuous and relevant multi-disciplinary research would have to be addressed so that collaborative research can take place at the convenience of all team members. This research study aims at presenting the academia with a suitable collaboration platform that promotes collaborative research among students with lecturers serving as online supervisors such that research activities can be shared among all team members anytime and anywhere. The Adaptive Software Development model was employed due to the innovative nature of the study. For the initiation part of the study, a Joint Application Design Requirement Gathering (JAD-R) session was conducted to determine the required functionalities and tools for the user interface design of the web-based platform. Based on the findings of the JAD-R session a database was designed for the platform's information system. The software was constructed using PHP, Javascript and HTML programming languages with the Model View Controller (MVC) programming technique on the programming framework called CodeIgniter (CI) to support continuous development and subsequent maintenance of the software. The testing and evaluation procedure employed students from four (4) different faculties to register their accounts, add or join research teams and create specific research projects while adhering to the requirements of the system to maintain standard. The respondents filled questionnaires that aided the evaluation process of the study. The results showed that eighty-eight percent (88%) of the respondents were satisfied with the general overview of the application while eighty percent (80%) of the respondents accepted that the application's user interface was user friendly and sixty-five percent (65%) accepting that the functionality of the application was satisfactory. This research study helped to demonstrate how research and innovation in the university can be supported and promoted using collaboration platforms while bringing to light other areas for further research regarding the usability and user friendliness of the application for collaborative research in the university.

**Keywords:** Research innovation, University collaboration online tool, Adaptive software development model.

## **Viewing Disaster Management through the Actor-Network Theory**

Shahedur Rahman, Thiagarajan Ramakrishnan, Louis Ngamassi  
Prairie View A&M University  
USA

shrahman@pvamu.edu; ram@pvamu.edu; longamassi@pvamu.edu

The past few years have seen many natural calamities such as floods, hurricanes, and forest fires. FEMA has proposed a four phase (mitigation, preparedness, response, and recovery) model for dealing with these disasters. Further, with the advances in technological innovations such as social media and big data, disaster management has been taken to a new level. This has also led to a lot of research on how different tools can be used effectively and efficiently to manage disasters. For example, some scholars have focused on how social media can improve disaster management. Similarly, others examined how big data analytics can help in disaster management. However, there is a dearth of research examining disaster management in a comprehensive way; one that includes not only tools and techniques, but also decision-makers and the people and places struck by such disasters. In this study, we propose to examine disaster management from the Actor-Network Theory (ANT) perspective that focuses on how different elements (decision-makers, organizations, technology) interact to manage such disasters. This study has both theoretical and practical implications.

**Keywords:** Actor-Network Theory, Disaster management, FEMA.



**Tuesday, October 09, 2018**

**Stream: Technological Innovations and Emerging Trends**

**Microgrids Technology for Enhancement of Voltage Profile and Loss Reduction of Power Distribution System**

Philip Adebo, Cofie Penrose, Matthew Sadiku, Sarhan Musa, Justin Forman  
Prairie View A&M University  
USA

philip.adebo@ieee.org; pscofie@pvamu.edu; sadiku@ieee.org; smmusa@pvamu.edu;  
jfforeman@pvamu.edu

With the rapid growth of renewable energy integration, Distribution Energy Resources (DERs) are becoming more prominent in the distribution segment of the power grid. Microgrid (MG) combines multiple DERs sources with battery support to maintain the reliability of generated power. This paper proposed an optimization technique for a 34-bus radial distribution system based on particle swarm optimization (PSO) to minimize both real and reactive power losses, voltage profile enhancement and overall cost reduction.

**Keywords:** Microgrid, Distribution energy resources, Particle swarm optimization.

# **Irony of the FAERS Database: An Analysis of Data Input Errors and Potential Consequences**

Michael A. Veronin, Robert P. Schumaker, Rohit R. Dixit, Morgan Ogwo

The University of Texas at Tyler

USA

mveronin@uttyler.edu; rchumaker@uttyler.edu; rdixit@patriots.uttyler.edu;

mogwo@patriots.uttyler.edu

One of the most common data entry problems occurs during the data input process. Even a seemingly insignificant typographical error can cause short- and long-term problems which may lead to inaccurate records, misinformation, and disorganization. The objective of this report is to present an analysis of specific files within the U.S. Food and Drug Administration Adverse Event Reporting System (FAERS) database involving errors and inconsistencies in reporting of drug names and assess potential consequences.

**Keywords:** Data cleaning, Data input, Food and Drug Administration, FAERS database, MedWatch, Data error.

## **Internet of Things and Customer Relationship Management**

Rene Boekman  
NNextGroup  
The Netherlands  
rene.boekman@gmail.com

With Internet of Things (IoT) it is possible to scan and monitor assets ('smart' objects) working together by internet protocols. A new trend is to connect IoT to Customer Relationship Management (CRM) systems. Asset data and customer data can be united to execute real-time interaction. In this study a combination of IoT and CRM is analyzed.

There are a lot of examples of assets which can be monitored by IoT. Automotive (maintenance sensors, connected cars, self-diagnostic engines), agriculture (meters), farming (transponders on farm animals), healthcare (heart monitoring implants, biochip, health assistance), consumer electronics (LED lighting, smart TVs, robotic vacuum, ovens, air purifier, refrigerators), home automation (control and automation of lighting, HVAC control, smart thermostat, smoke detection) and home utilities (energy meters, home energy management, solar panels).

In The Netherlands there is the 'building of the future' project. By IoT-systems and sensors everywhere in the building the air quality, temperature, air humidity, lightning and other things can be monitored and controlled. A new initiative will be to monitor all assets of big business customers by one network protocol for the whole of The Netherlands. These are IoT devices like construction sites, storage depots, factories, roads or bridges.

IoT services send data which can be put in the customer context of CRM. The status of the assets has to be reviewed continuously. When there is a warning or error status is monitored the customer can be engaged proactively to propose solutions. The customer can be alerted, and service can solve the issue before the customer experiences dissatisfaction. Equipment alerts that there is an issue before it breaks down or green buildings shut down systems when they are not needed. When a device is not working another product can be proposed to the customer, or another insurance premium can be offered. Patients can be monitored in real-time remotely and proactive appointments can be set. Service crew can be intelligently informed in case of energy failures (gas, electricity etc.), and they can also be helped to find the fault. The data of the devices can also be combined with the customer data to get a big total customer overview.

Technically, IoT and CRM need architecture and processes stated in this paragraph. The associated devices are connected by an application programming interface (API) to the CRM system. The traffic of the devices can be viewed. A device heartbeat counter can monitor the condition statuses like healthy state, not enough power state, warning state or error state. IoT orchestrations can be created like business logic rule workflows with many different combinations to handle the statuses. Triggers can be fired to automatically execute actions like opening customer cases, opportunities, leads or activities. Also, there is a two-way process which

closes cases automatically when device status changes to normal. And, again the customer will be notified. Examples of IoT CRM systems are Microsoft Azure IoT Suite linked to Microsoft Dynamics CRM, the Yodiwo platform and Salesforce IoT.

Many CRM benefits are possible: transform connected products into customer services, analyze data to look for trends over time, search for critical events, execute real-time analysis, take action using insights, reduce support cost, predictive failure forecast, fraud prevention, improve service, make self-service better, bring a higher degree of customer personalization, and improve customer retention.

In the distant future CRM solutions will be built right into IoT devices. Sensors in Internet-enabled devices will be able to detect potential problems and begin communicating immediately with customer services, using data mining to get insightful data about customer behaviour, to segment their markets and target their campaigns more effectively.

**Keywords:** Internet of Things, Customer Relationship Management, Assets, Device management, Data-analysis.

## **The Relationship between Business Process Management and Innovation in a Consultancy and Insurance Company**

Mark de Groot, Jakobus Smit, Pascal Ravesteyn

University of Applied Sciences Utrecht

Netherlands

mark@degroot.es; kobus.smit@hu.nl; pascal.ravesteijn@hu.nl

This paper presents an exploration of the relationship between Business Process Management and Innovation in a consultancy and insurance company. This study is conducted in the Netherlands. A brief review of the literature reveals the relevance of Business Process Management and Innovation. Systematic and well management innovation is becoming more and more a core focus for companies. Literature reveals that there might be a relationship between Business Process Management and Innovation. For this a model is used to measure this relation. This model is based on three dimensions: Business Process Management maturity model, Adoption of Innovation model and the Innovation Value Chain. Data was collected through an online survey. In general, there is a moderate positive relationship between Business Process Management and Innovation. When looking at the different dimensions of Business Process Management, we find that only three dimensions contribute to this relationship: Process Awareness; Process Description; Process Resource and knowledge. Although the strengths of the relations differed when the data was analysed per company, which implies two things, first of all that a company first needs to assess the Business Process Management maturity and Innovation before the efforts are made for improvement of innovation. Secondly, that the people who are part of the innovation value chain are more important to invest and not the IT systems and methodologies.

**Keywords:** Business Process Management maturity, Innovation adoption, Innovation value chain.

**Wednesday, October 10, 2018**

**Stream: Cybersecurity and Forensics**

**Utilization of Information and Communication Technology (ICT) and Library Operations in State University Libraries in South-South Nigeria**

Emmanuel Omini  
University of Calabar  
Nigeria  
mcyoke@yahoo.com

This study examined utilization of information and communication technology (ICT) and library job operations in state university libraries in South-South Nigeria. Two hypotheses were formulated to guide the study. Survey research design was used. The population for the study was 143. A sample of 94 librarians was selected using purposive sampling technique. The instrument was validated by experts with Split-half reliability method. The research data was analyzed with descriptive (mean and standard deviation) and inferential statistics (One-Way ANOVA). All hypotheses were tested at 0.05 level of significance. The findings revealed that there was a significant influence of online database services on library job operations, ( $f=3.79^*$ ,  $P<.05$ ,  $df=2,728$ ,  $F\text{-critical}=3.00$ ) and there was a significant influence of CD-ROM services on library job operations, ( $f=4.270^*$ ,  $P<.05$ ,  $df=2,728$ ,  $F\text{-critical}=3.00$ ). From the result of the study, it was recommended among others that librarians should utilize more ICT tools which will facilitate their job operations in the library.

**Keywords:** Utilization of information and communication technology, Online databases service, CD-ROM service, Library job operations, State university libraries, South-South Nigeria.

# Exploring ICT Applications among Healthcare Providers in Nigerian Tertiary Hospitals

Mohammed Adamu  
University of Kwazulu-Natal  
South Africa  
Adamum014@gmail.com

Opele Kehinde  
National Centre for Technology Management (NACETEM)  
Nigeria  
opelejk@gmail.com

The right to quality health care is one of the internationally recognized fundamental human rights for people of all ages regardless of religion, culture or social class. Lack of Information Technology Application in quality health care in Nigeria has led to poor quality of life for the citizens. Few empirical studies exist to ascertain the level of ICT application in quality health service delivery in Nigeria, even though the general public perceive this important service as low. This study provides empirical evidence on the influence of information technology application on quality of health care delivery in Federal tertiary hospitals in Nigeria.

The study employed survey research design. The population for the study was 479 health professionals comprising 204 Medical Doctors, 180 Nurses and 95 Health Information Management Officers from the Federal tertiary hospitals in the country. Instrument for data collection was structured questionnaire. The reliability test of the variables ranged from  $\alpha = 0.84 - 0.93$ . A response rate of 87% was obtained. Data were analysed using frequencies and multiple regression analysis.

Our findings revealed a moderate level of information technology application in the federal tertiary hospitals in Nigeria. Our study indicated that information technology application did not significantly predict quality health service delivery ( $\text{Adj.R}^2 = .016$ ,  $F(6,198) = 1.559$ ,  $p > .05$ ).

It was recommended that the Federal Ministry of Health in collaboration with National Information Technology Development Agency (NITDA) should provide more funds and deploy relevant information technologies to federal tertiary hospitals in Nigeria for sustainable health service delivery with a view to enhancing the quality of life of the citizens.

**Keywords:** Technology, Application, Health service delivery, Federal tertiary hospitals, Nigeria.

**Wednesday, October 10, 2018**

**Stream: IT for Economic Development and E-Government**

**Security of Cyberspace and Electronic Resources in Academic Libraries: A Case Study of Universities in South South Region of Nigeria**

Eno Ottong  
Akwa Ibom State University  
Nigeria  
enojoseph2001@yahoo.com

Ubong Joseph Ottong  
University of Calabar  
Nigeria  
ubgsouth@yahoo.com

Nse Emmanuel Akwang  
Akwa Ibom State University  
Nigeria  
drnseakwang@gmail.com

This study examines the availability, management and effectiveness of security systems for cyberspace and electronic resources in academic libraries with a focus on some selected University Libraries in South-South Nigeria. The concept of Cyberspace is the notional environment in which communication over computer network occurs. Hence, this paper seeks to examine the security of this notional environment with focus on hacking, damages to hardware, software or information, as well as from disruption or misdirection of services. The study further seeks to find out how e-resources are illegally accessed and removed, what electronic security systems are in use and how to ascertain the effectiveness of such systems in the libraries under study. A survey was designed for this study. Descriptive and Inferential statistics of frequency counts and percentages were used to analyse data gathered from the survey. One hundred and ten (110) copies of questionnaire were distributed. Eighty copies (74%) were duly completed and returned from the respondents. Furthermore, a participant observation method was used to measure how effective are the electronic security installations. The study reveals that academic libraries have suffered adversely from security bridges and that installation and effective management of security devices and software in academic libraries would immensely improve the situation.

**Keywords:** Security systems, Cyberspace, Electronic resources, Academic libraries.



## **A Legal Perspective of E-contract: Situating the Nigerian Position in the Matrix of the Emerging Global Trends**

Roland Akindele  
Adeleke University  
Nigeria  
rollymack@gmail.com

Technological developments and the emergence of the internet have led to new models in all aspects of human undertakings including business transactions. Consequently, electronic contract formations rely on internet technology as a fulcrum. Technological innovations have led to e-contracts which arise from various contractual interactions with online stores, financial institutions and media networks.

The paper will examine the global trends in electronic contract with a particular reference to the situation in Nigeria in a legal viewpoint. Electronic contract can be studied as a multidisciplinary subject due to its intrinsic multi-dimensional nature. However due to obvious limitations, the subject will be examined from a legal perspective.

Among other issues, the paper will discuss the evolution of e-contact, e-signature and the merits of e-contract in contrast to the traditional mode of contract. The paper will also undertake a comparative discussion of the challenges inherent in electronic contract globally and in Nigeria. The study adopts a descriptive and comparative research approach as relevant secondary materials will be sourced and critically analysed. This research aims to provide a deep understanding of the applicable rules to e-contract. In the paper, the focus is on legal issues pertaining to e-contract. The legal issues relating to e-contract are discussed in the light of existing laws and where there are gaps in the law possible solutions are proposed. Therefore, the research work will seek to make recommendations for the reform of the existing law on the subject.

This paper argues that norms, rules and customs in the real world are different from what are obtained in the virtual space in relation to formation and enforcement of contract consummated in the cyberspace. This study will examine what electronic contract entails, its various types and its peculiar issues.

The European initiative on Electronic Commerce, in defining e-contract states that it is any form of business transaction in which the parties interact electronically rather than by physical exchanges. E-contract is primarily concluded through computers or other electronic media of communication as opposed to the traditional contract which is mainly face to face or based on a written agreement.

**Keywords:** E-contract, Legal perspective, Nigeria, Reform.

# **Technological Innovations for Sustainable Development: A Case of e-Government in Lagos State**

Oluwasola Oni  
Pan-Atlantic University  
Nigeria  
ooni@pau.edu.ng; oluwasolaoni@gmail.com

Technological innovations have revolutionised the world around us in several ways. Innovations such as computers, the internet, World Wide Web, smart phones, the internet of things and big data have changed the way people live, work, think and even govern. They have helped to narrow the gap between the rich and the poor in many instances but can also create digital divides. This research explores technological innovations in relation to government agencies in Lagos and how they have applied e-Government and other technological innovations to improve the lives of citizens whilst ensuring sustainable development and transformation.

**Keywords:** E-government, Sustainable development, Innovations.

## **IOT Based Residential Electricity Monitoring System**

Kosisochukwu Ejimonu  
Kosview Productions  
Nigeria  
kosigab@gmail.com

Electricity without a doubt is now an integral part of our society and plays a vital role in our daily lives especially in Nigeria. Although till date Nigeria still struggles to provide her citizens with constant stable electricity, we have become accustomed to the unreliability of the presence of electricity and this has become part and parcel of our society. Even as important as electricity is, many Nigerians still fail to grasp the power that it possesses, we understand its benefits, but neglect its hazards.

Electricity is wonderful but under certain conditions, it can be very dangerous, destructive and deadly. Within Nigeria and throughout the whole world, electrical hazards have been responsible for the loss of life and property of many. These may come as electrical surges- damaging every single plugged device in the home, electric shock- leading to the serious injury or even death of the victim, or electrical fires, which may lead to the total loss of the home including its residents. These electrical hazards are mainly caused by voltage surges, overloading, and electrical wiring faults like poor ARC wiring, short circuiting, poor distribution board wiring.

Other electrical wiring faults include; use of wrong wire diameter for certain load lines- this causes over heating of the wire and melting of the insulation. As for electrical fires, you need to understand and respect the power of electricity and the role it can play in home fires. It can start in an instant and consume your home in just minutes. It takes lives, injures victims, destroys homes, and steals precious possessions.

The Residential Electricity Monitoring System (REMS) is an electricity meter connected to the Internet to provide real time data on the power system in your home. The REMS is designed to replace the distribution board allowing it to conduct a series of tests on the quality of the electricity supply to your home/facility and, within your home detect basic wiring faults and allow owners and service providers to identify potential problems with the electrical systems.

Because power monitoring systems operate around the clock, they can provide comprehensive historical data that helps end-users reduce the energy delivered to and consumed by electrical systems in their facilities.

The electrical monitoring system finally puts proper electrical control into the hands of the home owner by providing him with the ability to control power distribution within the home from anywhere in the world via sms, and to view analytical data over the web.

The REMS is capable of metering individual room power consumption, detecting voltage surges and tripping off voltage supply to the home, detecting high temperatures on distribution lines within the home, even detecting high temperatures at socket points, while tripping off affected lines or even the entire home.

The REMS is also capable of detecting electrical smoke and tripping off the entire system and contacting emergency services via call and text messaging. It is GPRS enabled giving it internet and sms functionalities, meaning it can receive commands via sms like “Switch off the kitchen”, send out emergency SOS alerts and warnings etc. Also, it can be monitored and controlled with an app over the internet. The REMS can detect simple electrical wiring faults, short circuiting, use of low current rated wires on high current distribution lines etc.

**Keywords:** Electricity monitoring, Overloading voltage, Surges, Text messaging, Internet monitoring.

**Wednesday, October 10, 2018**

**Stream: Medical Informatics and Healthcare IT**

**Robots in Elder Care – Security, Privacy and Policy Issues: A Multi-Nation Study**

Ramesh Subramanian  
Quinnipiac University  
USA  
ramesh.subramanian@quinnipiac.edu

Gerhard Steinke  
Seattle Pacific University  
USA  
gsteinke@spu.edu

As artificial intelligence (AI) and social robotic systems gain applications and acceptance in the realm of elder care, critical questions arise: What are the security and legal ramifications of the use of these new technologies? Should their commercialization be regulated? What are the privacy issues associated with the use of these technologies? What are the ethical considerations? Who has responsibility for the large amounts of data that are collected and manipulated by these systems? What happens when these systems do more than intended or if they fail? What is the recourse if there is a malfunction or a system failure? These questions are just a small subset of possible questions in this emerging field.

Our focus is on issues during the design, development and implementation of social robots for elder care. This includes issues such as:

- **Affective behavior:** How to manage or incorporate affective behavior in these robots? Affective behavior deals with how robots understand and reciprocate emotions in humans.
- **Adaptive learning:** Adaptive learning deals with how robots learn, how they adapt to changing conditions and contexts, and make decisions on their own.
- **Autonomy:** Autonomous function is a critical aspect of social robots. At present there is significant debate on how far the autonomy of a social robot should go.
- **Cooperation:** When should a social robot cooperate and listen to human orders, and when it should not – e.g. when the human's order is detrimental to her health.
- **Cultural dependency:** Since a social robot interacts with humans, the robots should exhibit appropriate cultural dependency – and “understand” differences in social values, norms and standards among cultures.
- **Adherence to social rules:** A social robot should adhere and follow social rules attached to its role. For example, a personal assistant robot should follow the rules of good service, should be reliable, anticipate the needs of the master, and be discreet.
- **Safety:** This concerns both the safety of the human, as well as the safety and well-being of the social robot itself.

We propose a study to determine how these issues are addressed in three different geographic and political landscapes, namely the US, Japan and EU. The aim is to aid designers, policy makers, regulators as well as customers and users of these robots.

The list of issues that we focus on includes:

- **Security & Privacy:** Robots constantly interact with the environment in which they operate. This involves continuous transfer of large amounts of data in and out of the system. Social robots that are attached to humans also acquire and retain a large amount of information about the human, including information on health and habits. Thus, it goes without saying that security and discreteness of social robots is a very critical imperative.
- **Ethics:** There is growing literature on how humans get attached to inanimate objects, such as cars and stuffed toys. There are several ethical issues with respect to the use of these social robots. One is the “real versus fake” problem. Users of these robots could, over time, lose the ability to distinguish between what is real and what is fake, and by extension, what is authentic, and what is not. Another issue is the ethicality of replacing humans with machines in areas such as elder care. If users get attached to their social robots, it becomes eminently possible for companies and other nefarious organizations to use the robots as a means to control their human companions.
- **Law:** Within this topic, one important issue that emerges is the issue of liability. Who is liable for the actions of social robots? The liabilities may extend from financial to criminal. A robot may be completely responsible in aiding its human companion in administering medicines, or making financial decisions related to healthcare, which may or may not lead to disastrous results, such as administering the wrong dosage, or wiping out the human’s savings. Can robots act as judges and medical advisers?

We use a mixed methodology approach for this project. We use historiographic methods to collect historical information on the development of robots in general. We analyze published documents in academic journals as well as mass media in the area of robotic use in healthcare. We also identify companies and research establishments that are engaged in elder healthcare based robotic research and identify the issues that they are working on. We examine government documents, regulations, laws and acts pertaining to privacy and security of AI entities, and study current regulatory activities in the three nationalities that we mentioned earlier. We also plan to conduct a small survey of representative populations in the US, EU and Japan to compare people’s perceptions vis-à-vis social robotics, especially their reactions to the security, privacy, ethical and legal issues that arise due to the emergence of social robots in elder care.

**Keywords:** Robots, Privacy, Security, Eldercare, Ethics.

## **Smart Planning Systems Using Building Information Modelling: Enhancing the Building Permitting Processes in Ghana**

Gideon Ayim-Mensah, Isaiah Ewuzie, Olugbenga Adejo, Bassey Orok, Abel Usoro  
University of the West of Scotland

UK

gideon.ayim-mensah@uws.ac.uk; isaiah.ewuzie@uws.ac.uk; olugbenga.adejo@uws.ac.uk;  
bassey.orok@uws.ac.uk; abel.usoro@uws.ac.uk

The issuance of building and development permits is one of the ways which the Local Authorities control physical and urban developments in Ghana. However, despite all government efforts, the planning systems have failed to effectively control the sprawl of developments and human settlements in Ghana. The challenges faced by the local authorities include but not limited to: lack of an integrated central database management system, lack of co-ordination between stakeholders and local authorities, as well as inadequate feedback systems. As such the government loses millions of dollars each year due to illegal development and exploitation of a vulnerable planning system. The use of BIM will help overcome these challenges. BIM is a digital representation of physical and functional characteristics of a facility in a virtual environment. BIM serves as a platform for information sharing, interoperability, identification and visualisation of legal and technical information related to building and parcel of land in 3D to 5D virtual environment. This allows prompt feedback, eliminates repetition, delays and loss of revenue to the government. This research aims to produce a smart planning system by integrating Building Information Modelling (BIM) in the building permitting processes of the Local authorities in Ghana. Primary data was collected by the use of structured questionnaire to six Local Councils in Ghana. Secondary data was also collected from the literature on building permit systems in Ghana, the National Building Regulation and the Local Government Act 1993, Act 462. The research produces a smart planning model that is efficient and that is capable of controlling urban development and enhancing revenue generation of the local authorities in Ghana.

**Keywords:** Building permit, Smart Planning Systems, Building Information Modelling, Physical and urban developments.

## **A Decision Tree Analysis of Opioid and Prescription Drug Interactions Leading to Death Using the FAERS Database**

Rohit R. Dixit, Robert P. Schumaker, Michael A. Veronin  
The University of Texas at Tyler  
USA

rdixit@patriots.uttyler.edu; rschumaker@uttyler.edu; mveronin@uttyler.edu

Can unknown and possibly dangerous interactions between opioids and prescription drugs be identified? Is it possible? Our research seeks to answer these questions by applying a supervised machine learning algorithm to the FDA's Adverse Event Reporting System (FAERS). We trained a decision tree classifier to investigate heroin and prescription drug interactions with an accuracy of 84.9%. We found that heroin and buprenorphine, a commonly prescribed opioid detox drug, led to a 28.0% survival rate among patients. Heroin, buprenorphine, and quinine were even deadlier with a 24.0% survival rate. Our technique can be applied to previously unknown drug combinations to predict mortality and perhaps improve patient safety.

**Keywords:** Machine learning, FAERS, Opioids, Business intelligence.



## Securing Medical Devices using Security Best Practices

Peter James  
Amen RA Security  
USA  
peter@amenrasecurity.com

Sarhan Musa  
Prairie View A&M University  
USA  
smmusa@pvamu.edu

The healthcare industry has been targeted more than ever in the recent years by many hackers. Hackers are not only attempting to export sensitive data, but they are now able to identify and exploit the same medical devices that are used to treat patients. This paper provides a breakdown of the Software Development Life Cycle (SDLC) process, and then shows how security can be implemented into each phase. In addition, we review statistical data from the Ponemon Institute that addresses the phases in which medical device makers begin conducting security testing within their SDLC. It follows by additional analysis of the Food and Drug Administration's 2017 Transcript meeting minutes that highlight the fundamental problems within medical devices and the problems with attempting to discover vulnerabilities that reside on medical devices while in production. After that correlation, this work reviews the vulnerabilities associated with the Smiths Medical infusion pump and lastly provides recommendations that healthcare organizations can implement to better secure their medical devices that are connected to their network.

**Keywords:** Cybersecurity, Medical device security, SDLC, Medical device makers, Healthcare industry.

## **Information Literacy Skills and the Utilization of Information Resources by Public Health Workers in Federal Neuro-Psychiatric Hospital, Calabar**

Aniebiet Inyang, Blessing Robert, Emem Offon

University of Calabar

Nigeria

ntuinju@yahoo.com; blessrobert@yahoo.com; uwemoffon@yahoo.com

This study investigated the influence of information literacy skills on the utilization of information resources by public health workers in Federal Neuro-Psychiatric Hospital, Calabar. Three research questions and hypotheses were formulated to guide the study. Survey research design was adopted for the study and purposive sampling technique was utilized to select subjects for the study. Ninety five out of the one hundred and twenty five copies of the questionnaire administered were retrieved and found treatable. A well-structured and validated questionnaire named information literacy skill and utilization of information resources (ILSUIR) questionnaire was used to collect information from the respondents. Cronbach's Alpha reliability method was used to determine the reliability of research instrument, and coefficients of 0.74 to 0.89 were arrived at. These were considered high enough to justify the conclusion that the instrument is reliable in measuring the variables set for the study. Data obtained were subjected to statistical analyses using Independent t-test which was carried out at .05 level of significance. The result revealed that Access point, ICT competence and information evaluation significantly influenced utilization of information resources by public health workers in Federal Neuro-Psychiatric Hospital, Calabar. Based on the findings it was recommended that library literacy skill programs should be organized by the authorities in the study area in order to update the staff and other users of the library on access point. It was equally recommended that the use of information and communication technology (ICT) should be encouraged while evaluation of information resource toward effective library utilization should be carried out periodically.

**Keywords:** Information literacy, Skills utilization, Resources, Health workers.

# **Leveraging Multi-Stakeholder Networks in Mainstreaming ICTs into Agricultural Research and Development: Lessons for Developing Economies**

Olugbenga Adejo  
University of the West of Scotland  
UK  
olugbenga.adejo@uws.ac.uk

Egbe Etowa  
University of Portharcourt  
Nigeria  
egbe.etowa@uniport.edu.ng

Asuquo Mbang  
Abubakar Tafawa Balewa University Bauchi  
Nigeria  
asuquo.emmanuel001@gmail.com

Agriculture plays a great role in alleviating poverty, increase food sufficiency and the economic development of developing nations. However, the insufficient investment, inappropriate and unimplemented policies are giving rise to low productivity.

Few years ago, Oxfam initiated a multi stakeholder network (MSN) to bring in the civil society, public, private and other agricultural stakeholders into addressing the challenges of agricultural research, innovation and development. The multi stakeholder network approaches are vital in today's agriculture and aim to achieve research for development outcomes. However, for the approaches to be successful and effective, there is need for a paradigm shift in the area of information and communication technology (ICT) to align with what is obtainable in other sectors.

This paper uses developing economies as case study to explore the impact and benefits of the application of ICT in MSN to address the challenges of agricultural research and development in developing nations. In doing so, it provides critical review of the trending and future roles of MSN in adapting ICT-driven approach to agricultural research and development. Preceding this review is a conceptual insight into the intersecting MSN between Agriculture and ICT sectors. The paper also tries to examine the various challenges hindering its success as well as proffers solution on how the ICT tools can be used more collaboratively and efficiently for the development of the network. Finally, a generic framework for integrating ICT into MSN for agricultural research and development was proposed.

**Keywords:** Agriculture, Research, Development, MSN, ICT.

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