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The Risk of Artificial Intelligence in Cyber Security and the Role of Humans

Article by Joseph Ogaba Oche
M.Sc., MCITP, MCSE, Certified PHP Developer
E-mail: Joseph.oche@hotmail.com

Abstract

This paper will present and analyze reported failures of artificially intelligent systems and extrapolate our analysis to future AIs. I suggest that both the frequency and the seriousness of future AI failures will steadily increase. AI Safety can be improved based on ideas developed by cybersecurity experts. For narrow AIs safety failures are at the same, moderate, level of criticality as in cybersecurity, however for general AI, failures have a fundamentally different impact. A single failure of a super intelligent system may cause a catastrophic event without a chance for recovery. The goal of cybersecurity is to reduce the number of successful attacks on the system; the goal of AI Safety is to make sure zero attacks succeed in bypassing the safety mechanisms. Unfortunately, such a level of performance is unachievable. Every security system will eventually fail; there is no such thing as a 100% secure system. Future generations may look back at our time and identify it as one of intense change. In a few short decades, we have morphed from a machine-based society to an information-based society, and as this Information Age continues to mature, society has been forced to develop a new and intimate familiarity with data-driven and algorithmic systems. Artificial agents to refer to devices and decision-making aids that rely on automated, data- driven, or algorithmic learning procedures. Such agents are becoming an intrinsic part of our regular decision-making processes. Their emergence and adoption lead to a bevy of related policy questions.

Keywords: *AI Safety, Cybersecurity, Failures, Super intelligence, Algorithms, Advanced Persistent Threats (APT).*

Introduction

Artificial Intelligence or AI is the intelligence shown by machines. When any machine becomes aware of its surroundings and does something keeping that in mind in order to achieve something. Usually the term Artificial Intelligence is used when a machine behaves like a human in activities such as problem solving or learning, which is also known as Machine Learning.

The maturation of the Information Age has forced some adaptation and evolution in our laws, regulations, and policies. But the pace and intensity of technological change has often made it difficult for the policy, regulations, and laws to keep up. As has been the case in other periods of intense change, the lag in the evolution of laws and regulations can lead to significant policy gaps.

For example, data-laden societies are currently re-evaluating acceptable personal standards of privacy. This is necessary given the growing use of ubiquitous data collection and powerful, cheaply run, and readily available algorithms. The legal standards of reason- able or acceptable privacy need renegotiation to accommodate new technologies that are being adopted at pace and scale. There is a lot at stake (Ohm, 2009; Davis and Osoba, 2016): health data privacy, consumer fairness, and even the constitutional Census mandate.

A day does not go by without a news article reporting some amazing breakthrough in artificial intelligence. In fact, progress in AI has been so steady that some futurologists, such as Ray Kurzweil, project current trends into the future and anticipate what the headlines of tomorrow will bring us. Consider some developments from the world of technology:

2004 DARPA sponsors a driverless car grand challenge. Technology developed by the participants eventually allows Google to develop a driverless automobile and modify existing transportation laws.

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2005 Honda's ASIMO humanoid robot is able to walk as fast as a human, delivering trays to customers in a restaurant setting. The same technology is now used in military robots.

2007 Computers learned to play a perfect game of checkers, and in the process opened the door for algorithms capable of searching vast databases of information.

2011 IBM's Watson wins Jeopardy against top human champions. It is currently training to provide medical advice to doctors. It is capable of mastering any domain of knowledge.

2012 Google releases its Knowledge Graph, a semantic search knowledge base, likely to be the first step toward true artificial intelligence.

2013 Facebook releases Graph Search, a semantic search engine with intimate knowledge about Facebook's users, essentially making it impossible for us to hide anything from the intelligent algorithms. 2013 BRAIN initiative aimed at reverse engineering the human brain receives 3 billion US dollars in funding by the White House, following an earlier billion-euro European initiative to accomplish the same.

2014 Chatbot convinced 33% of the judges that it was human and by doing so passed a restricted version of a Turing Test. 2015 Single piece of general software learns to outperform human players in dozens of Atari video games.

2016 Go playing deep neural network beats world champion.

From the above examples, it is easy to see that not only is progress in AI taking place, it is accelerating as the technology feeds on itself. While the intent behind the research is usually good, any developed technology could be used for good or evil purposes.

From observing exponential progress in technology, Ray Kurzweil was able to make hundreds of detailed predictions for the near and distant future. As early as 1990 he anticipated that among other things, we will see between 2010 and 2020:

- Eyeglasses that beam images onto the users' retinas to produce virtual reality (Project Glass).
- Computers featuring "virtual assistant" programs that can help the user with various daily tasks (Siri).
- Cell phones built into clothing and able to project sounds directly into the ears of their users (E-textiles).

But his projections for a somewhat distant future are truly breathtaking and scary. Kurzweil anticipates that by the year:

2029 Computers will routinely pass the Turing Test, a measure of how well a machine can pretend to be a human.

2045 The technological singularity will occur as machines surpass people as the smartest life forms and the dominant species on the planet and perhaps Universe.

If Kurzweil is correct about these long-term predictions, as he was correct so many times in the past, it would raise new and sinister issues related to our future in the age of intelligent machines. About 10,000 scientists around the world work on different aspects of creating intelligent machines, with the main goal of making such machines as capable as possible. With amazing progress made in the field of AI over the last decade, it is more important than ever to make sure that the technology we are developing has a beneficial impact on humanity. With the appearance of robotic financial advisors, self-driving cars and personal digital assistants, come many unresolved problems. We have already experienced market crushes caused by intelligent trading software, accidents caused by self-driving cars and embarrassment from chat-bots which turned racist and engaged in hate speech. We predict that both the frequency and seriousness of such events will steadily increase as AIs become more capable. The failures of today's narrow domain AIs are just a warning: once we develop general artificial intelligence capable of cross-domain performance, hurt feelings will be the least of our concerns.

Methods

My discussion so far may seem to foreshadow impending instability because of AI. Popular discussion on AI and algorithms tends to share a similar tone. I proposed to try to cut through the hype with analytic and cross-disciplinary thinking on the risks and future of AI.

I convened a team of 12 researchers from across the academic disciplines and with a multitude of professional experiences to discuss AI. We curated a team of colleagues who were diverse in gender, ethnicity, and race while also making sure that we did not over represent for deep technical knowledge of AI. The team included expertise in information technology, psychology, political science, engineering, mathematics, radiology and design. Our hope was that, by convening such a group of researchers with extensive and varied training, we would encourage a dialogue around AI that was distinct and would allow for insights from topics and substance adjacent to AI.

The group's first exercise was to take part in a structured brainstorming session involving independent thought, small group discussions, and whole-group debate to first develop a working definition of AI and then to highlight application areas most prone to disruption by AI. The working definitions were developed via a rapid-fire collection of answers to "describe AI in less than five words." The themes of the contributions were summarized.

We followed these initial exercises by driving the team to deeper discussion via a future-casting exercise for which the larger group was split into 4 subgroups.

Results

While the insights and outcomes of the activity varied depending on the envisioned future that the groups chose, there was a list of application spaces that were included by each of the teams.

Due to the consistency across groups, I consider those to be "no-brainer" applications of AI, and they include

Cyber-security
Security (national and domestic)
Employment ("future of work")
Decision making
Health.

Following the activities with our team of colleagues, I chose to dive more deeply into the literature on the first topic; Cyber-security with a goal of developing a clearer picture of the risks inherent in the use of algorithms or artificial intelligence (or jointly as artificial agents) in these spaces. We chose these topics because we believe they are more pressing concerns to governments and the populace. To discuss AI benefits and risks to cyber-security and the role of humans as related to the security of nation states, we convened a smaller team of colleagues with deep knowledge of systems, algorithms, programming and security.

Discussions

First, the cyber environment is becoming more and more complex along with the cyber-threats. For example, "By 2020 Cisco estimates that 99% of devices (50 billion) will be connected to the Internet. In contrast, currently only around 1% is connected today" (e.g., Rosenquist, 2014). Even defenses are becoming complex, whether a defense is passive or active (e.g., despite our lengthy review of cyber defenses, we omitted numerous defenses, such as the use of encrypting emails, randomly generating passwords, using peer networks to increase security, hardening websites, etc.; from FIPSP, 1993; Intel, 2014; respectively). One of the problems with defending a website against cyber threats is that the relative value of what is being protected increases to cyber-attackers as the defenses they face improve, fueling the arms race between cyber hackers and cyber defenders (Schwartz, 2014).

This review was not inclusive of all potential cyber threats. We omitted many threats, such as those for businesses that must handle private personnel information.

With advancement, new exploits and vulnerabilities could be easily identified and analyzed to prevent further attacks. Incident response systems could also benefit greatly from AI. When under attack, the system will be able to identify the entry point and stop the attack as well as patch the vulnerability.

Studies show that it takes, on an average in 2016, 99 days for a company to realize that they have been compromised. Although a long way from 146 days in 2015, yet a very long time for the attackers to gain all

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the information they were looking for. This time frame is not only enough to steal data but also manipulate it without detection. This can have a great impact on the company as it makes it very difficult for the company to differentiate between the fake and the actual data.

But, in addition, we want to understand how malicious agents interdependently select targets – not just watch them do it. We should be able to create a system that predicts a malicious action before a red team composed of humans or autonomous AI agents enact a threat. Based on data sets of past cyber threats and defensive actions, predictive cyber threat analytics that predict future threats should become a part of the AI tool kit used by defenders against malicious actors.

From an individual perspective, cognitive biases form individual vulnerabilities that cyber-attackers attempt to exploit.

Advantages of artificial intelligence

Organizations face millions of threats each day making is impossible for security researcher to analyze and categorize them. This task can be done by using Machine Learning in an efficient way.

By finding a way to work towards unsupervised and supervised machine learning will enable us to fully utilize our current knowledge of threats and vectors. Once those are combined with the ability to detect new attacks and discover new vulnerabilities, our systems will be able to protect us from threats is a much better and efficient way.

However, like every Machine Learning algorithm, even these advanced algorithms would require human guidance to learn from as humans are better equipped to look beyond a simple anomaly that a machine could pick up and put it in a different context and decide to ignore it as a security threat.

Another benefit of using AI based machines is that, in theory, these systems would work in a more calculated approach and in a more accurate way resulting in eliminating human error. Additionally, these systems could work simultaneously on various tasks, monitoring and protecting a vast number of devices and systems. They can therefore mitigate large scale attacks.

Disadvantages of artificial intelligence

The biggest disadvantage of any AI based system is that we cannot predict what it'll do. If fallen into the wrong hands, the result could be fatal and a whole different level can could do more damage than good.

A super-intelligent AI will be really good at completing goals, but, if those goals aren't aligned with ours, we'll have a problem. AI in security systems had foregone the utilization of valuable analyst skills and therefore didn't benefit from human feedback.

Even though the initial concerns about the development on AI in cyber security may revolve around concerns about eliminating the much-needed human expertise, intuition and judgment, the real disadvantage of artificial intelligence is its unpredictability.

Conclusion

We first agreed that cyber threats are making cyber environments more complex and uncomfortable for average users; second, we concluded that various factors are important (e.g., timely actions are often necessary in cyber space to counter the threats of the attacks that commonly occur at internet speeds, but also the 'slow and low' advanced persistent threats (APTs) attacks that are difficult to detect, threats that occur only after pre-specified conditions have been satisfied that trigger an unsuspecting attack). Third, we concluded that APTs pose a risk to users but also to national security (viz., the persistent threats posed by other Nations). Fourth, we contend that using "red" teams to search cyber defenses for vulnerabilities encourages users and organizations to better defend themselves. Fifth, the current state of theory leaves many questions unanswered that researchers must pursue to mitigate or neutralize present and future threats. Lastly, we agree with the literature that cyber space has had a dramatic impact on human life and that the cyber domain is a breeding ground for disorder. However, we also believe that actions by humans and AI researchers can be taken to stay safe and ahead of existing and future threats.

Fully autonomous machines can never be assumed to be safe. The difficulty of the problem is not that one particular step on the road to friendly AI is hard and once we solve it, we are done. All of the steps on the path are simply impossible. First, human values are inconsistent and dynamic and so cannot be understood and subsequently programmed into a machine. Suggestions for overcoming this obstacle require changing humanity into something it is not, and so by definition destroying it. Second, even if we did have a consistent and static set of values to implement, we would have no way of knowing if a self-modifying, self-improving, continuously learning intelligence greater than ours will continue to subscribe to that set of values. Perhaps, friendly AI research is exactly what will teach us how to do that, but we think fundamental limits on verifiability will prevent any such proof. At best we will arrive at a probabilistic proof that a system is consistent with some set of fixed constraints, but it is far from "safe" for an unrestricted set of inputs. Additionally, all programs have bugs, and can be hacked, or malfunction because of natural or externally caused hardware failure, etc. To summarize, at best we will end up with a probabilistically safe system.

It is really difficult to predict what the future Artificial Intelligence holds. Some say it'll help us to better our world while the others lean towards the possibility that it may go rouge.

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The Impacts of the Namibian School Admission Policy on High School Learners

Article by Memoir Chimwamurombe[1], Ndinaani Mwashita[2]
[1]Ph.D, Texila American University - Guyana
[2]Ph.D, Midlands State University - Zimbamwe
E-mail: mchimwa@gmail.com[1], mndinaani@yahoo.com[2]

Abstract

The impacts of the Namibian School Admission Policy on high school learners have major contributions to social problems experienced by stakeholders as learners advance with their education. Social problems such as sexual relations, substance abuse and learner drop-out have become a social trend. However, other factors like peer pressure and poverty should not be overlooked. Learners admitted in schools after the age of six (6) experience problems that makes them vulnerable. This leads to high academic failure rate, teenage pregnancy, drug addiction that eventually compromises the quality of education. Learners become adults whilst in high school and this conflict with policies and regulations in Namibia. The aim of this study was to scrutinize the impacts of the Namibian School Admission Policy on social behavior of leaners as they reach high school. A quantitative research method was used with learners from Grade 8 to 12 from five state secondary schools in Windhoek. The sample had 200 participants who were randomly chosen. A pilot study was used to test the instrument's reliability. Data was collected using a closed questionnaire. Ethical considerations were implemented throughout the research process. Chi-square correlations and descriptive analysis were used to analyze data. Results were in the context of the study. Recommendations were given to address the observed social problems.

Keywords*: policies, impact, adolescents and behavior.*

Alternative hypothesis: The admission policy has an impact on high school learners in Namibia.

Null Hypothesis: The admission policy has no impact on high school learners in Namibia.

Introduction

Social ills among high school learners have been of concern to many countries in Africa (Lloyd and Hewett, 2009). Literature has proven that teenage pregnancy among schoolgirls is a major distress in South Africa (Malahlela, 2012; Mashishi and Makoelle, 2014). In Namibia, high school learners are engaging in immature sexual relationships (Pazvakawambwa, Indongo and Kazembe, 2013, and Legal Assistance Centre [LAC]; 2012 and Nekongo-Nielsen & Nchindo, 2013) which lead many girls to drop out of school due to unplanned pregnancy. In addition, Rima (2008) observed the majority of high school learners also engage in various misbehavior acts such drinking alcohol, stealing and abusing drugs bunking lessons to mention a few. Apart from poverty, peer pressure and environmental factors, problems are traced to have their foundations in the Admission Policy. United Nation Education Scientific and Cultural Organization [UNESCO] (2015) pointed out that some children clearly start school late and in some parts of the country some learners are admitted at the age of nine (9).

The age of the learners becomes a major cause of concern as children enter high school. By the time these learners reach high school, they are above the age of 16 which makes it difficult for the teachers to discipline them without brushing their shoulders with the arms of law – The Age of Consent. Johnson et al. (2011) are of the view that between the years of 15 and 18 children are undergoing a crisis stage where individuals are fighting for identity and recognition. The phase is defined as an interim stage from childhood to adulthood and is a stage of quick evolution in which physical, sexual and emotional modifications happen (Wolff, 2012). In concurrence, Reddy and Sinha (2010) states that most high school learners are engaging in alcohol abuse and unsafe sexual

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behaviors. Unprotected sexual relationship among high school learners has led to accidental pregnancies to girls between the ages of 10 – 19 and this has become a grave health and social challenge (The Namibia Statistics Agency, 2012). This then becomes a challenge when a child is admitted to start school at the age of 7 because they become mini adults whilst in high school.

Late admission in primary school mostly causes learners to drop-out from school before the completion of the secondary phase. This paper has the opinion that The Namibian's School Admission Policy contributes in having adults in high schools instead of teenagers Ministry of Education, (Ministry of Education [MoE] Bill, 2018). According to Ministry of Education's Admission Policy in Namibia, a child must be turning 7 in Grade 1 and completes the 7-year primary course at 13. If it happens that the child repeats once in each primary school phase, he/she will be 15 by the time of completing Grade 7 (MoE, 2017). The high school has two phases and a learner is allowed to repeat once at each one. If this happens, the learner completes Grade 12 at the age of 22 or beyond. The implementation of the Pregnancy Policy has also added academic years of learners who fall victim of that. This has left the Education of the Namibian child under spotlight.

According to Tschombe *et al*, (2011) several studies have pointed out the serious problems of the Namibian educational system. They have substantiated that many of the problems are related to low performance when compared to other African countries. The high failure rate is a cause of concern as argued by UNESCO (2015). The Namibian government is on record for its unwavering support to the development of quality education. However, the outputs are not desirable if compared to the financial and human resource invested (MoE, 2008). The intention of the government to keep all children in the school and create a knowledge-based society is a noble idea. To achieve the national aim, the education system has several plans in place, such as the Pregnancy Policy. A decision was made by the MoE (2012) that if a girl child falls pregnant, she should continue with her studies until the time of giving birth. After that, she is allowed to re-join and continue with her studies. This has made it difficult for parents and school to control children that are above The Age of Consent (16).

In an endeavor to solve the existing problems, the government has revised the Promotion Policy to improve the number of learners proceeding to the next grade. However, those who fail to meet the expected competence levels are given the opportunity to repeat the level. In support of that, Sichombe *et al*, (2011) state that repetition comes from various dimensions which include voluntary caused by family, by language barrier or as a result of examination failure. While it can be argued to be a noble idea to repeat a grade, other researchers have a view that, repeating a grade has negative effects on learners' progress both academically and socially and also the learner becomes older for the grade (UNESCO, 2015). From a social perspective, leaners who are too old for their grades negatively influence others into deviant behavior such as substance abuse and sexual relations (Kapitako, 2017).

UNESCO (2006) recommended the government of Namibia for its commitment towards the well-being of children by signing The Convention on the rights of the child. The right to education is well enshrined in the Namibian constitution. A number of policies have been initiated and several programs are in place to address the developmental aspects of the learners. However, the most recent National Policy of MoE (2017) argues that educational stakeholders found it very necessary to develop a new curriculum and Promotion Policy to assist their learners sail through the high school phase. Nonetheless, this study examined the impacts of the Namibian School Admission Policy on high school leaners. Additionally, the study explored how the age of learners contradicts with the school rules and some country laws.

As of late, the concerned authorities in Namibian education have realized the problems and have been advocating for reforms. However, their efforts are being hampered by a number of limitations. Firstly, Namibia has a very small population of about 2.5 million people which is sparsely distributed. The situation makes it difficult for the government to build schools around the country to accommodate the scattered population. UNESCO (2015) indicated that population distribution in Namibia makes it impossible to build schools for all children. Children of farm workers, Khoisan and Ovahimba are mostly affected when it comes to enrolling late because they live in remote areas (UNESCO, 2015). Historically, they are semi-nomadic, meaning that the continuous movement is a challenge for children to successfully go through the learning phase without repeating. Even though the government has tried to establish mobile schools, the challenge of getting qualified teachers who

can suit that lifestyle is another stumbling block. Moreover, the parent's value more of their culture and household chores such as herding cattle than schooling (UNESCO, 2015). Therefore, due to lack of parental support, learners repeat grades as they would have failed to meet the expected competence, and urban areas are affected by broken families (Parks, 2013).

Method

A quantitative research methodology together a cross-sectional research designs were used to contact this study (Creswell, 2008). Cross-sectional design gives the necessary base for further inquiry of the phenomenon under investigation. At the moment, no research was done in Windhoek concerning the impacts of the Namibian School Admission Policy on high school learners. The cross-sectional design may suggest a base for further intervention studies.

In addition, a quantitative research method needs statistical analysis and inferences to refute or accept hypotheses for the investigated variables of the study (Bless, Higson-Smith and Kagee, 2006). Quantitative research was conducted using a diversity of methods which use quantities to record and investigate the authenticity of aspects being investigated (Kumar, 2005). The collected data was coded and recorded in statistical forms, to which analysis was done to explain the significance of the discoveries (Hirschstein *et al*., 2007). The yielded numerical data had a relative benefit and were able to be compute and calculate associations for large populations. Quantitative research takes an account of designs, techniques and measures that produce undistinguished statistical or numerical data (Kothari, 2006). This was to regulate the degree to which the Admission Policy impacts learners' behavior in high schools. For this reason, data collected was perceived with a higher degree of confidence. The assertion attained permits authorities and policy makers to discover contributory factors and make possible adjustments (Creswell, 2008). In this study a questionnaire with closed questions was used to collect data. The data was then statistical analyzed to see if there were any statistical correlations between the age of the participants and certain social trends displayed in schools.

Procedurally, permission was requested from the Regional Director of education to investigate whether the admission policy has an impact on high school learners in Namibia. Permission was then sought from school principals and parents to allow learners to participate in the study. Questionnaires were completed during normal Life Skills Lesson time ensuring minimum disturbances of the normal school timetable. The collected raw data was systematically and numerically coded, entered and cleaned in SPSS analysis (Bless, Higson-Smith and Kagee, 2010). The Statistical Package for the Social Science [SSPS] 24 was used to approve or reject the pre-defined hypothesis for ensuring relationships between variables under study (Babbie and Mouton, 2006). The cross-sectional design was used because it is the appropriate one to use when exploring relationships within a short period of time (Deslandes and Berthrand, 2005). The sample consisted of 200 participants who were randomly selected from five state secondary schools in Katutura, Windhoek. The probability sampling was used since it has a selection of a "random sample" from the list with names of high schools, grades and learners within the population of interest (Babbie and Mouton, 2006). The sample had hundred and eleven (111) girls and eighty-nine (89) boys' learners from different ethnic groups from grades 8 to 12. The Section A of the questionnaire needed demographic information from participants such as gender, age and grade. Section B contained closed questions which required participants to indicate how they had behaved or interacted with others at school within the previous year. The questionnaire was in English and those participants who could not read were helped to understand the questions while confidentiality of answers was being observed.

Results

The obtained results of the conducted statistical enquiry that was done for the study are displayed in this section. The results are presented as (1) descriptive on how the Namibian School Admission Policy has permitted learners to become adults while they are still in schools and (2) the interactive characteristics between age and behavioral traits. The SPSS 24 using Pearson Chi- squares and Spearman Correlations and standard deviations were used for all the statistical calculations.

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Presentation and analysis of respondents' bio -data

An overview of the analyses

The hypothesis below for this study was framed as follows:

Alternative Hypothesis: The Namibian School Admission Policy has an impact on high school learners in Namibia. This hypothesis was tested by independent *t* tested by a Pearson Product-Moment correlation.

Null Hypothesis: The Namibian School Admission Policy has no impact on high school learners. This hypothesis was tested by a Standard Deviation (SD).

Internal consistencies of measures

The instrument used in this study was the Youth Self –Report [YSR], Achenbach and Edelbrock, 1987) questionnaire. It measured the behavioral traits of the high school learners. A test reliability test technique was used applying the Cronbach alpha that needed only a single test administration to provide a unique estimate of the administered test (Gliem, et al, 2003). Table 1 shows the Cronbach alpha coefficients for behavioral traits of the high school learners.

Table 1. Internal consistencies of misbehavior among high school learners

Instrument n (items) Alpha
YSR 15 .85

The Cronbach Alpha coefficient for the YRS was. 85. The obtained Cronbach Alpha coefficient is within the usual parameters according to Mckillup (2006) because they it is above .75. Hence, the instrument was considered dependable.

A description of the adolescents' demographic set up

Gender

Demographics were measured using a Questionnaire Demographic Survey which asked participants to indicate their gender, age and Grade. There were more girls who participated in this study. Figure 1 indicates the total number of high school learners who participated in the study according to gender.

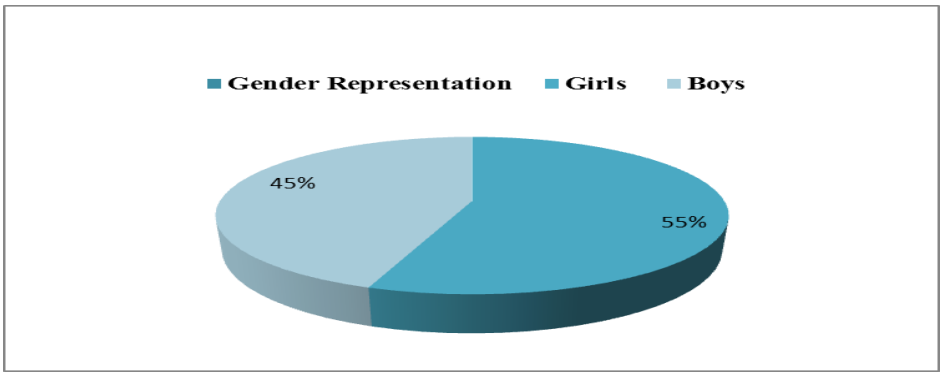

Figure 1. The distribution of participants according to gender

The sample had hundred and eleven (111) girls (55%) and eighty-nine (89) boys (45%) from five state schools ranging from grades 8 to 12. The data was collected during examination time. This may be was the cause the imbalance of numbers as per gender and grade because only those who had examination the day of collecting data were present and a few from other grades who came to study.

Grade

Grade representation

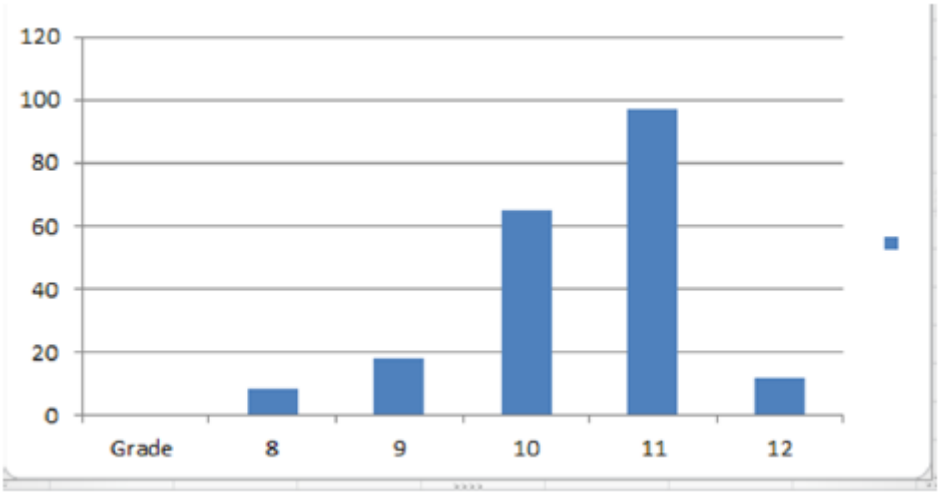

Figure 2. Shows the number of participants according to grade.

Most of the participants were Grade 11 learners (97: 48.5%) because it was their examination day. Grade 10 learners had a revision session in one of the visited schools that's why they were a bit more than other grades too. However, it must be also mentioned that the results obtained do not point to an explicit grade. The results in Table 2 show the age of participants as per Grade. The youngest was 15 years old and the oldest was aged 34.

Table 2. The age of participants as per Grade

Age	15	16	17	18	19	20	21	22	23+	Total
Grade 8	1	2	2	1	0	1	1	0	0	8
9	2	6	8	1	1	0	0	0	0	18
10	1	37	21	1	3	2	0	0	0	65
11	0	0	8	18	18	18	10	6	4	97
12	0	0	2	3	3	4	0	0	0	12
Totals	**4**	**45**	**41**	**24**	**25**	**25**	**11**	**6**	**4**	**200**

Table 2 shows that 76 (38%) of the participants have reached The Age of Consent and 95 (47.5%) of them were 18 years old and above and are allowed by law to drink alcohol and to smoke. Meaning 181 (90.5%) of the participants are somehow protected by country laws that contradict with the school rules (MoE, Bill 2018).

Table 3 represents the mean and standard deviation totals for each of the 15 variables of the YSR (ASB) for all the participants according to age.

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Table 3. Means and SD for items of participants' behavioral traits

Behavioral Traits of high school learners during the past year	N = 200	
Have you done any of the following at or around school with friends or alone?	Mean	SD
1. Bullied (threatened, harassed, fought or beat another learner	1.34	0.56
2. Pretended to be sick in order to stay away from school.	1.24	0.51
3. Brought home clothes to school without permission	1.45	0.59
4. Not done school work or homework	1.09	0.31
5. Missed out lessons/ school	1.15	0.22
6. Lied to a teacher(s)	1.27	0.57
7. Be on facebook/WhatApp/ twitter during lessons(use a cellphone)	1.56	0.73
8. Cheated during tests/exams or another learner	1.73	0.67
9. Fallen in love with a boy/girl	1.42	0.65
10. Disrespected teachers	1.16	0.22
11. Had sexual relationships	1.92	0.75
12. Drank alcohol	1.48	0.66
13. Smoked cigarettes/ hubbly bubbly	1.75	0.68
14. Used drugs for non medicinal purposes	1.37	0.46
15. Brought dangerous object toschool (a knife/ screwdriver) etc.	1.28	0.58
Totals	1.08	0.28
Percentages	1.44	0.59
Final Percentages	1.32	0.54

The highest mean scores are found for the item "*Had sexual relationship(s*) (*M* = 1.92, *SD* = .75). The second highest mean scores are found for the items "*Failed to do your school work/ homework"* (M = 1.85, SD = .35) and "*Had cheated during tests/exams or another learner*" (M = 1.75, SD = .67). The lowest mean score is found for the item "*had brought dangerous object(s) to school –e.g knife/school driver"* (M =1.08, = SD = .28).

Table 4. Frequencies of items on behavioral traits of participants during the past year

Individual Behavior Checklist Questions	Frequencies on behavior as per age																	
Have you ever done any of the following at or	15		16		17		18		19		20		21		22		23+	
around school with friends or alone?	Yes	No	Yes	No	Yes	No	Yes		Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
1. Bullied (threatened, harassed, fought or beat another learner	2	2	26	19	15	26	18	6	14	11	12	8	6	5	3	3	9	10
2. Pretended to be sick in order to stay away from school.	3	1	32	13	24	17	16	8	20	5	16	4	7	4	3	3	1	18
3. Brought home clothes to school without permission	1	3	28	17	36	5	12	12	16	9	13	7	8	3	2	4	14	5
4. Not done school work or homework	2	2	36	9	32	9	18	6	18	7	14	6	10	1	4	2	10	9
5. Missed out lessons/ school	0	4	30	15	29	12	13	11	17	8	9	11	4	7	2	4	5	14
6. Lied to a teacher(s)	4	0	39	6	21	20	15	9	12	13	17	3	5	6	4	2	5	14
7. Be on facebook/WhatApp/ twitter during lessons(use a cellphone)	0	4	21	24	32	9	10	14	15	10	6	14	4	7	3	3	7	12
8. Cheated during tests/exams or another learner	3	1	42	3	25	16	8	16	19	6	18	2	9	2	4	2	13	6
9. Fallen in love with a boy/girl	3	1	40	5	39	2	22	2	24	1	17	3	8	3	6	0	17	2
10. Disrespected teachers	0	4	22	23	25	16	11	13	10	15	2	18	3	8	0	6	2	17
11. Had sexual relationships	2	2	27	18	23	18	19	5	20	5	16	4	10	1	4	2	15	4
12. Drank alcohol	2	2	37	8	38	3	19	5	20	5	15	5	8	3	3	3	13	6
13. Smoked cigarettes/ hubbly bubbly	2	2	25	20	31	10	15	9	17	8	7	13	4	7	3	3	12	7
14. Used drugs for non medicinal purposes	2	2	21	24	25	16	13	11	7	18	11	9	6	5	2	4	10	9
15. Brought dangerous object toschool (a knife/ screwdriver) etc.	0	4	2	43	4	37	4	20	4	21	3	17	4	7	1	5	4	15
Totals	**26**		**428**		**399**		**213**		**233**		**176**		**96**		**44**		**137**	**148**

Results shown in Table 4 indicates that most learners between the ages of 16 and 19 had behavior problems. Most participants indicated that they had fallen in love (87%), 78% had drank alcohol and 72% had not done their homework or school work. Some variables were less violated. For example, only 13% of the participants had brought dangerous objects to school and 38% of them had disrespected the teachers.

Discussions

Introduction

This section integrates the results in Chapter 3 in order to discuss the posed hypothesis of the study. Also, the limitations of the study will then be pronounced, the conclusion will be clearly defined and recommendations for future researchers will be stated.

Gender

The results displayed that most of the participants were girls (55%) and boys were 45%. Nonetheless, issues such as parental involvement, poor performance, substance abuse and more importantly, parental care and support have added in taking the boy child away from school (Cooper, 2012 and Kapitako, 2017). If this happens, they then drop out of school. Apart from this, the involvement in delinquent behavior such as hooliganism, robbery and violent behavior had driven most of them to be expelled from school. For girls, the Pregnancy Policy has protected them since they are allowed to rejoin the education system after giving birth (The Namibia Statistics Agency, 2014).

Age and grades

The age of participants ranged from 15 to 34. The majority of the participants' age ranged from 16-20 years old of which is the most critical stage of life since individuals fight for identity and gratitude (Johnston et al., 2011). It is also puzzling to understand why 21-year-olds and up are still in high school? This is promoted by the Education Policies that are in place, like the School Admission Policy, where children turn 7 years in their first grade. On top of that, the Repeating, Promotional and Transfer Policies encourage learners to age whilst they are still labeled as school children whereas in reality they are already adults (Ministry of Education Admission Policy, 2018; Ministry of Education Promotional; Pregnancy Policy, 2016 and Transfer Acts, 2018 & the Revised Education Bill, 2018). These circumstances confuse the children as they reach the age of 16, because of The Age of Consent Act allows them to engage in sexual activities. The Age of Consent Act stipulates the minimum age at which an individual is considered legally old enough to consent participation in sexual activity. Alcohol intake and smoking bring the same confusion to the situation. These commodities are sold to persons over 18 years of age and it is legal. The School Rules then contradict with the country law. If these children are allowed by the country regulations to indulge into drinking and smoking because they are adults, will there be a balance on academics and their social behaviors? Hence, the origination of misbehavior in schools which leads to school drop-outs, teenage pregnancies and substance abuse. As shown in Table 2, 47.5% of the participants were 18 year old and above, how can teachers then discipline these adults in the classroom?

The age of learners has opened doors for substance use among them. As shown on Table 3 and 4, 61% of the learners indicated that they had used drugs such as alcohol, hubbly bubbly and cigarettes. 77% of the respondents had fallen in love and indulged in sexual activities. The root cause of such behaviors is the above mentioned policies in place. Evidence that most high school learners are sexually active corresponds well with Malahlela, (2012); and Mashishi and Makoelle, (2014)'s findings on high rates of unplanned pregnancies among leaners. These policies accommodate a 23 year old and above person to be still in school. Above all, the Age of Majority Act starts at 21 year, but at 18 years one is legally allowed to smoke and drink alcohol.

Behavior traits of high school learners

According to Table 4, the frequencies of items on behavioral traits of participants during the past year show that most of the participants had drifted away from the school rules in one way or another. Responses in Table 4, displayed that these school going age people are already sexually active and are smoking and using drugs for non-medicinal purposes. This is maybe the major cause of high rates of pregnancies in schools, dropping out and poor academic performance in Windhoek. Learners are engaging in activities that destroy them instead of studying. Literature has confirmed that high school learners (Rima, 2008; LAC; 2012, and Nekongo-Nielsen and Nchindo, 2013) engage in the mentioned risky acts. On the other hand, the law declares that it is their right because of their age. The behavior

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problems from the learners were an indication that age was playing a major role. The findings are supported by UNESCO (2015) by pointing out that despite the policy; learner pregnancy continues to contribute to young girls dropping out of school. T

It was also observed that bullying was evident in schools. 53% of the respondents indicated that they had bullied others during the past year. It is not surprising that this offence is common in schools and as it is associated with learners who are well versed with the school system. In high school, the grade 8 learners are the main victims since they will be still new and younger from primary school. Responses show that learners in the 16 to 17 age group are major offenders of this transgression. These learners agreed to have beaten, harassed or threatened other learners. This concurs with UNESCO (2015) who states that learners that repeat grades become older than their classmates, hence bullying takes place.

The results in Table 3 and 4 indicated that social media has become the problem of young generations. The responses (49%) showed that learners do visit social media websites during learning times. Most learners between the age of 17 and 19 have agreed that they had used various social media platforms during learning time. This explains why 55% of the respondents had missed out on school lessons.

Conclusion

It has been discovered that the majority of learners in high schools fall under certain laws that allow them to act as adults whilst they are still teenagers. For example, The Age Consent Act allows a 16-year-old to make decisions on sexual matters while they are still staying with parents. This has opened doors for teenage pregnancies, sexually transmitted diseases, abortions and baby dumping cases that Windhoek is facing. The policies have left learners very vulnerable since they start school late and as they reach high school, most of them are already adults. This study has also discovered that people over the age of 18 are still in high school and are permitted by law to smoke if they wish. When they mingle or socialize with the underage learner's peer influence takes over and the innocent ones if not careful, they are trapped in. The hidden curriculum then takes over and those who are under 16 or 18 are left exposed. So, what educational stakeholders see as mischief in some learners is not, because they are behaving according to their age and no one can fight against nature. It is really hard to imagine a discussion that goes on between a 23 plus year old learner and a 13-year-old learner during school break time at school. It can then be concluded that schools are challenged by behavioral problems as a result of the age of the learners. However, as worrying and multifaceted the situation may appear, there are methods that can be implemented to rescue those who start school earlier than 7 years to minimize their conversion to ill behavior traits for the better.

Recommendations

The emphasis of this open-minded research has often focused on the impacts of the Namibia School Admission Policy on High School Learners. Dynamic perceptions were provided in this study to broaden our understanding why some high school learners behave the way they do. The following recommendations are grounded on the results of this study;

- The Government of Namibia should revise the Sexual Consent age and must be from the age of 21 not 16.
- The Ministry of Education should revise the Education Bill, the regulations and Acts concerning the School Admission Age, Promotion-transfer of learners and the Pregnancy Policy.
- There must be specific schools for learners who are over 18 years of age. They must not be allowed to mix or interact with learners who are still under National Laws.

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The Disruptive Blockchain: Types, Platforms and Applications

Article by Mahendra Kumar Shrivas[1], Dr. Thomas Yeboah[2]
[1]*Research Scholar, School of Information Technology, Texila American University, Guyana, South America*
[2]*Head of Department, Department of ICT Christian Service University College, Kumasi, Ghana*
E-mail: [1]mshrivas@texilaconnect.com [2]tyeboah@csuc.edu.gh

Abstract

Organizations with high motivation for growth and cost-effective operation efficiencies, are always trying to bring new technologies to their operations. These organizations are very sensitive to change and value driven thus constant change is the only law for them to achieve their goals and to be in the market. When Bitcoin jumps into the market, the whole world wanted to own it but now after Bitcoin and Cryptocurrency bubble, there are significant shift towards Blockchain related products, services, solution developments, researches and use-case studies. From technical-financial opportunist, to evangelist, to researchers, to Tech enterprises, to financial institutions, to governments, the whole world is behind Blockchain and now it has the technological spot light. Blockchain has left behind all other technologies as far as research initiatives, investments and financial funding are concern. There are substantial research growth on, how Blockchain can be useful in specific area? Objectives of this paper are to highlight some facts about Blockchain that were misinterpreted and misrepresented due to this sudden shift. In this research article, authors are presenting comprehensive literature review of Blockchain Technologies and its applications in various sectors. Our research supports that Blockchain is revolutionizing and disrupting organizations across all industries. Blockchain is really a next big technological invention after Internet. In Blockchain Code is the law and Smart Contracts are the new way of doing business.

Keywords: *Blockchain, Permissioned, Permission less, Smart Contract, Bitcoin, Ethereum, Hyperledger Fabric, Corda R3, Quorum, IOTA, Ripple, Kadena, Tezos, Sawlooth, NEM, MultiChain, HydraChain, BigChainDB, OpenChain.*

Introduction

Industrial revolution, computer revolution and power of internet have transformed various economies in the past and were main driving force of growth. Today we are in the next transition phase, new technologies like Cloud Computing, Big Data, Internet of Things (IoT), Artificial Intelligence (AI), Machine Learning (ML), Quantum Computing, etc. are going become de facto standard of next era of driving force of economic growth and Blockchain is going to be integral part of all technologies.

Blockchain was originally used in Bitcoin by a pseudonym called Satoshi Nakamoto in 2009, which is a digital cryptocurrency. Blockchain facilitates transfer of digital currency between parties without need of any central bank or intermediator in Bitcoin network (Shrivas & Yeboah, 2017; Nofer, Gomber, Hinz, & Schiereck, 2017; Tama, Kweka, Park, & Rhee, 2017). While Bitcoin is designed to store state of ownership of coins, Ethereum can be used to store state of ownership of any items in digital form using smart contracts (Dinh, et al., 2017).

Blockchain is just two-decade-old young disruptive technology and now getting popularity after success of Cryptocurrency. Most of the facts about Blockchain are either exaggerated, misinterpreted, little known or still unknown. The main objectives of this paper are to highlight some important phenomena about Blockchain that were misinterpreted and misrepresented. Exploratory research methodology is used in this comprehensive research study. The Standard Exploratory Method Type I, Exploratory method type 5 and 6 (Swedberg, 2018) were employed to explore various Blockchain related concepts. We tried to explore all

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possible secondary sources to understand Blockchain related phenomena. We explored thousands of resources mainly research articles from Google Scholar, IEEE Explore, Whitepapers, Discussion forums, Websites, Blogs, Developer Documentations from Blockchain Projects, Project Codes from GitHub, etc. and presented it in this publishable research paper (Miscione, Ziolkowski, Zavolokina, & Schwabe, 2018). In the exploration phase we used all possible key combination like "Blockchain and Open Chain", "Blockchain and Project Funding", etc. in search query and choose most relevant and reliable source for the study.

This paper has been organized in various sections. Section II focuses on Blockchain and types while Blockchain Platform reference architecture and Blockchain platforms have been discussed in Section III. Section IV covers current and future status of financial infusion and Blockchain project initiatives while there is detailed discussion on applications of Blockchain in Section V. Conclusion is given in Section VI at the end.

Blockchain and types

A distributed ledger that holds collection of interlinked blocks along with block hash is called Blockchain (Shrivas & Yeboah, 2017). Blockchain is distributed registry, which records transactional data blocks initiated by participating notes in the Blockchain network. Block is basic unit in Blockchain, which is generally combinations of block header and block data as depicted in Figure 1. Block header generally holds information like current block hash, root hash, timestamp, nonce, previous block hash while block data portion contains total number of transaction, transaction details (sender address, value being transfer, receiver address, transaction fee, etc.) (Dinh, et al., 2017; Zheng Z. , Xie, Dai, Chen, & Wang, 2017; Fernàndez-València, Caube, & Vila, 2018). A cryptographic hash algorithm like SHA-256, SHA2-512, SHA-256d (Glabb, Imbert, Jullien, Tisserand, & Veyrat-Charvillon, 2007), SHA3-256 (Dworkin, 2015), SHAKE256, Winternitz hash (Buchmann, Dahmen, Ereth, Hülsing, & Rückert, 2011), BLAKE2 (Patent No. IETF RFC 7693, 2015), Keccak256 (Bertoni, Daemen, Peeters, & Assche, 2009), Scrypt (Patent No. No. RFC 7914, 2016), etc. is used to generate hash value of block that is stored in the block. Therefore, each blocks hold the value of either current block & previous block or only previous block hash (Tama, Kweka, Park, & Rhee, 2017). Each blocks are inter-linked in Blockchain generally by Merkle tree or acyclic directed graph, etc. and can be retrieved using underline protocol scheme. Figure 1 shows sample Block structure, while Figure 2 represent sample blocks in Blockchain, which is high level and general representation to understand Blockchain architecture. Hash values are unique for blocks thus it is very hard to change block data once it is recorded in the distributed Blockchain. Firstly, Blockchain is distributed, so if anyone wanted to change any one block, they have to alter the records everywhere and secondly they have to change all forward blocks because change in one block will generate a different hash causing different hash value for all foremost blocks, which require consent of all participating parties and required lots of computing power. This makes Blockchain transparent, temper proof, and ensure trust between parties. Third parties, intermediary or agents can be eliminated using Blockchain thus Blockchain just not ensure trust between parties but also help in lowering down the cost. Blockchain allows participants to query each transaction or transaction paths thus each transactions can be traceable from originating address/note to receiver address/node from tamperproof-distributed records.

Block Header					
Block Hash	Tree Root Hash	Timestamp	Nonce	Previous Block Hash	Other Metadata
Block Data					
Transaction Counter		Total Block Value		Total Block TX Fee	
Transaction(TX1)	Transaction(TX2)	Transaction(TX3)	Transaction(TX4)	Transaction(TX5)	Transaction(TXn)
Sender Address	Sender Address	Sender Address	Sender Address	Sender Address	Sender Address
Value	Value	Value	Value	Value	Value
TX1 Fee	TX2 Fee	TX3 Fee	TX4 Fee	TX5 Fee	TXn Fee
Receiver Address	Receiver Address	Receiver Address	Receiver Address	Receiver Address	Receiver Address

Figure-1. Sample Block Structure

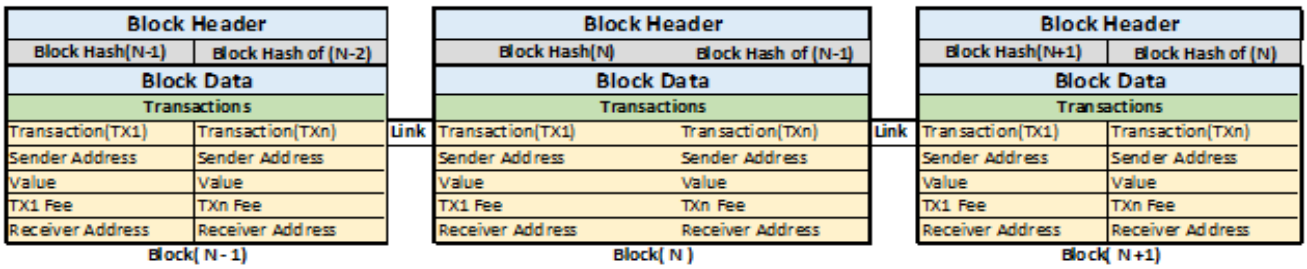

Figure-2. Sample Blocks in Blockchain

Blockchain types

Based on the nature of data accessibility (Lin & Liao, 2017) **Blockchain can be categories as below**

1. **Public Blockchain:** - In this type of Blockchain, anyone one can read and submit transaction.
2. **Private Blockchain: -** In this type of Blockchain only one organization or all subsidiary organization within same group are allowed to read and submit transaction.
3. **Community/Consortium Blockchain: -** In this type of Blockchain multiple group of organizations form a consortium and are allowed to submit transactions and read transactional data.
4. **Hybrid Blockchain: -** This is new category where any of three Public, Private or Community/Consortium, Blockchain can be combined to facilitate transactions. A Blockchain platform can be configured in multi-mode using Hybrid Blockchain.

Based on the need of authorization to participate in Blockchain it can be categories (Michael, Cohn, & Butcher, 2018) **as below**

1. **Permission less Blockchain: -** No prior permission is needed to participate in this type of Blockchain, everyone allowed to participate in verification process and can join Blockchain network with their own computational power.
2. **Permissioned Blockchain**: - To join this type of Blockchain prior permission is needed. Only authorized parties are allowed to run nodes to verify transactions in Blockchain network.
3. **Hybrid Blockchain: -** There could be possibility that a node is participating in Permission less and Permissioned Blockchain together to facilitate inter-Blockchain communication such Blockchain can be called Hybrid Blockchain. A Blockchain platform can also be configured to support Permissioned and/or Permission less model.

As far as core functionality and smart contract support in concern, Blockchain can be categories (Hileman & Rauchs, 2017) **into following: -**

1. **Stateless Blockchain: -** Stateless Blockchain system only focus on transaction optimization and chain functionality that is verifying the transaction by computing hashes. It is independent from smart contract logic layer thus unaffected from smart contract code bugs and vulnerabilities.
2. **Stateful Blockchain: -** This type of Blockchain provide smart contract logic optimization along with optimized transaction computing capabilities.

Blockchain platforms

Blockchain is emerging technology and reaching to maturity as adoption is growing. Bitcoin was the first Blockchain powered platform launched in 2009 and was designed to exchange digital cryptocurrency without any need of central authority. Bitcoin revolutionizes exchange of money by using distributed technology and cannot counterfeited due to strong cryptographic protocol and hash function. New coins can only be generated by mining process as a reward for solving computation hashes and verifying transactions (Zheng Z. , Xie, Dai, & Wang, 2016).

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In last one decade there are various Blockchain platforms that are somehow similar to Blockchain platform but with added functionalities, have been developed. Blockchain platform is core of Blockchain network and provides key services to participating nodes. A typical Blockchain platform (Cloud Standards Customer Council, 2017) should have following modules as depicted in Figure 3:-

1. **Blockchain Runtime Environment: -** To be able to process Blockchain transactions and smart contracts Blockchain needed a secure hosting environment. Generally secure operating system, programming language, runtime libraries and supporting libraries reside in this layer.
2. **Cryptographic Services: -** This layer provides access to cryptographic algorithms like hash function, digital signature, etc.
3. **Smart Contract Module: -** Smart contract module is optional and only applicable to Stateful Blockchain. It encapsulates business logics that can be implemented using programming language like go, solidity, java, Rust, C++, etc.
4. **Blockchain Secondary Storage: -** Blockchain platform process high amount of transactions and needs highly secure, reliable and scalable storage solution to store block data in Blockchain distributed ledger. This layer provides permanent storage capabilities to platform. Generally Level DB, Rocks DB, H2 Database, Mongo DB is being used as storage along with other distributed data storage solutions to store ledger information.
5. **Blockchain Memory Store: -** This layer stores latest transactions in memory for faster data retrieval and to speed up the transaction execution. Merkle Tree, Trie, Acyclic Directed Graph, Associative Array, etc. are some of the data structures that are being used as a memory storage in various Blockchain platforms.
6. **Consensus Protocol Module: -** This module contains mechanism to achieve agreement between nodes about transaction validity and authenticity. Once majority of nodes are agree and consensus level is achieved then the given transaction is treated as valid and recorded in the distributed ledger. Proof of Service (Pow), Proof of Stake (PoS), Proof of Importance (PoI), Raft, Byzantine Fault Tolerance (BFT), etc. are some of the famous Blockchain Consensus Protocol in use.
7. **Blockchain Services Layer: -** Using this layer Blockchain platforms can be leverage with extra capabilities such as membership management, authorization and access management, event distribution and notification services, exposing platform services using Application Programing Interface (API), etc. However, some of the services like membership management, authorization, access management, etc. are mean only for Permissioned Blockchain and not applicable to Permission less Blockchain.
8. **Communication Protocol:** Blockchain Protocol implements standard rules that facilitates distributed peer-to-peer communication between participating nodes in Blockchain network. Bitcoin uses broadcasting over TCP connection (Bitcoin Community, 2018) and Hyperledger Fabric is powered by a gossip data dissemination protocol (Hyperledger, 2018) while Ethereum uses devp2p protocol (Ethereum Community, 2018).

Generally, users send transaction to a node in Blockchain network. The Node groups set of transactions into one block and then broadcast this Block to all nodes for processing. Nodes compute cryptographic hashes, process Blockchain transactions, and broadcast success result to all Nodes in Blockchain network. Based on Consensus and agreement block is added to distributed ledger and transaction is completed successfully. In case of Bitcoin and Ethereum the node that is successfully verified the transaction is rewarded and this process is called mining.

Table 1 shows most popular Blockchain Platforms and its categorization while Blockchain Platforms and its technical specifications have been pretested in Table 2.

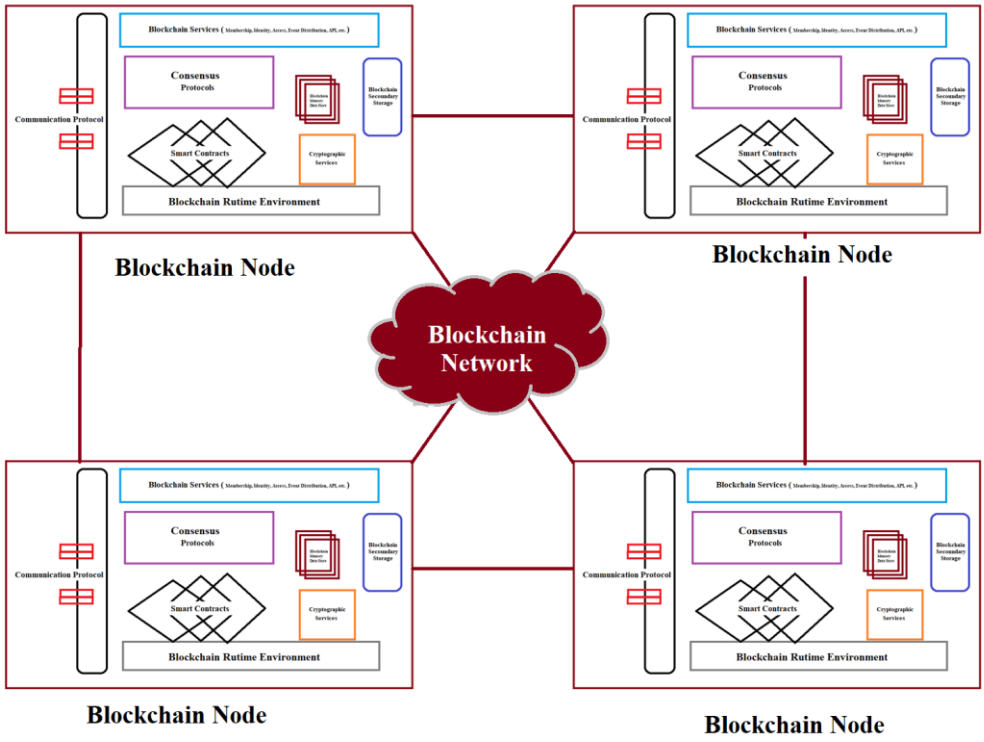

Figure 3. Sample high-level blockchain and network architecture

Table 1. Blockchain Platform and Categorization

S.N.	Blockchain Platform	Start Year	Category 1 (Private/Public/Consortium/Hybrid)	Category 2 (Permission less/Permissioned/Hybrid)	Category 3 (Stateless/Stateful)	Project Website
1	**Bitcoin**	2009	Public	Permission less	Stateless	https://bitcoincore.org https://bitcoin.org
2	**Ethereum**	2015	Public	Permission less	Stateful	https://ethereum.org/
3	**Hyperledger Fabric**	2016	Consortium	Permissioned	Stateful	https://www.hyperledger.org/
4	**Corda R3**	2015	Consortium	Permissioned	Stateful	https://www.corda.net/
5	**Quorum**	2016	Consortium	Permissioned	Stateful	https://www.jpmorgan.com/global/Quorum
6	**IOTA**	2015	Public	Permission less	Stateless	https://www.iota.org/
7	**Ripple**	2012	Consortium	Permissioned	Stateless	https://ripple.com/
8	**Kadena**	2016	Hybrid	Hybrid	Stateful	https://kadena.io
9	**Tezos**	2018	Public	Permissioned	Stateful	https://tzscan.io

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10	**Sawlooth**	2016	Hybrid	Hybrid	Stateful	https://www.hyperledger.org/projects/sawtooth
11	**NEM**	2015	Hybrid	Hybrid	Stateless	https://nem.io/
12	**Multi Chain**	2015	Private	Permissioned	Stateless	https://www.multichain.com
13	**Hydra Chain**	2016	Hybrid	Hybrid	Stateful	https://github.com/HydraChain
14	**Big ChainDB**	2016	Hybrid	Hybrid	Stateless	https://www.bigchaindb.com
15	**Open Chain**	2015	Hybrid	Hybrid	Stateless	https://www.openchain.org/

Table 2. Blockchain platform and technical specification

S.No.	Blockchain Platform	Hash Function	In Memory Data Structure	Secondary Storage	Consensus Protocol	Programming Languages
1	**Bitcoin**	SHA-256	Merkle Tree	Level DB	Proof of Work	C++
2	**Ethereum**	Keccak256	Trie	Level DB, Rocks DB	Proof of Work (Ethash)	Go, C++, Rust, Solidity
3	**Hyperledger Fabric**	SHA3 SHAKE256	Bucket-tree, Merkle Tree	Rocks DB	Supports pluggable consensus like Practical Byzantine Fault Tolerance (PBFT), Raft, PoW, PoS	Go, JavaScript, Java
4	**Corda R3**	SHA-256	Merkle tree	H2 database	Validity consensus, Uniqueness consensus, pluggable consensus	Java, Kotlin
5	**Quorum**	Keccak256	Trie	Level DB	QuorumChain pluggable consensus (PoS, Raft, Istanbul - BFT)	Go
6	**IOTA**	Winternitz hash	Acyclic Directed Graph	Trytes, Balanced Trinary System	PoW	Go, C, C++, Java, JavaScript
7	**Ripple**	SHA2-512	Merkle Tree, Knowledge Grap	Rocks DB, NuDB	XRP Ledger Consensus Protocol	C++ , JavaScript
8	**Kadena**	BLAKE2	Merkle	Oracle	BFT Raft, ScalableBFT	Pact

9	**Tezos**	SHA-256,BLAKE2	Merkle	Distributed Database	Proof-of-Stake	Michelson
10	**Sawlooth**	SHA-512,SHA256	BlockCache, Radix Merkle Tree	BlockStore	Pluggable consensus algorithms Proof of Elapsed Time (PoET), PoW, PBFT	Rust, Python, JavaScript, Go, C++, Java
11	**NEM**	SHA-256d	Web, Portable or Network database	Web Database, Access database	Proof of Importance	Java, C++
12	**Multi Chain**	SHA3-256	Merkle Tree	Level DB	PoW	C++
13	**Hydra Chain**	SHA3-256	Merkle tree	Level DB	PBFT	Python
14	**Big ChainDB**	SHA3-256	Associative Array	Mongo DB	BFT	Python, JavaScript, Java
15	**Open Chain**	SHA-256	Associative Array	SQLite, SqlServer, Mongo DB	Proof of Work	C#

Blockchain current and future status

Blockchain has left behind all other technologies as far as research initiatives, investments and financial funding are concern. Resource ready Cloud Computing platforms are also fueling adoption of Blockchain. Blockchain-as-a-Service (BaaS) is new service offering category after SaaS, PaaS and IaaS from various Cloud Computing providers (Hiran, Henten, Shrivas, & Doshi, 2018).

Blockchain is going to generate new business value of $176 billion by 2025, which will grow to $3.1 trillion by 2030 further (Lovelock, Reynolds, Granetto, & Kandaswamy, 2017). Value generation of Blockchain in 2030 is greater than individual Gross Domestic Product (GDP) of France (2.6 trillion), United Kingdom (2.6 trillion) and India (2.4 trillion) (statista.com, 2018) in 2017.

A. Financial infusion and project initiatives

As per PricewaterhouseCoopers (PwC) 2018 survey with 600 global executives 84% of executives were actively involved with Blockchain. As per the survey, various organizations reported their Blockchain based project status as 20% research stage, 32% development stage, 10% Pilot stage and 15% projects were live. In First five-month of 2018, various start-ups & market leaders raised $13.7 billion for Blockchain based products and services via Initial Coin Offerings (ICOs). Industry wide Blockchain leadership were reported as Financial services 46%, Industrial products and manufacturing 12%, Energy and utilities 12%, Healthcare 11%, Government 8%, Retail and consumer 4% while Entertainment and media 1% (PricewaterhouseCoopers (PwC) Ltd., 2018).

In another global survey on Blockchain in 2018 by Deloitte found Blockchain working use-case Supply chain 53%, Internet of Things 51%, Digital identity 50%, Digital records 44%, Digital currency 40%, Payments 30% and Voting 12%. Organizations from Canada (36%), China (49%), France (37%), Germany (36%), Mexico (48%), United Kingdom (40%) and United States (14%) reported that Blockchain is currently in production. While Organizations from Canada (51%), China (86%), France (44%), Germany (40%), Mexico (56%), United Kingdom (49%) and United States (24%) are investing in hiring staff with Blockchain experience now and in the future (Pawczuk, Massey, & Schatsky, 2018).

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Figure 4 suggests that Various Venture capital firms have invested total $1,222 million in 558 companies. While they have funded total 295, Blockchain projects in last 12 months. As per Figure 4 New York (NY) gets highest amount of $268 million investment followed by Menlo Park (CA) $163 million, San Francisco (CA) $125 million and Beijing (China) $102 million and where top four city getting funding from Venture Capital firms respectively. Beijing (China) gets 48 highest number of funding for Blockchain projects followed by Palo Alto (CA) 44, New York (NY) 41 and Menlo Park (CA) 33 projects. While Venture Capitals firms have funded total 121 projects in New York, 83 projects in San Francisco, 63 projects in Menlo Park and 57 projects in Beijing.

Complete names of projects/organizations who have get funding from Venture capital firms have been given in Appendices A - Top 50 Venture Capital Firms Investing in Blockchain Project/Organization). While Figure 5 shows data of top 50 global public companies, their fortune. Public companies from various countries are aggressively working on Blockchain use cases. Top 50 global public companies with total $11,678.1 billion market valuation and $44,089 billion assets are generating yearly sales volume of $5,505.1 billion and making $661.2 billion profits yearly. All these top public companies are exploring Blockchain and pumping huge money in Blockchain related technologies. Public companies from China and United States are showstopper in this Blockchain play as depicted in Figure 5.

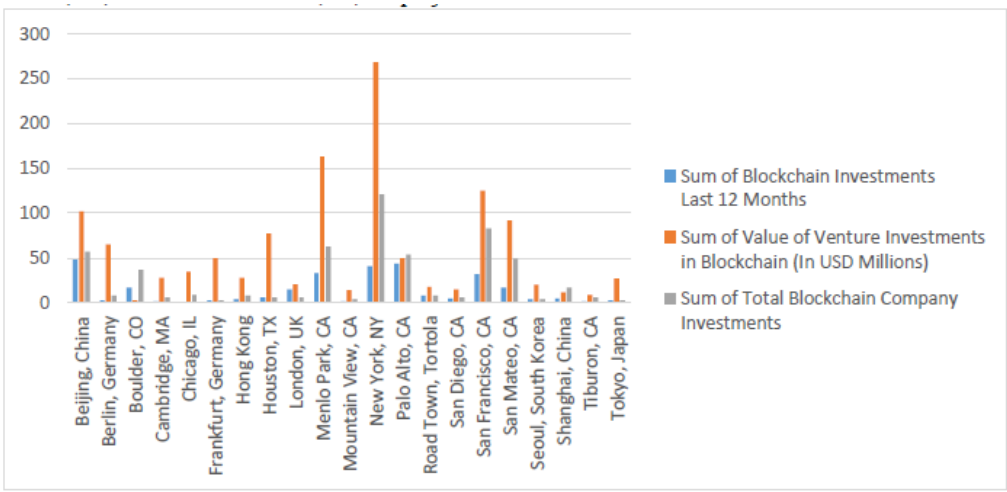

Figure 4. City wise Investment by Venture Capital Firm in Blockchain Projects (through 15 June 2018)

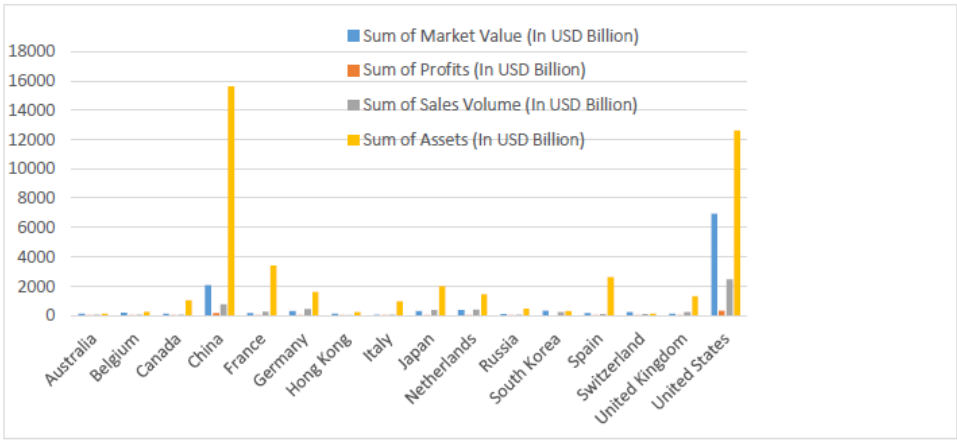

Figure 5. Country wise financial of Top 50 Global Public Companies investing in Blockchain

B. Human capital

Human capital is very important factors to sustain growth and achieve technological maturity specifically in Blockchain like young technology. As being the new and evolving technology, there are huge demand of skilled human resources in Blockchain sector. There is huge gap in supply and demand. China has evolved as global hub of Blockchain based investment while United States has largest number of Blockchain developer communities followed by India. Top five country wise total estimated Blockchain developers head count stood as 27,876(US), 12,509(India), 7,656(UK), 4,544(Canada) and 4,283(France) as depicted in Figure 6 (Filatov, 2018).

There is huge demand of Blockchain related skills in job market. As per Burning Glass Technologies in 2016, there were 1,838 job openings, that grew to 3,958 job opening, clocking 115% job growth (Bittle, 2017). As per Indeed.com Blockchain based job openings increased by 207% in 2016-2017. While demand for Blockchain engineers has grown up 700% from Jan-2017 to Jan-2018. Job openings grown-up from 1,037 jobs in December 2016 to 4,541 job opening in Dec. 2017 on LinkedIn (HowToToken Team, 2018). At the time of writing this article, there were total 13,831 active job openings Worldwide in LinkedIn while industry wise distribution of job opening were Information Technology and Services (9205), Computer Software (8566), Financial Services (4798), Internet (4047), Staffing and Recruiting (1659), Hospital & Health Care (163), Insurance (135), Computer Hardware (112), Investment Management (92), Fund-Raising (15). Job Function wise job openings were Information Technology (7875), Engineering (5236), Business Development (998), Marketing (911), Finance (672), Writing/Editing (321), Product Management (296), Human Resources (168), Administrative (114) and other (1547). While Location wise job openings recorded as United States (4042), United Kingdom (1417), London, United Kingdom (1042), Germany (933), Netherlands (761), Greater New York City Area (711), India (590), Amsterdam Area, Netherlands (318), Hong Kong (197) and Chennai Area, India (35). As per Figure 7 Malta is having highest 46 Blockchain developers per 100K Population followed by Luxembourg 36 developers, Singapore 36 developers, Switzerland 24 developers and Netherlands 19 developers respectively. Blockchain development is hottest skills and demands has grown more than 6000% within a year as far as Blockchain related Freelancing work is concern. In Free Launching job market specialist are making between $50 to $150 per hours based on their experience level while Blockchain full time developer earns between $50K and $180K yearly (Mearian, 2018). Apart from technical skills demand there are significant demand for Marketing Manager, Community Manager, Relations Manager, Product Manager, Risk Analyst, etc. (Walters, 2018).

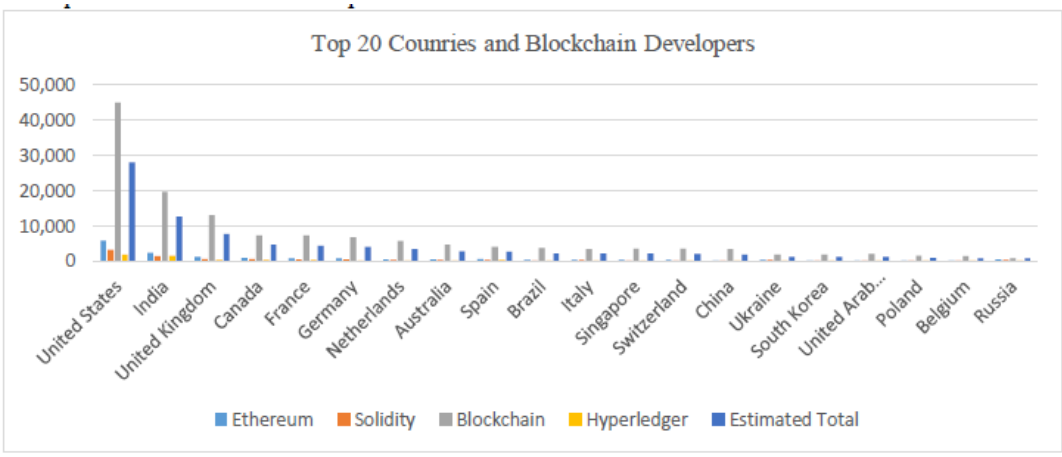

Figure 6. Global blockchain developers counts (Top 20 Countries)

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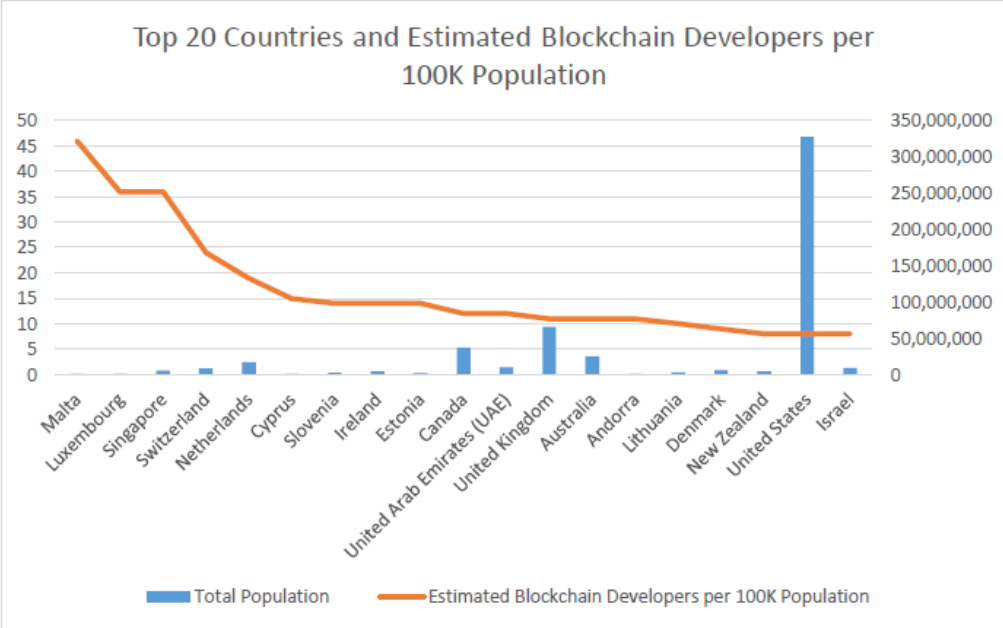

Figure 7. Estimated global blockchain developers per 100k population (Top 20 Countries)

C. Blockchain applications

Governments in Dubai, United States, Korea China and India are planning to launch public services using Blockchain to prevent fraud and better data management. Blockchain is disrupting all sectors and going to become most widely adopted technology of this era. It is having vast area of applications although some of the applications of Blockchain are listed below

1. **Land Registry:** The Swedish Lantmäteriet has successfully tested a Blockchain Platform for Land Registry with the help of SBAB, Telia Company, Landshypotek Bank, Kairos Future and ChromaWay. The Land Registry System (Figure 8) stores purchase/sale bills and contracts, signatures of parties, their identity documents and ownership information in Blockchain. Edition of records are allowed through administrative interface only but record all the transactions in Blockchain, which can be viewed by all stakeholders like buyers, sellers, agents, banks including public (Kempe, 2017). Ghana government and IBM have signed Memorandum of Understanding (MoU) to develop Blockchain based Platform (ghanaweb.com, 2018). An Indian state government, Andhra Pradesh has also piloted land registry and registered 100,000 land records in Blockchain (Haridas, 2018).
2. **International Trade:** World Trade Organization (TWO) is looking at various feasibility to bring International Trade in Blockchain (Ganne, 2018). In January 2018 Maersk and IBM come up together to develop Blockchain based solution to Digitize Supply Chains and Improve Global Trade (White, 2018) and in August, 2018 Maersk and IBM Introduce a robust Blockchain Platform called TradeLens with Shipping Solution 90 organizations participated in this solution and 154 million events captured. TradeLens is recording one million trade-based events on daily basis (IBM, 2018). Singapore and Hong Kong are jointly developing Global Trade Connectivity Network (GTCN) using Distributed Ledger Technology (DLT) (Hong Kong Monetary Authority (HKMA), 2017).
3. Customs: The World Customs Organization (WCO) has already initiated feasibility study to transform custom processes into Blockchain. They are exploring the option to join TradeLens platform jointly developed by IBM and Maersk including Global Trade Connectivity Network (GTCN) (Okazaki, 2018). U.S. Customs and Border Protection (CBP) agency is also testing Blockchain based shipment tracking system developed by the Department of Homeland Security (Partz, 2018). Samsung SDS is

developing a Blockchain based platform for an export and customs clearance system for The Korea Customs Service (KCS) (Das, 2018).

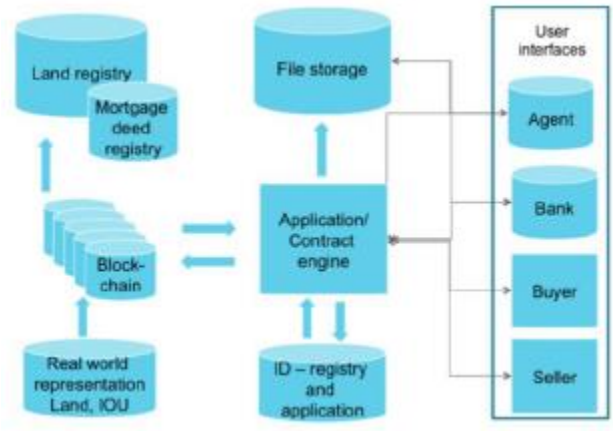

Figure 8. The swedish lantmäteriet land registry blockchain platform

As shown in Figure 9 Banking, Financial Service and Insurance are most disrupted sectors by Blockchain followed by Conglomerate and Automotive sectors, and are the consumers of Blockchain. While Technology sectors are Blockchain platform and service providers in general. We have listed top 50 global public companies in Table 3 who are exploring/adopting Blockchain in their businesses. Blockchain application use cases are also listed along with it.

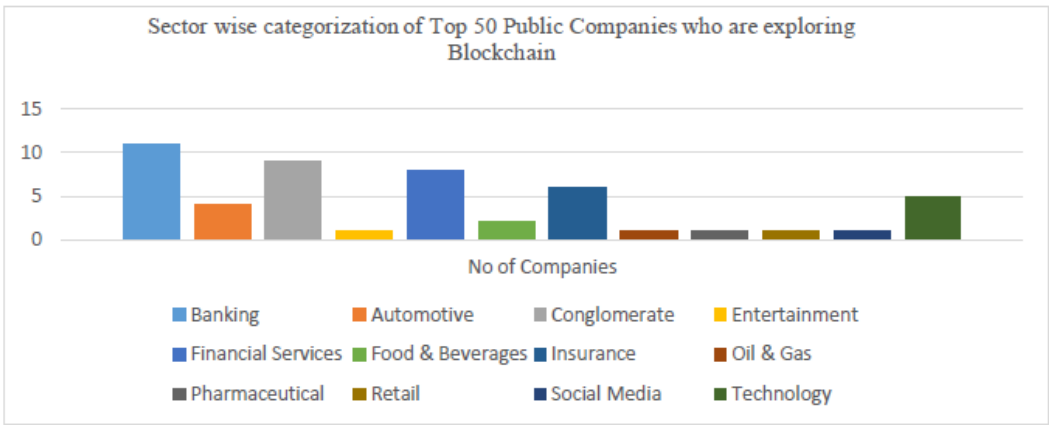

Figure 9. Sector wise categorization of top 50 public companies who are exploring blockchain

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Table 3. Global Top 50 Public Companies[1] and their Blockchain Use Case Plan

S. No	Rank[2]	Public Company Name	Company Category	Country	Blockchain Application Use Case	Website
1	1	Industrial and Commercial Bank of China (ICBC)	Banking	China	Trying to verify digital certificates using Blockchain	http://www.icbc-ltd.com/icbcltd/en/
2	2	China Construction Bank	Banking	China	Using IBM Blockchain for financial products	http://www.ccb.com/en/home/indexv3.html
3	3	JPMorgan Chase	Financial Services	United States	Contributed to Quorum Project	https://www.jpmorganchase.com/
4	4	Berkshire Hathaway	Conglomerate	United States	Blockchain base supply chain	http://www.berkshirehathaway.com/
5	5	Agricultural Bank of China	Banking	China	Unsecured agricultural loans on Blockchain for e-commerce merchant	http://www.abchina.com/en/
6	6	Bank of America	Banking	United States	Trying to use Ethereum Blockchain to automate issue of letters of credit	https://www.bankofamerica.com/
7	7	Wells Fargo	Financial Services	United States	Member of R3 and trying to simplify tracking of securitized home mortgages.	https://www.wellsfargo.com/
8	8	Apple	Technology	United States	Registered a patent to timestamp data using Blockchain	https://www.apple.com/
9	9	Bank of China	Banking	China	Working with Tencent to develop financial solutions using Blockchain.	www.boc.cn/en/
10	10	Ping An Insurance Group	Insurance	China	Member of R3 and working with various insurance firm to develop Blockchain solution	http://www.pingan.cn/en/index.shtml

[1] Source:- Big Blockchain: The 50 Largest Public Companies Exploring Blockchain(https://www.forbes.com/sites/michaeldelcastillo/2018/07/03/big-Blockchain-the-50-largest-public-companies-exploring-Blockchain/588939c92b5b) and Global 2000: The World's Largest Public Companies (https://www.forbes.com/global2000/list/)

[2] Rank is based on 16th annual Forbes Global 2000 list which include topmost public companies from 60 countries

11	11	Royal Dutch Shell	Oil & Gas	Netherlands	Funding Blockchain projects and working with BP to develop Energy Commodities Platform	https://www.shell.com/
12	12	Toyota Motor	Automotive	Japan	Founder member of Blockchain Mobility Consortium and developing Blockchain based payment system for self-driving cars	https://www.toyota-global.com/
13	14	Samsung	Conglomerate	South Korea	Own Nexledger platform to track global supply chains	https://www.samsung.com
14	19	BNP Paribas	Banking	France	Blockchain platform for internal treasury operations	https://group.bnpparibas/en/
15	20	Microsoft	Technology	United States	Offering Blockchain as a services on Azure Platform	https://www.microsoft.com
16	22	Allianz	Financial Services	Germany	Working on self-insurance Platform	https://www.allianz.com
17	23	Alphabet	Conglomerate	United States	Working on various Blockchain projects	https://abc.xyz/
18	24	Walmart	Retail	United States	Supply Chain on Hyperledger Fabric	https://www.walmart.com/
19	29	Daimler	Automotive	Germany	Corporate bond using Ethereum Blockchain	https://www.daimler.com/en/
20	31	Banco Santander	Banking	Spain	Funded to Ripple and Digital Asset Holdings and own a payment platform on Ripple	https://www.santander.com
21	33	AXA Group	Insurance	France	Own 'Fizzy' smart contract platform to execute flight insurance payments	https://www.axa.com/
22	34	Comcast	Conglomerate	United States	Indirectly investing in enterprise Blockchain startups.	https://www.xfinity.com/
23	41	Anheuser-Busch InBev	Food & Beverages	Belgium	Blockchain based logistics Platform	https://www.ab-inbev.com/
24	42	Royal Bank of Canada	Banking	Canada	Automating credit scores on Blockchain	www.rbcroyalbank.com
	44	Pfizer	Pharmaceutical	United States	Blockchain based supply chains solution	https://www.pfizer.com/
26	47	Sberbank	Banking	Russia	Blockchain lab, Blockchain solution for corporate bonds	https://www.sberbank.ru

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27	48	Nestle	Food & Beverages	Switzerland	Working with IBM to develop Blockchain based supply chain solution	https://www.nestle.com/
28	49	Intel	Technology	United States	Part of Hyperledger consortium & Developing Hardware for Blockchain Platforms	https://www.intel.com
29	50	Morgan Stanley	Financial Services	United States	Clearing house for bitcoin futures contracts	https://www.morganstanley.com/
30	51	Siemens	Conglomerate	Germany	Blockchain for energy Sector	https://www.siemens.com
31	53	Amazon.com	Conglomerate	United States	Blockchain & Cloud integration, working with Ethereum startup ConsenSys for Blockchain solutions	https://www.amazon.com/
32	56	ING Group	Financial Services	Netherlands	User Identity	https://www.ing.com
33	60	Goldman Sachs Group	Financial Services	United States	Trading Platform	https://www.goldmansachs.com/
34	61	Intesa Sanpaolo	Banking	Italy	Using Public Bitcoin Blockchain to timestamp records and Ethereum Blockchain for derivatives	https://www.intesasanpaolo.com/
35	66	Prudential Financial	Insurance	United States	Financing Blockchain Companies	https://www.prudential.com
36	66	Prudential	Insurance	United Kingdom	Trade platform for SME	https://www.prudential.co.uk/
37	67	IBM	Technology	United States	Contributor to Hyperledger Fabric and have multiple Blockchain initiatives, Blockchain Technology Provider	https://www.ibm.com
38	67	Ford Motor	Automotive	United States	Blockchain research group for the auto industry Has a patent for controlling traffic flow	https://www.ford.com/
39	72	Walt Disney	Entertainment	United States	Developing various Blockchain solution and own Dragonchain platform	https://www.thewaltdisneycompany.com/
40	77	Facebook	Social Media	United States	Exploring Blockchain Use-Cases	https://newsroom.fb.com/company-info/
41	78	MetLife	Insurance	United States	Own Blockchain platform for Insurance	https://www.metlife.com/

42	81	Alibaba	Conglomerate	China	Food supply chain, Blockchain technology Provider	https://www.alibaba.com/
43	92	AIA Group	Insurance	Hong Kong	Developed Bancainsurance platform using Hyperledger Fabric and runs its own Blockchain accelerator	http://www.aia.com/en/index.html
44	105	Tencent Holdings	Conglomerate	China	Developing Blockchain for taxes	https://www.tencent.com/en-us/
45	107	Oracle	Technology	United States	Contributor to Hyperledger Fabric and Own Enterprise Blockchain Platform	https://www.oracle.com
46	108	BHP Billiton	Conglomerate	Australia	Blockchain for Supply chain	https://www.bhp.com/
47	112	Mitsubishi	Automotive	Japan	Using Ripple payments network and Planning to launch their own Blockchain Platform	https://www.mitsubishicars.com/
48	114	Mizuho Financial	Financial Services	Japan	Funding Blockchain projects	https://www.mizuho-fg.com
49	116	BBVA-Banco Bilbao Vizcaya	Banking	Spain	Developing platform for Corporate loan in Ethereum and Hyperledger Fabric.	https://www.bbva.com/en/
50	119	American Express	Financial Services	United States	Membership rewards using Blockchain	https://www.americanexpress.com/

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Conclusion

This is certain that Blockchain is new technology and disrupting almost all sectors. Various organizations are pouring lots of money into Blockchain Platform development and transforming their businesses and operation by adopting Blockchain but the big question on hand is, why? Because these organizations knows that, there are various complexities and loopholes in their existing systems, which Blockchain is addressing. Data is stored in distributed ledger, secured using cryptographic functions and almost temper resistance. Blockchain promote trust and transparency between participating parties and elements need of third parties that is huge cost saving and operational plus point. Smart contracts are the digital agreements between parties and a new way of doing business while Code is the law in Blockchain and records in ledger are proof of an event.

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Appendices

Table 4. Top 50 venture capital firms investing in blockchain project/organization

S. No.	Venture Capital Firms Name	Blockchain Investments, Last 12 Months	Value of Venture Investments in Blockchain (In millions)	Total Blockchain Company Investments	Top Blockchain Project/Organization funded	City	Website
1	Digital Currency Group	15	78	58	Basis, Ledger, Circle, Blockchain Inc.	New York, NY	http://dcg.co
2	Pantera Capital	13	65	31	Basis, Circle, Harbor, Dmarket	Menlo Park, CA	https://www.panteracapital.com
3	Blockchain Capital	12	71	37	Circle, Coinbase, Blockstream, Ripple	San Francisco, CA	http://blockchain.capital
4	Andreessen Horowitz	9	55	14	Basis, Coinbase, DFINITY, Harbor	Menlo Park, CA	https://www.a16z.com
5	Node Capital	21	20	22	Trip.io, HuoBi, Delphy Foundation, Fengwo	Beijing, China	http://www.nodecap.com
6	Boost VC	11	67	32	BlockCypher, Tezos, Ledger, Coinbase	San Mateo, CA	https://www.boost.vc/
7	IDG Capital	4	31	8	Ripple, Circle, Mars Finance, imToken	New York, NY	http://en.idgcapital.com

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8	Draper Associates	6	25	17	Coinbase, Ledger, Factom, CryptoMove	San Mateo, CA	http://www.draper.vc
9	Ceyuan Ventures	4	36	6	Basis, Mars Finance, Trip.io, OkCoin	Beijing, China	http://www.ceyuan.com/en/index.html
10	Lightspeed Venture Partners	3	24	6	Basis, Blockchain Inc., Saga Foundation, BTCC	Menlo Park, CA	http://lsvp.com
11	Techstars	17	3	37	Filament, Tok.tv, Storj Labs, Chainalysis	Boulder, CO	https://www.techstars.com
12	RRE Ventures	2	32	12	Paxos, Ripple, Abra, Gem	New York, NY	http://www.rre.com/
13	Union Square Ventures	3	28	9	Coinbase, CryptoKitties, Polychain Capital	New York, NY	https://www.usv.com/
14	General Catalyst	2	28	6	Circle, Bitwise, Bluzelle	Cambridge, MA	http://generalcatalyst.com
15	Liberty City Ventures	2	29	5	Paxos, Libra	New York, NY	https://www.libertycityventures.com/
16	500 Startups	4	5	16	Libra Credit Network, BlockCypher, Hijro, Stably Blockchain Lab	San Francisco, CA	https://500.co
17	DHVC (Danhua Capital)	19	20	21	Libra Credit Network, Hedera Hashgraph, Origin Protocol	Palo Alto, CA	http://www.danhuacap.com/
18	18 Kindred Ventures	5	15	6	Radar Relay, TruStory, dYdX, Rare Bits	San Diego, CA	https://kindredvc.com

19	Sequoia Capital	5	12	8	Guanguan Coin, String Labs, Binance	Menlo Park, CA	www.sequoiacap.com
20	Future Perfect Ventures	2	15	11	Blockstream, Blockchain Inc., Harbor, Abra	New York, NY	http://futureperfectventures.com
21	Fenbushi Capital	5	12	17	Symbiont, Gem, Stream Token, Ripio	Shanghai, China	http://fenbushi.vc
22	ZhenFund	7	11	10	Basis, LIno, Silot, BlockSeer	Beijing, China	http://www.zhenfund.com
23	First Round Capital	3	6	8	Abra, Rare Bits, Amino Payments, Gem	San Francisco, CA	http://firstround.com
24	Limitless Crypto Investments	6	77	6	Tezos, Power Ledger, 0x, Kadena LLC	Houston, TX	https://www.limitlesscryptos.com/
25	FBG Capital	14	30	14	Ripio, Origin Protocol, Eximchain, Lino	Beijing, China	https://www.fbg.capital/
26	Tally Capital	1	35	9	Blockstream, Civic, MaidSafe, Blockchain Capital	Chicago, IL	http://tallycapital.com/
27	GV (Google Ventures)	2	14	4	Basis, Blockchain Inc., Veem, Ripple	Mountain View, CA	https://www.gv.com/
28	Polychain Capital	8	40	8	Basis, DFINITY, MakerDAO, CoinList	San Francisco, CA	http://polychain.capital/
29	Earlybird Venture Capital	1	15	5	Traxpay, XAIN Group, BigChainDB	Berlin, Germany	https://earlybird.com
30	InBlockchain	8	18	8	Eximchain, Lino, ONO, Trip.io	Road Town, Tortola	http://inblockchain.com

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31	Galaxy Asset Management	6	23	6	VideoCoin, WePowerNetwork, StormX, NuCypher	New York, NY	http://www.galaxyllc.com/
32	8 Decimal Capital	15	6	15	BluZelle, Libra Credit Network, 0x	Palo Alto, CA	https://www.8dcap.com
33	Mosaic Ventures	15	21	6	Blockstream, Blockchain Inc.	London, UK	http://www.mosaicventures.com/
34	Mandra Capital	1	24	4	PINTEC, OKCoin, Chronicled, Overnest Inc.	Hong Kong	http://www.mandracapital.com/
35	Camp One Ventures	2	2	6	Ripple, Augmate, Mobius	San Francisco, CA	http://www.camponeventures.com/
36	PreAngel	2	5	5	Origin Protocol, OkCoin, Sensay, LendChain	Beijing, China	http://www.preangelfund.cn
37	Abstract Ventures	2	9	6	Ripple, Harbor, Compound Labs, TruStory	Tiburon, CA	https://www.abstractvc.com
38	Foundation Capital	3	7	4	Basis, Origin Protocol, BlockCypher, OpenSea	Menlo Park, CA	https://foundationcapital.com
39	Right Side Capital Management	3	1	8	Airfox, Chroma, Elemetric, Hanzo	San Francisco, CA	http://rightsidecapital.com/
40	AME Cloud Ventures	1	12	6	Blockstream, Ripple, ShoCard, BlockCypher	Palo Alto, CA	https://www.amecloudventures.com/
41	1confirmation	7	10	7	Basis, Harbor, MakerDAO, OpenSea	Palo Alto, CA	http://www.1confirmation.com
42	Hashed	4	20	4	StormX, Origin Protocol,	Seoul, South Korea	https://www.hashed.com

					Bluezelle, SureRemit		
43	FinLab	3	50	3	Iconiq Lab, Vaultoro, Abra	Frankfurt, Germany	https://finlab.de/
44	Streamlined Ventures	2	2	5	BlockCypher, Chronicled, PiggyBank, PayStand	Palo Alto, CA	http://streamlinedventures.com
45	Greycroft	3	4	5	Sensay, BitPesa, The Block	New York, NY	https://www.greycroft.com
46	Tusk Ventures	2	26	3	Circle, Coinbase	New York, NY	http://tuskventures.com/
47	Catagonia	2	50	3	Envion, AppCoins, HydroMiner, Basis	Berlin, Germany	http://www.catagonia.com/
48	Compound	2	2	4	Compound Labs, NuCypher, Gem	New York, NY	https://compound.vc/
49	Arbor Ventures	3	4	4	Abra, Silot, Global ID	Hong Kong	http://www.arborventures.com/
50	JAFCO Japan	3	27	3	Nayuta, Tech Bureau, COMSA	Tokyo, Japan	http://www.jafco.co.jp

A Cloud Computing Based Mobile Census of Population and Housing System, Case of Central Statistics Office in Zambia

Article by Barbara Moto
Information Technology, Texila American University
E-mail: bmuyabi@gmail.com

Abstract

This research is a study of how census can be automated using hand held mobile devices. This automation may reduce on the possible and actual errors in the final processed information.

According to Shao, D. (2012) "The growing use of mobile technologies has increased pressure on the demand for mobile-based data collection solutions to bridge the information gaps for researchers" [1]. The law and technology favor an increased use of Information Technology platforms for data communications. Recently more bandwidth has become more available and cheaper and data transmission speed are faster with the launch of technologies such as 4.5G by Zamtel.

The objective of this study is to develop and implement a Cloud Computing Based Mobile Census of Population and Housing System using cloud computing technology and Geographic Information that addresses the current traditional way of Census Data Collection System. We will explain cloud computing *can address problems related to efficiency and quality of statistical information for decision making*. Secondly, we discuss the *challenges that are anticipated in the implementation of Mobile Census of Population and Housing System*. Thirdly we will discuss *some of the areas of improvement expected in the implementation process of the Mobile Census of Population and Housing System for the Central Statistical Office*. Fourthly we discuss the *suitable technologies are available to support the development of the system.* Finally, we will focus on the strategic advantages of developing a *Cloud Computing Based Mobile Census of Population and Housing System* and its security.

Keywords: *Data Collection, Enumerator, Cloud Computing technologies, Zamtel, Census and CAPI.*

Introduction

Census essentially refers to a complete counting all elements in a population. This process includes the collection, processing, compiling, evaluating, analyzing of collected data. It also includes the actual disseminating all census information for decision making. [3] This process may be automated or manual. In today's world, information technology affects and influences every aspect of human activity. The use of information technology to deploy automation may reduce on the time and cost spent on such an activity and improve on the efficiency and data integrity of the final processed information. This research is a study of how census can be automated using hand held mobile devices and the cloud for information processing and storage.

The use of cloud computing technology

Cloud computing is widely accepted to refer to remote data centers that host huge amounts networked servers which act as a central repository of for data [4]. This repository or data center provides various kinds of web services. Cloud computing when integrated into a mobile environment overcomes obstacles related to the performance, scalability and security. Cloud computing framework can be divided into Core services, Management and User interfaces. Each of these layers perform specific roles to contribute to the overall performance of the cloud to make available data storage and speedy data retrieval services to numerous users concurrently.

Cloud computing emanates from telecommunications where providers use virtual private network services for data communications. It relates to the computation, software, and data access and storage services. This does not need end-user knowledge of the actual physical location and server or technology configuration of the platform that is delivering the cloud services to the users.

Another study reinforced the need for an efficient land use planning, and represented the first

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approach integrating satellite imagery with population census data for studying the human environment in the Caribbean [5]. This helps in the mapping by capturing images using the satellite. This expedited the mapping process in the Caribbean and can be simulated in Zambia for use by 2020. The integration of satellite imagery during population census would be beneficial for this project is essential for Zambia in the planning of 2020 census, field management, area allocation to data collectors and locating households during field work.

The processes put in place to provide an internet option to the Australian public at the 2006 Census, was briefly outlined in another work [6]. Australia opted to use the internet option to harness the benefits of technological advances and their falling costs. Technology makes it possible to collect data offline and only use internet when uploading data to the cloud and servers. In the case of Zambia, the proposed system would allow the Census exercise to take advantage of information technology.

Statement of the problem

The Central Statistical Office in Zambia is affected by many problems ranging from collecting, processing and interpreting census data effectively and efficiently before it can be disseminated for decision making.

In October 2010, Zambia conducted its fifth comprehensive census of population and housing using traditional paper and pencil methods of data collection. Data capturing for this census took over a year to complete. The actual data analysis took yet another year.

During data collection for the census, the CSO, employed a large enumerators' workforce and data entry clerks to collect and capture data using scanners. From this traditions data collection method, several problems are evident. The researcher attempts to propose solutions to some of these with this study. The problems include

i. The Pace of data collection and capturing determines the lag between data collection, analysis and its use.
ii. Difficulty to ensure data integrity when using manual data collection methods.
iii. Use of a large workforce increasing time and labour costs.
iv. High cost of printing research tools and user manuals

Objectives of the study

The main objective of this study is to develop and implement a mobile data collection system using cloud computing technology and Geographic Information Systems that addresses the current manual systems.

We will explain the How the Mobile Census of Population and Housing System can address problems related to efficiency and quality of statistical information for decision making. Secondly, we will cover the challenges are anticipated in the implementation of Mobile Census of Population and Housing System. Thirdly we will discuss some of the areas of improvement expected in the implementation process of the Mobile Census of Population and Housing System for the Central Statistical Office. Fourthly we discuss the suitable technologies that are available to support the development of the system. Finally, we will focus on the strategic advantages of developing a cloud computing mobile data collection system and its security.

How cloud computing addresses problems related to quality data collection

The Data entered incorrectly is of little use, therefore in order to make sure that quality data is collected the following has to be done:

Data entry training

Data reliability starts at the source. In our case it will start with the numerators. As Enumerators are collecting and capturing data in the system, they are bound to introduce errors that compromise analytical results meant to guide decision makers. Therefore, it is important to ensure that staff members with system access are properly trained on data entry and upload protocols. There are several steps to consider when training:

- Training should be intensive and interactive, evolving process in response to operational needs.

- Enumerators manual with procedures on how to collect data should be readily available for reference.
- System administrators should assign correct level of access to Enumerators and Supervisors based on their training and role.
- Auditing processes ought to be place in order for people to follow as they are checking for any inaccurate information entered into the system.

Validation and verification

Validation and verification checks are two ways to examine that the keyed in data into the computer or mobile device is correct. This is done by writing logics in the application which will check the skip patterns, ranges and consistency.

Real time monitoring

Information on the quality of the survey data collected in the Cloud Computing Based Mobile interviews and the process of conducting the interviews has to be monitored throughout the data collection period. Monitored information includes missing data and completeness among others. These data are analyzed regularly to assess quality of the interviews and compliance with the quality control put in place. This information is send as fed back to the interviewers when to make corrections when necessary.

Challenges anticipated in the implementation of Mobile Census of Population and housing system

Despite the benefit of acquiring high-quality data, there are also challenges anticipated in implementing the cloud mobile system such as Capacity building, data transfer, Skills, hiring a qualified field staff, data security.

Capacity building

Cloud Computing Based Mobile Census of Population and Housing System is a new technology in Zambia therefore Central Statistical Office will require to do a lot of capacity building for staff and the data collectors who be involved in the 2020 Census. This process is very expensive because it will require to train a good number of staffs for a period of not less than 14 days. The training will attract participant allowances hence it is costly because staff will be trained on the new methodology of collecting data using a mobile device.

Data transfer

Lack of Internet infrastructure in the rural areas of the country can result not uploading data to the central server hence hindering substantial progress in data processing, analysis and disseminating of Census results to the users.

Skills

Lack of technological skills by staff in development of the system such as; Programming, Networking, collaboration tools, Server administration, Storage management, Data analysis and visualisation can lead to failure in implementing the system.

Hiring a qualified field staff

Census is a big exercise which requires a good number of data collectors. Most of the participants are School leavers who may not possess the skills in mobile data collection.

Data security

Moto B. states that “During mobile data collection the data is stored on the device. The challenge comes in when the device is lost, there is a risk of losing data or the data may end up in the hands of unauthorised people who may not be part of the program and can result in compromising with confidentiality”.

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Areas of improvement expected in the implementation process of the mobile census of population and housing system

Cloud computing increases efficiency, **Cost and time of disseminating Census results is reduced**

Efficiency

The systems will be automated therefore the speed of conducting interviews will be reduced, interviewer is automatically prompted with the correct questions to ask, data will be ready for analysis as it is entered in directly into an electronic form, data will also be presented automatically through visualization technology which does not require someone doing it manually.

Reduction on cost

Cloud computing will reduce costs at all levels of the census processes such as:

i. No printing of questionnaire
ii. No transport is required to deliver questionnaires
iii. Reduce on Allowances as number of data collectors is reduced
iv. No data warehouse is required to store questionnaires

Time

Automation will reduce time to complete tasks such as

i. The time of conducting interviews can be reduced
ii. Time for Analysis is reduced
iii. Time is reduced to disseminate data

Technology availability

The following are the suitable technologies that are available to support the development of the system:

Skills

In order for Statistical Offices to develop a good and working system for data collection Staff need to poses skills which are available such as; Programming, Networking, Collaboration tools, Server administration, Storage management, Data analysis and visualization.

Internet

Data collected using cloud computing requires to be synchronised to the Sever through the Internet Technologies which are available such as; Wireless, WIFI/WiMAX, Ethernet/fibre Mobile Network (3G/4G) and Bluetooth

Hardware

The following are the suitable technologies under hardware that are available to support the development of the system

i. Smartphone
ii. Tablet/PDA
iii. Laptop
iv. Computer,
v. and Servers

Security

While their benefits using cloud computing to conducting Census and Surveys there is need to ensure that user convenience never undermines protection of valuable organization or users' information. In order to secure the system and data there are suitable technologies available such as; ID and Password, Encryption and Encapsulation, Data Access controls, User roles and privileges, Physical security (Access control) and Virtual Private Network links (VPN)

Strategic advantage

Data collection using Cloud Computing technology can be said to focus on the potential benefits that may accrue to the exercise in terms of efficiency, accuracy, data integrity and the speed of performing the census. Benefits such as speed of collection and processing of data for decision making are important so that the data can be put to use before it becomes obsolete.

Many organizations are increasingly focusing on new ways of conducting surveys that focus on electronic data collection and analysis methods that have since replaced the traditional ways of data collection. Decision makers, statisticians and stakeholders need accurate and timely data in order to improve the quality of their decisions.

The ever-increasing use of mobile technologies has increased pressure on the demand for mobile-based data collection solutions to bridge the information gaps for researchers. This is even more possible with the explosion of information technologies in Zambia. The law and technology favour an increased use of Information Technology platforms for data communications. [7] Recently more bandwidth has become available and cheaper, data transmission speeds are also faster with the launch of technologies such as 4.5G in 2018 by Zamtel.[8]

Conclusion

As we are well aware of the main risks and challenges in implementing such a solution, we always keep in mind the fact not underestimate how much work it takes to properly implement a census, even with

the use of the latest technology (IT or ICT). Thus, our paper comforts us in knowing that this solution will make it possible for ONS to enumerate and present the census data meticulously with minimum hardship. A key ingredient also, is our ongoing consultation with the different users and producers of statistical information as well as our national technology partners, namely mobile operators, internet providers and IT manufacturers.

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Should I or Should I Not? The Effects of Prostaglandin E2 on Mate-Search behavior, in Female Crickets, Acheta Domesticus

Article by Tsukasa Jonathan Tanaka, M.S.[1&2]
[1]*Texila American University, Guyana & Universidad Central de Nicaragua*
[2]*California State University, Fullerton. Fullerton, CA, USA*
E-mail: tjtanaka@gmail.com[2]

Abstract

Sexual conflict occurs when the costs and benefits of mating differ between males and females. Numerous studies have confirmed that compounds in the seminal fluids of males can impact females. These impacts include manipulation of egg laying, reductions in innate immune responses, and altering behavior. Prostaglandin E2 (PGE2) is a compound found in the spermatophore of house crickets and initiates oviposition behavior in female crickets. Here, I speculate that PGE2 may affect mate-search behavior in house crickets in a dose-dependent manner. Past studies have indicated PGE2 also simulate multiple mating by giving female house crickets multiple injections of PGE2. This experiment investigated the phonotactic (latency to reach an acoustic stimulus) response of females when injected with PGE2. The female crickets were raised until adult eclosion and the phonotactic cues were measured 24 h after injection with a 1 µg, 10 µg, 100 µg dose of PGE2 dissolved in 1 µL EtOH and 9 µL of phosphate buffer saline (PBS). Controls were injected with 1 µL EtOH and 9 µL pf PBS only. Crickets were randomly assigned (n=10) to each group prior. Acoustic stimuli were applied afterwards. The latency to respond to male signals was not impacted by PGE2; thus, PGE2 does not impact other aspects of female behavior or life-history that can be manipulated by other components of male seminal fluids.

Introduction and conceptual background

Mate selection can create an asymmetry in evolutionary interests, since two persons rarely have exactly the same allelic and genomic composition (reviewed in Arnqivist and Rowe, 2005). These differences are similar to parental and child interest asymmetry (Trivers 1972). Thus, the strategy and behavior of matt selection will differ between women and men depending on the amount of investment that individual devotees towards future children (Parker, 1979). This asymmetry can generate a more expensive and larger sex cell (gametes) before conception, while males tend to produce a less expensive and smaller sex cell (sperm) (Bateman 1948). Therefore, a conflict for the pursuit of individual, evolutionary interests can arise through reproductive strategies and sexual selection that can lead to gender divergence (Parker, 1979). The theory of sexual conflict explains how differences in the interests of men and women generate coevolution between men and women (reviewed in Chapman et al., 2003).

Genetically speaking, sexual conflict can also be investigated. The difference in morphology, physiology and behavior is based on the genetic differences between the sexes. Genetic sexual conflict may be both intralocal and interlocutory (Parker and Partridge, 1998). That is, according to the sex, there are different selective pressures at the same location. The other genetic instance of sexual conflict is the sexual conflict. This happens when two alleles interact with one sex and have a negative effect on the other sex (reviewed in Arnqvist and Rowe, 2005). Interlocus sexual conflict results in a " arms race " scenario in which sexual antagonism can be observed. (Price and Burley, 1994). The other instance of sexual conflict at the genetic level is interlocus sexual conflict. This occurs when, at two loci, two alleles interact resulting in a trait in one sex that has a negative impact on the other sex (reviewed in Arnqvist and Rowe, 2005). Interlocus sexual conflict results in an “arms race” scenario where antagonistic co-evolution of the sexes can be observed. Sexual conflict can occur in many forms, including pre-copulatory behavior and mating-related phenotypes, parental care, fertilization tactics and even post-mating (Parker and Partridge, 1998). The most convincing examples of sexual

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conflict occur when males use chemicals in their ejaculates to manipulate females ' behavior in a manner that benefits the male but costs the female (Arnqvist and Rowe, 2005).

The chemical manipulation of female invertebrates is investigated in many studies. For example, in Drosophila melanogaster, male ejaculates contain oviposition-initiating compounds such as ovulin (Chapman et al., 2003). In female Drosophila melanogaster, longevity in matted versus unmated females is also greatly reduced (Chapman et al., 1995). Female crickets, Gryllus bimaculatus, injected with seminal male fluid showed a reduction in lifespan, although the oviposition rate was not different from controls (Green and Tregenza, 2009). Many have assumed that such compounds could affect the integrity, ageing and stress of the immune systems (Stanley et al., 2009). Similar compounds can interestingly be found in male house crickets (Destephano et al., 1974). Prostaglandin E2 (PGE2), an eicosanoid subclass, initiates female house cricket oviposition (Loher, 1979; Destephano et al., 1974). Some prostanoids also change the invertebrates ' immune response (Stanley et al., 2009).

Eicosanoids are oxygenated 20-Carbon (C20) polyunsaturated fatty acid metabolites. They have received a lot of attention due to their role in a number of signaling pathways in a large number of organisms. Prostaglandins (a subclass of eicosanoids) act on cells and systems where they are synthesized, unlike other endocrine hormones; therefore, they are more considered autocrine hormones, can act on a wide variety of cell types and function differently (Norman and Litwack, 1989). In mammalian models, most notably prostaglandins play a role in oxidative stress, neuronal toxicity, innate immune activation and several other key regulators (Ford-Hutchinson, 1994; McGiff, 1981; Milatovic et al., 2011). In comparison with mammals, the literature documenting the role of prostaglandin in invertebrates is minimal. The first prostaglandin was isolated from the seminal vesicles of mammals (Bergstrom et al., 1962), but it was not until 1969 that the first invertebrates of prostaglandin, Plexaura homomall (Weinheimer and Spraggins, 1969), were discovered in the sea vault. Eicosanoids influence the behavior of reproduction in invertebrates. Most notably, PGE2 appears to initiate a female house cricket oviposition behavior (Destephano et al., 1974).

Individuals have only a limited amount of energy for reproductive purposes (Pianka 1976). Women can invest energy in offspring, innate immunity or other homeostatic maintenance mechanisms. The more energy females reproduce, the less energy they allocate to their immunity or other life functions. A trade-off of energy allocation to reproduction or immunity could therefore be observed. Empirical studies have found that women will allocate more resources for the future well - being of their offspring either as parental care or as nutritional output (such as antioxidants, increased egg sizes containing more nutrients, etc.) (reviewed in Ratikaninen and Kokko, 2009). A mate can reduce the oviposition frequency when faced with an immune challenge (Bascuñán-García and Córdoba-Aguilar, 2010). In addition, a previous study showed that matted women had a lower immune response than unmated women (Bascuñán-García and Córdoba-Aguilar, 2010). This is interesting because the compounds in the male ejaculate can influence both the immunological and ovipositional responses. It is evident from the above studies that the male ejaculate influences female longevity and immune response. The above study may indicate that priority is given to the energy allocation for egg production. The activation of immune cells by PGE2 can, however, be expensive for the ability of women to increase the oviposition rate. Mating increases longevity in Gryllus campestris (Wagner et al. 2001). It's a paradox. Oxidative stress and neural toxicity in mammals may be caused (Milatovic, 2011). In addition, many cricket species mates with more than one partner; therefore, there may be several reasons why the female and her offspring(s) can benefit from multiple mating (Fleischman and Sakaluk, 2004; Wagner *et al.*, 2001). One example is the indirect benefits in the form of interactions of parental genomes to create genetic diversity (Zeh and Zeh, 2001). Direct benefits to the female (and its offspring) can be seen in the form of nuptial gifts that contribute to immediate and future fitness (Sakaluk *el al.*, 2006; Simmons, 1986; Vahed, 1998). However, there seem to be two contradictory results in prior studies. First, female crickets do not show reduced receptivity after mating (Fleischman and Sakaluk, 2004). Second, mating reduces phonotactic behavior in females (Bateman, 2001). These are important to consider when quantifying post-mating behaviors because phonotactic response towards a male calling indicates the receptivity to invest time and energy for the females to find a mate that is calling from a distance.

I will investigate the possible influence of PGE2 on the house cricket mate search behavior, Acheta domesticus. PGE2-dose females show reduced phonotactic response to male calling songs after PGE2, similar to a separate study showing reduced receptivity in females of a different species after matching (Bateman, 2001). Females can also show no change in phonotactic response to the hypothesis that there are no manipulators of receptivity in male ejaculates (Green and Tregenza, 2009; Fleischman and Sakaluk, 2004).

Methods

overview

Virgin female House Crickets (*Acheta domesticus*) were injected with varying concentrations of PGE2 dissolved in 1 µL EtOH and 9 µL phosphate buffered saline (Insect Ringer's; PBS) solution (NaCl 128.4mM g, KCl 4.7mM, $CaCl_2$ 1.9mM, and NaH_2PO_4 as buffers for adjusting pH levels) (Ephrussi and Beadle, 1936). Controls were injected with 1 µL EtOH and 9 µL Insect Ringer's; PBS solution only. I applied an acoustic stimulus to determine the impact of exposure to PGE2 on female phonotactic behavior. Crystallized PGE2 was purchased from Cayman Chemicals. Different concentrations (1 µg, 10 µg, and 100 µg) of PGE2 were dissolved in 1 µL EtOH and 9 µL phosphate buffer saline (Insect Ringer's; PBS) solution as indicated in Cayman Chemicals protocol (Cayman Chemicals, 2011). The females were anesthetized by inserting them in the freezer for 5-6 min. The females were randomly injected with the above solutions or a 1 µL EtOH and 9 µL pf PBS only for controls at the third to fourth abdominal tergite.

Insect maintenance

Four-week-old *Acheta domesticus* were ordered from Fluker's Cricket Farm as noted elsewhere and housed in large plastic bins until 14 days after adult eclosion. Crickets had access to food (Purina cat chow) and water *ad libitum*. They were kept in a 28°C environment on a 12 hr:12 hr light-dark cycle. Trial crickets were moved individually to a smaller, separate 14x14x13 cm plastic bin to avoid interactions with other crickets.

Influence on female mate search behavior

This experiment investigated the phonotactic (latency to reach an acoustic stimulus) response of females when injected with PGE2. The female crickets were raised until adult eclosion and the phonotactic cues were measured 24 h after injection with a 1 µg, 10 µg, 100 µg dose of PGE2 dissolved in 1 µL EtOH and 9 µL of PBS. Controls were injected with 1 µL EtOH and 9 µL pf PBS only. I am employing a playback mating call of a large attractive male (e.g., Gray, 1997; Stoffer and Walker, 2012) at a setting of 57dB. Again, the female crickets were randomly placed in groups. Songs of attractive males that have been verified to attract females (Stoffer and Walker, 2012) were used. The crickets were allowed to acclimate to the speaker apparatus for 3 minutes. Phonotactic responses were measured by observing the latency to move onto the speaker broadcasting the song. Latencies were analyzed using survival analysis to compare the effect of different doses of PGE2 on mate-search behavior. The average temperature for all trials was 27.74^{o}C+1.62 with a maximum temperature of 31.30^{o}C and a minimum temperature of 25°C. The sample sizes are described in Table 1 and Appendix B.

Statistical analysis

All experiments were analyzed by single or two-factor Analysis of Covariance (ANCOVA) unless stated otherwise. I used ANCOVA to control for differences in female mass across treatments and to more precisely estimate treatment effects. Female mass was used as a covariate (Unpublished data). Multiple comparisons were done using Tukey's Honestly Significant Difference test (Tukey's HSD) (Unpublished data). In some cases data were log or log+1 transformed to meet the assumptions of the analysis. Latencies to respond to songs were analyzed using survival analysis to compare the effect of different doses of PGE2 on mate-search behavior. All statistical analysis was done using R (http://www.r-project.org/).

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Table 1. Data table to indicating controls used and dose in micrograms cohort. Acoustic stimuli indications are noted as Yes or No

ID	Acoustic Stimuli	Sample Size (n)
Untreated Control	No	25
Untreated Control	Yes	24
Sham Control	No	25
Sham Control	Yes	25
100 ug	Yes	23
10 ug	Yes	21
1 ug	Yes	14

Results

Latency to mating

The latency to mounting speakers did not differ statistically when compared between the cohorts that received a sham injection (ISR+EtOH) versus those that were untreated (Figure 1). However, the cohorts that received an acoustic stimulus versus those that did not showed a significant decrease in the latency to mount the speaker (Figure 1). The application of PGE2 doses did not change latency to mount the speaker among the different treatment groups (Figure 1).

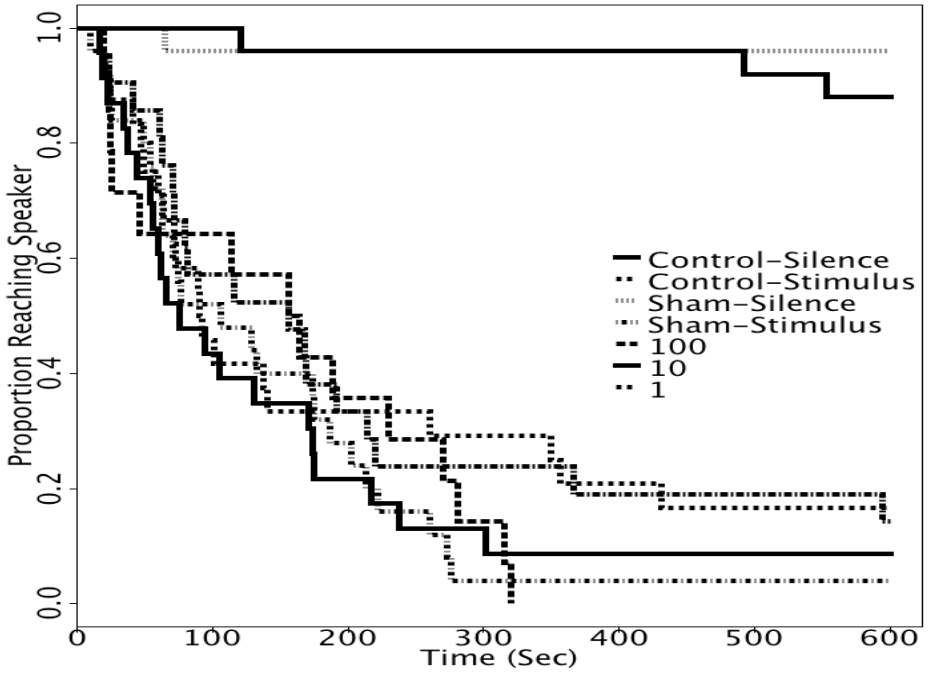

Figure 1.

Figure 1: The latency to mounting speakers did not differ statistically when compared between the cohorts that received an acoustic stimulus (Log-rank test: $\chi^2 = 2.99$, DF = 4, P = 0.5594). However, the cohorts that received an acoustic stimulus versus those that did not showed a significant effect on the latency to mount the speaker (Log-rank test: $\chi^2 = 90.6$, DF = 1, P < 0.0001).

Discussion

Summary of results

My data demonstrate that The latency to mount a speaker did not show any differences between groups that received PGE2 treatment. However, the application of the acoustic stimulus had a significant effect than those that did not (i.e. acoustic stimulus was required for the crickets to mount the speaker).

Influence on female mate search behavior

The injection of PGE2 did not impact the latency to mount when received an acoustic stimulus compared to controls or within treatment groups. However, an acoustic stimulus showed a mounting response to the speakers to those that didn't receive an acoustic stimulus and suggests that females responds well to acoustic stimulus from speakers, of which, is consistent with a prior study (Stoffer and Walker, 2013). The female's behavior in mounting the acoustically active speaker after injection of PGE2 is consistent with other laboratory and field observations where *A. domesticus* females can mate multiple times a day (e.g. Kindle *et al.,* 2006). However, this does not provide an explanation to why the latency to mounting an acoustically active speaker did not statistically change or decrease within PGE2 groups or between sham and untreated controls. This is particularly interesting to note because the injection of PGE2 is energetically costly to females because it induces egg laying behavior as shown in my study and past studies (e.g. Loher, 1979; Destephano *et al.*, 1974), decreases immune response as shown in my study, and could contribute to oxidative stress (e.g. Ford-Hutchinson, 1994; McGiff; 1981; Milatovic *et al*., 2011). In addition, there are no direct benefits to female *A. domesticus* through mating, such as nuptial gifts (reviewed in Vahed, 2007). Therefore, females should show be hesitant to re-mating because there is no direct benefit to her and prostaglandins could potentially be harmful, yet we observed no effect in response. Perhaps this finding may suggest that females choose multiple mates to increase the probability of accumulating good genes (e.g. Simmons, 1987; Head *et al.,* 2006), to avoid genetic incompatibilities and deleterious genes (e.g. Simmons *et al.,* 2006), and/or the indirect benefit of attractive off springs (Fisher, 1930; Wedell and Tregenza, 1999). Therefore, the pros of investing in a more attractive and/or fit offspring negates any deleterious impact acquired from mating with more males.

Conclusion

Female house crickets are impacted from sexual conflict as demonstrated in my studies. First, males seem to manipulate the female reproductive system to prime and induce laying egg. Lastly, prostaglandins in male ejaculate do not influence mate search behavior after exposure. Although, my studies do not definitively demonstrate that antagonistic coevolution (interlocus sexual conflict) is occurring because of PGE2 in male ejaculates, my study imply that PGE2 from males has fitness consequences for females following mating. Perhaps, future studies could test for antagonistic coevolution and also examine the relationship between the quantity of fecundity stimulating substances in attractive and less attractive males.

APPENDIX B

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Appendices

Appendix A

Figure S1: The pre-experimental mass (in grams) was recorded for all female crickets used for data. Here, the number of females was graphed as a function of mass in grams where the binning categories were made in 0.03 grams per interval. All the female crickets were 14 d post-adult ecolosion. The minimum mass recorded was 0.223g, the maximum mass recorded was 0.668g, and the average mass was recorded as 0.425+0.09g These are cricket masses that were pooled from previous studies mentioned elsewhere. The groups were randomly assigned to different cohort studies mentioned elsewhere or to the mate-search behavior cohort.

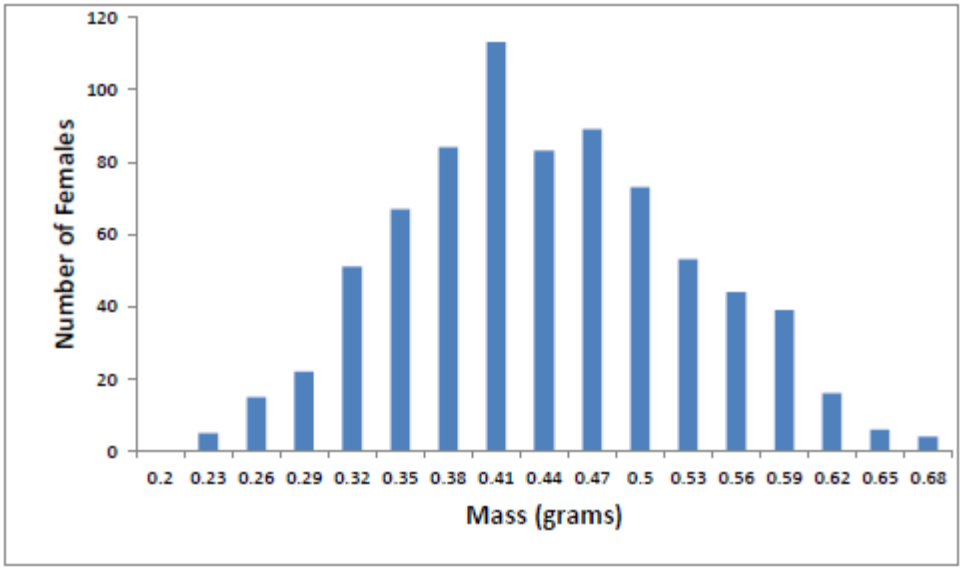

Figure S1. The pre-experimental mass for all females used

Appendix B

Table S1: Data table showing the demographics of individual cricket's used in Experiment three. Each row shows the individual cricket's mass in grams, the time taken to mount the speaker in seconds, and if the crickets received an acoustic stimulus or not. Crickets that took more than 10 min. to mount the speakers are noted as 600.

Table S1. Data table of crickets for experiment three

Treatment	Mass (g)	Time (Sec.)	Acoustic Stimulus
Untreated Control	0.417	600	No
Untreated Control	0.411	600	No

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Untreated Control	0.508	600	No
Untreated Control	0.331	600	No
Untreated Control	0.517	600	No
Untreated Control	0.450	600	No
Untreated Control	0.293	121	No
Untreated Control	0.474	600	No
Untreated Control	0.409	553	No
Untreated Control	0.406	600	No
Untreated Control	0.405	600	No
Untreated Control	0.420	492	No
Untreated Control	0.337	600	No
Untreated Control	0.490	600	No
Untreated Control	0.363	600	No
Untreated Control	0.444	600	No
Untreated Control	0.482	600	No
Untreated Control	0.396	600	No
Untreated Control	0.388	600	No
Untreated Control	0.280	600	No
Untreated Control	0.241	600	No
Untreated Control	0.433	600	No
Untreated Control	0.346	600	No
Untreated Control	0.305	600	No
Untreated Control	0.309	600	No

Sham Control	0.389	600	No
Sham Control	0.322	600	No
Sham Control	0.359	600	No
Sham Control	0.392	600	No
Sham Control	0.448	600	No
Sham Control	0.393	600	No
Sham Control	0.362	65	No
Sham Control	0.415	600	No
Sham Control	0.505	600	No
Sham Control	0.344	600	No
Sham Control	0.440	600	No
Sham Control	0.576	600	No
Sham Control	0.525	600	No
Sham Control	0.329	600	No
Sham Control	0.351	600	No
Sham Control	0.438	600	No
Sham Control	0.355	600	No
Sham Control	0.452	600	No
Sham Control	0.429	600	No
Sham Control	0.324	600	No
Sham Control	0.452	600	No
Sham Control	0.307	600	No
Sham Control	0.354	600	No

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Sham Control	0.286	600	No
Sham Control	0.350	600	No
Untreated Control	0.375	350	Yes
Untreated Control	0.371	357	Yes
Untreated Control	0.484	49	Yes
Untreated Control	0.414	431	Yes
Untreated Control	0.488	260	Yes
Untreated Control	0.283	600	Yes
Untreated Control	0.519	89	Yes
Untreated Control	0.504	101	Yes
Untreated Control	0.503	92	Yes
Untreated Control	0.391	138	Yes
Untreated Control	0.458	64	Yes
Untreated Control	0.368	41	Yes
Untreated Control	0.348	20	Yes
Untreated Control	0.353	47	Yes
Untreated Control	0.377	73	Yes
Untreated Control	0.362	600	Yes
Untreated Control	0.422	90	Yes
Untreated Control	0.278	25	Yes
Untreated Control	0.377	600	Yes
Untreated Control	0.399	72	Yes
Untreated Control	0.279	141	Yes

Untreated Control	0.343	600	Yes
Untreated Control	0.383	20	Yes
Untreated Control	0.385	60	Yes
Sham Control	0.353	25	Yes
Sham Control	0.646	222	Yes
Sham Control	0.329	273	Yes
Sham Control	0.382	175	Yes
Sham Control	0.313	71	Yes
Sham Control	0.550	26	Yes
Sham Control	0.287	174	Yes
Sham Control	0.275	10	Yes
Sham Control	0.393	75	Yes
Sham Control	0.412	21	Yes
Sham Control	0.580	260	Yes
Sham Control	0.402	202	Yes
Sham Control	0.319	63	Yes
Sham Control	0.440	77	Yes
Sham Control	0.458	133	Yes
Sham Control	0.425	276	Yes
Sham Control	0.363	129	Yes
Sham Control	0.401	49	Yes
Sham Control	0.514	63	Yes
Sham Control	0.409	600	Yes

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Sham Control	0.478	213	Yes
Sham Control	0.530	54	Yes
Sham Control	0.600	106	Yes
Sham Control	0.426	187	Yes
Sham Control	0.559	56	Yes
100 µg	0.510	23	Yes
100 µg	0.488	217	Yes
100 µg	0.423	66	Yes
100 µg	0.477	34	Yes
100 µg	0.428	37	Yes
100 µg	0.460	17	Yes
100 µg	0.436	54	Yes
100 µg	0.380	19	Yes
100 µg	0.535	105	Yes
100 µg	0.495	175	Yes
100 µg	0.278	302	Yes
100 µg	0.297	56	Yes
100 µg	0.332	171	Yes
100 µg	0.249	76	Yes
100 µg	0.336	131	Yes
100 µg	0.226	174	Yes
100 µg	0.431	94	Yes
100 µg	0.501	44	Yes
100 µg	0.624	600	Yes
100 µg	0.537	60	Yes
100 µg	0.607	600	Yes
100 µg	0.316	62	Yes
100 µg	0.548	238	Yes
10 µg	0.620	595	Yes
10 µg	0.520	367	Yes
10 µg	0.318	169	Yes
10 µg	0.356	600	Yes
10 µg	0.523	82	Yes
10 µg	0.467	24	Yes
10 µg	0.540	168	Yes
10 µg	0.300	156	Yes
10 µg	0.501	192	Yes
10 µg	0.422	71	Yes
10 µg	0.599	63	Yes
10 µg	0.372	600	Yes
10 µg	0.451	41	Yes

10 µg	0.292	214	Yes
10 µg	0.513	80	Yes
10 µg	0.531	72	Yes
10 µg	0.522	61	Yes
10 µg	0.486	116	Yes
10 µg	0.496	220	Yes
10 µg	0.311	600	Yes
10 µg	0.463	17	Yes
1 µg	0.374	281	Yes
1 µg	0.485	156	Yes
1 µg	0.457	320	Yes
1 µg	0.322	25	Yes
1 µg	0.320	230	Yes
1 µg	0.398	26	Yes
1 µg	0.393	270	Yes
1 µg	0.455	189	Yes
1 µg	0.429	114	Yes
1 µg	0.358	24	Yes
1 µg	0.466	20	Yes
1 µg	0.380	164	Yes
1 µg	0.601	46	Yes
1 µg	0.544	315	Yes

Brain Swelling and Death in Children with Cerebral Malaria

Article by Dave Raynier C. Paguntalan
Health Science, Texila American University, Guyana
E-mail: dave.p@tau.edu.gy

Abstract

Introduction

Cerebral malaria is the most severe neurological impediment of infection and it is caused by Plasmodium falciparum idro et al. *The article was aims to determine the main pathogenic processes and causes of death of children infected with cerebral malaria, by using clinical observations and pathologic findings, among children admitted with cerebral malaria who fulfil the world health organization criteria for cerebral malaria (WHO). The article further emphasises in regard using treatment challenges facing the children affected by cerebral malaria.*

Using Artesunate in the treatment of cerebral malaria was found to be infective in complete eradication of the parasite that causes the disease. The article proposes that an enlargement in brain volume caused by the pressure exerted within the brain of children infected with cerebral malaria will be considered as the main cause of death. The article looks forward for its contribution to the population affected with malaria by inputting new scientifically proven knowledge that enhances new drug development.

The article begins with general introduction and proceeds by mentioning the aims and problems and the importance of the study. So, to address the stated problem the article uses an observational study design on children suffering from cerebral malaria. The article bases on numerous literature reviews, this supports the significance of the research. The comparison statistical analysis which was done on children with cerebral malaria who survive verses who lived.

The study was carried out in Queen Elizabeth Central hospital in Blantyre Malawi, from 2009 to June 2011.

Review of literature

As it is stated on the world malaria report, 2014 countless efforts in treatment, prevention and control of malaria has been done but yet difficult to eradicate. According to Dondrop, 2005 pathophysilology of cerebral malaria was not fully understood and the processes are vary in adults and children.

Although some articles discuss the features of the parasite life cycle considered as exceptional to *plasmodium falciparum* which is attach to endothelial cells and uninfected red cells (Sherman *et al*, 2003) in various organs including brains (Taylor et al, 2004). However, in contradiction other researches based on an autopsy-based study states 25% of children qualified for a cerebral malaria falls short to have histologic evidence of sequestration at autopsy. According to the research done by Newton *et al*, the swelling in brain and injury in cerebral malaria patients can be caused due to intracranial factor on top of its immediate effect of the intravascular sequestration. The relevance of the study was more pronounced as most of the literature reviewed couldn't discuss the pathophysiology of diseases and diseases associated with cerebral malaria and the cause of death.

Brown *et al,* documented in their study that the breakdown of BBB is caused by sequestration in areas of the parasite. Some researches done in intracranial pressure in childhood cerebral malaria shows an elevated opening CSF pressure Waller *et al*. He further finds out brain swelling and the compression of brain stem in brain swelling is seen in children die from sudden respiratory arrest.

As part of the exclusion strategy malarial retinopathy was used in distinguishing malaria to non-malaria coma according to an autopsy study of children dying with cerebral malaria in Malawi (Bear *et al*, 2006) in addition of the WHO criteria stated by WHO, 2000 which was good because as it is a new finding proven to do so.

It is also supported by other research Newton *et al*, as the pressure created with in the brain is very important disease-causing factor in children with cerebral malaria. But other researches show the death due to cerebral malaria can not only limited to brain swelling because in addition of the neurological

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problem's other diseases such as anaemia, respiratory distress, hypoglycaemia and complications of pregnancy also has an impact, according to Murphy and breman.

Article summary

African Child death due to cerebral malaria ranges from 15 to 25%, the disease development and its possibility of causing death is not well understood. This article carries an observational study in combination with pathological finding aimed to find out the relationship between brains enlargements as a result of the pressure created with in the brain could be the cause of death.

Magnetic resonance imaging (MRI) is used to investigate the role of the enlarged brain to the disease development of the deadly cerebral malaria in Africa.

Children who have retinopathy were considered as positive for cerebral malaria with cerebral malaria and were included in the research. Detailed clinical data, MRI scan and Electroencephalogram images data on and after admission was collected.

The result of the article indicates Although 348 children were admitted only 168 manage to fulfil the inclusion criteria of cerebral malaria given by WHO. A total of 25 children which is 15% were recorded as dead, 21 out of 168 which is 84% were having brain swelling on admission. Meanwhile 39 out of 143 survivors. The MRI of children with cerebral malaria who died shows an increase in brain volume as compared than those who survive.

Finally, the article concludes with the finding of an increase in brain volume experienced in the cerebral malaria patients.

Article structure

The article was structured in a chronological order of the abstract, introduction, Method, Results, Discussion and Conclusion.

The article's abstract summaries in short and precise form. It covers concisely the background of the study, states the problem and article objective. Later the methods and instruments used to achieve the proposed problem were stated.

The authors Introduces generally about the epidemiology of the disease and acknowledge what has covered and achieved so far and what the article will contribute in detail. it includes numerous reviewed literatures up on the area, this support the research and shapes where it is heading. Besides, the hypothesis and the objectives of the study were stated.

Method: the researcher used an observational study design on the diseased children. An inclusion and exclusion criteria were implemented. In addition, Retinopathy examination was taken as distinguishing criteria for the malarial from the none malarial diseased children. It includes the recording the clinical findings, MRI Scans and EEG images of the patients on admission.

The result of the article was compiled in a tabular format, and the figures were discussed in a graphical interpretation of the collected data. This simplifies readers understanding of the outcome and its interpretation and summaries the overall findings of the research.

The article was properly referenced and this motivates readers who intend to read further and helps in article evaluation. Meanwhile the availability of the article only in a PDF format hinders the reader for a quick evaluation process due to the file.

The article was well aligned, punctuated and justified. The English used in the introduction and method was not difficult readers but as it goes to the result section, discussion and data interpretation it requires knowledge of the subject matter. The article data of the result was well coordinated and proper sign box was placed at the bottom of the table for it simplifies readers interpretation of the collected data. Tables and figures were labelled properly, and they are linked with the result and discussion efficiently. That means correct figure was used for the corresponding statement properly.

The article conclusion and discussion were placed under one category. Although the necessary information was there but separation of the two would be more beneficial.

Article critique

Authority

The article is authorised and published under the New England journal of Medicine. The New England journal of medicine is published by the Massachusetts medical Society and is among the most prestigious

peer-reviewed medical journals. This can show the credibility of the study. The authors of the article are listed below with their qualifications.

- Karl B. Seydel, M.D., Ph.D., Samuel D. Kampondeni, M.B., Ch.B., wrote 9 publications, Michigan state university, East Lansing, Department of Radiology
- Clarissa Valim, M.D., D.Sc., Harvard university, Cambridge, wrote 56 publications. Her publications have got 6279 views, 1071 citations for the last 3 months
- Michael J. Potchen, M.D., Board certified Radiologist with CAQ's in Neurology, American Board of Radiology, University of Rochester Medical Center School of Medicine and Dentistry
- Danny A. Milner, M.D., Birigham and Women Hospital, Boston, Pathology, Infectious Diseases. Featured in 41 publications.
- Francis W. Muwalo, A.D.I.T., Blantyre Malaria Projects. Biostatistics, information systems (Business informatics), Programming Languages. Featured in 1 Publication.
- Gretchen L. Birbeck, M.D., MPH. Professor- Department of Neurology, Epilepsy (SMD). Professor- Centre for Human Experimental Therapeutics. Professor- Department of Public Health Sciences (SMD) University of Rochester Medical Centre, School of medicine and Dentistry, featured in 118 publications.
- William G. Bradley, M.D., Ph.D., Professor, Radiology, UC San Diego
- Lindsay L. Fox, M.D.,
- Simon J. Glover,
- F. R. C. Ophth.,
- Colleen A. Hammond, A.S., Michigan State University, East Lansing. Neurology, Neuroradiology, Radiology. He featured in 8 Publications.
- Robert S. Heyderman, F.R.C.P., Ph.D.,
- Cowles A. Chilingulo, B.Sc.,
- Malcolm E. Molyneux, F. Med. Sci., and
- Terrie E. Taylor, Osteopathic Medical doctore, Researcher, Michigan State University, publishes 191 publications.

Review on the author

The article was written by well-known and experienced authors. The leading author was Dr. Karl Boynton Seydel, he is an osteopathic medical specialist. He has published about 56 publications.

Accuracy

The article was published recently in 2015 though the research was carried out 3 years earlier, from the year 2009 to 2012. A number of articles have been written in the study area of malaria, but the article is one of its types to cover the area accurately. The article inclusion and exclusion criteria, avoids sample bias.

The introduction of new medical diagnostic equipment such as MRI and EEG add more value to the article, as it has not done previously, which will contribute to a more reliable images and measurement figures. In addition, the article referred to two radiologist and two neurologist readings of MRI and EEG respectively with unawareness of each other and medical condition of the patients, this reduces informed bias. The article uses specific Statistical tests for reliability analysis, for the clinical characteristics and MRI and EEG. Reliability analysis was done for the Radiologic readings. P value of the likelihood ratio test was applied in comparing of models which don't have specific marker. Generally, the article implements proper statistical tests to avoid any form of bias. This indicates the accuracy of the article.

Currency

The research study was done at the Queen Elizabeth central Hospital in Blantyre, Malawi from January 2009 to June 2011. And it is published by the New England Journal of medicine in 2015; 372; 1126-37 Doi: 10.1065/NEJMoa1400116. It is a current research done in that particular topic recently.

Relevance

The article will be an asset in unlocking new research doors and will contribute in the development of new malarial drugs as the authors manage to associate the proposed objective. The article holds valuable information which can be utilized by pharmaceutical, academic, research institutes; but it still will limit

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readers with no research background. This will be due to the vast statistical analysis and interpretations provided. The article will add awareness to the World health organization on how to set their plan in eradicating this deadly disease that affects African countries. It is also a good reference for pharmaceutical companies in developing an appropriate medication and reduces the mortality and morbidity overwhelming the African children. Understanding of the nature and cause of death in patients affected with cerebral malaria also will lead health sectors in setting up the treatment plan.

In general, the article discovers an additional broadened understanding on the pathogenesis of cerebral malaria and how it causes death.

Objectivity

The article was funded by National Institutes of Health and Welcomes Trust U.K. The article states the problem associated with cerebral malaria and the importance of the study relaying on previously done well referenced researches. The objective of the researchers was provided as it is finding out association of brain swelling and causes of death of children infected with cerebral malaria. The study was carried out in an area where there is high prevalence of cerebral malaria among children in Africa.

The article was supported by referring many related articles and underlines their limitations as well as their contribution.

The article used an observational study on 348 children. It states the inclusion and exclusion criteria for cerebral malaria. The sample participants were known, although the distribution of sample was not proportional among the compared participants.

The article succeeded in eliminating any possible cofounder such as misdiagnosing patients for cerebral malaria. It diligently follows the research processes, inclusion and exclusion criteria and other protocols. For example, it targets children aged > 5 months and it includes patients with cerebral malaria according to the criteria given by WHO for cerebral malaria. This helps the article to focus only on the proposed study groups and avoid sampling errors. The article also manages in avoiding errors caused as a result of misdiagnosis the cerebral malaria patients. According to some researches patients with cerebral malaria must be diagnosed for the presence of retinopathy to be included in the research.

The article includes updated medical equipment that were used such as MRI and EEG and compare them with previously used instruments and their limitations. This assists in producing precise images and collect accurate data that helps in objectively developing the association of brain swelling among the died and survived patients. The data collected was statistically analysed and scrutinized. Finally, the article discusses the findings as 21 out of 25 which is 84% children were found to have severed increase brain volume on MRI Scan. In contrast only 27% were having brain volume increase from the survivors. It shows brain swelling is the main cause of death cerebral malaria patients.

Stability

The article is available as a stable source for an academic or further research journal. The original article can be found from the New England Journal of medicine website. And it can also be found from various other research websites, and journals.

http://www.nejm.org/doi/pdf/10.1056/NEJMoa1400116

Data analysis

Based the data collected regarding the clinical features of the admitted patients, the author manages to diagnose children infected with cerebral malaria before admission and rule out other diseases such as HIV. And the researcher tries to relate lactate increase in patients who died as compared to patients who survive. On admission the CSF opening partial pressure was higher in patient who died in comparison to those who survived. High parasitic infestation in the dyed patients than the survivors has also recorded; this shows an increase intracranial pressure and vascular degradation.

The article statistically analyses and compares the association of MRI and EEG among patients who survived and the patients who died. Severely increased brain volume was noted among patients who died 21 out of 25 (84%) as compared to the patients who survived 39 out of 143 (27%). An increased water retention has been observed in both the survived and died patients but the died patients have shown a relative increase. Higher parchy lesions which is described as discrete cerebral injury relate to venous

occlusion has been shown to be increased by 28% in Patients who died of cerebral malaria as compared to the 6% patients who survived the disease.

EEG findings shows that there is a slight increase in patient who died of seizure activity in than survived.

The graph indicates a decreased prepontine CSF is noticed in patients with severe increased brain volume who died as compared to the patients who survive.

Conclusion

It is also supported by other research Newton *et al*, 1991 as the pressure created with in the brain is very important disease-causing factor in children with cerebral malaria.

In the review it was concluded that children who died from cerebral malaria as a result of intracranial pressure and these evidences of severe brain swelling was proved using serial MRI scans. The decrease in brain swelling on the dyed children up on this further mri check-up shows strictly the relationship of brain swelling as the main cause of death.

It was concluded that *plasmodium falciporium* which brings about the brain swelling in children with cerebral malaria though the pathogenesis of cerebral malaria is incompletely understood. It was suggested that brain swelling increase in intracranial pressure are the main cause of death in Malawian children with cerebral malaria as proved by the study design. An it furtherly emphasised the article will contribute by adding knowledge not only on the eradication of the parasite but also reliving intracranial pressure which was observed to be the mail cause of mortality and morbidity. This contributes an insight in research and developing drugs that works in lowering the intracranial pressure alongside of cleansing of the causative parasites.

I argued in this article about the way it correlates the pathogenesis of the brain swelling which was not fully understood with the overall finding of the research. The article failed to provide enough information on the pathogenesis of cerebral malaria in relationship with brain swelling however it discusses extensively the association of brain swelling lead by intracranial pressure as the cause of death in the children.

Source

The Original article was taken from the New England Journal of Medicine, written by KB Seyde *et el*, published in March 19, 2015.
N Eng L J Med 2015;372;11126-37 DOI: 10.1056/NEJMoa1400116

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Leadership in Public and Private Higher Institutions of Learning in Uganda: A Case Study of the Eastern Region

Article by Henri Buregea Bin Rwakenda
PhD, Texila American University
E-mail: henry.buregea@livingstone.ac.ug

Abstract

Education a crucial domain of life indispensable for long-lasting development. Government and schools in Uganda have made a great effort to develop the education sector in Uganda. Employment is scarce. Students who get jobs seems not be full prepared for them. Society and especially business owners have identified graduates to be half baked failing to meet job expectations. Despite their effort, available opportunities and potentials are not yet fully explored. Besides that, there are also challenges that leaders of Schools face in their day-to-day operations which hinder them to fully lead higher Institutions of Learning (HILs) to the fulfillment of their missions and visions. Alongside those challenges, opportunities and potential do exist. The research paradigm of the study was pragmatic leadership theory that leads to self-reliance indispensable for transformational development. The aim of the research was to use this theory to develop another theory. This could help address issues of unemployment because of the poor quality of graduates upon completion of their studies. The population of the study were leaders of HILs that are accredited and in operation in the Eastern Region of Uganda for at least five years. The sampling technique was purposive and convenient in nature. The research method was qualitative. The instruments used were In-depth Interview (IDI) and Focus Group Discussions (FGDs). Interview and moderator guides were used. Data collected were categorized and data were analyzed and classified; opportunities, potentials as well as challenges were reported. A new theory was developed and areas for further studies proposed.

Keywords: *School Leadership, Higher Institution of Learning, Leadership opportunity, Leadership Potential, Leadership Challenge, Integral Development, Total transformation.*

Introduction of the study

Education is a highway for development. The prerequisites for a successful economic development program have been said to be a ‘substantial degree of literacy” and an educated elite of substantial size (Galbraith, 1961). King (2004) indicates that his vision of development is self-reliance. For education to reach that vision, its leadership should focus attention to design educational curriculum meant to achieve development. Presumably development brings about a resource base that can lead to the improvement of the lot of human beings so that they can have access to knowledge and opportunity and so fulfill their human potential in a better world (Galbraith, 1961). He further says that economic development can be both a prerequisite and a consequence of it (Ibid.). He indicates that:

A certain kind and quantity of education must be regarded as a necessary input to achieve rising growth rates. This is true not only in terms of the achievement of higher rates of literacy, but also in terms of specific vocational training and training for intermediate and higher administrative and managerial positions. The problem then, is not whether education is a prerequisite for economic growth, but rather, the questions that needs to be asked are what kinds of education at what levels, in what quantities, how should education be organized, and how can education be best administered?

However, there are lots of factors that may come into play as development and self-reliance are targeted. Since the Ugandan education system was inherited from the British system, there is a need to rethink the education system in Uganda. The notion of education brings with it the need for effective leadership. As they get trained, students need School leaders who expose them to life reality and challenge them to use

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their full potential to adapt and adjust to the demands of society and community where they are to live. Bright future means self-reliance. Self-reliance is not possible if there is no development as a consequence of it.

Development must emphasize employment, income distribution, self-reliance and commitment (op. Cit.). One disturbing dilemma that many developing countries, especially those in Africa are faced with, is that they have invested enormous sums of money in education since they have achieved independence, but the long-awaited economic growth has not yet occurred (Galbraith, 1961). Economic growth remains a myth because most of those who graduate are either jobless, hence not productive as society expects. Unfortunately, Statistics show that employments are very rare to the African graduate and worse in Uganda. The Guardian indicates that, "Youth unemployment in Uganda is the highest in Africa". A recent publication "Lost opportunity? Gaps in youth policy and programming in Uganda", published by ActionAid, put youth unemployment at 62%, although the African Development Bank says it could be as high as 83% (Ibid.). Unemployment is a social situation that gives a way for training the youth to fight it and make them able to be job creators rather than job seekers. Statistics show that there is job scarcity in Uganda. The Vice Chancellor's Forum (2016) indicates that more than 400.000 Students (who) graduate from Higher Institutions of Learning but only 150.000 get jobs.

This situation is worrying in case nothing is done to help reverse the situation. The call is for those in charge of education, politics, and development. It is more than urgent therefore that HILs organize an education system that will promote job creation for wealth creation. Galbraith (1961) posits that Education has until recently been neglected in the study of economic development. Education has been regarded as a consumption good, is now also recognized as an investment and a direct contribution to increased economic productivity in much the same way that capital and machinery is recognized (Ibid). For this reason, the educational goals set in HILs should lead to decisions that prompt for not only knowledge but training in relevant skills and should involve different stakeholders. In relation to this, Harvard University (2012) says:

Leaders do not make decisions in isolation nor are the implications of their decisions inconsequential. Leaders make decisions with others (either for others, against others, or with others in mind) with the goal of changing that social context, ideally for the "better," but often with the risk that their decisions may have negative effects or collateral implications.

For this to happen, the school leader of today must play a panoply of roles, engage in a plethora of activities, and make a myriad of decisions to ensure student learning. The list of roles and responsibilities is vast and overwhelming (2008). But which roles do new leaders most frequently play? Are these roles chosen or assigned? How do new leaders learn to play the roles they are uncomfortably playing? How do they learn to authentically inhabit the role of the school leader? By looking at the frequency of roles described in administrative narratives, one begins to get a picture not only of the concerns and challenges that new administrators face but also of their corresponding priorities and underlying values (Op. cit.). As leaders in HIL and Eastern Region Local Government (ERLG) have priorities and values that guide their leadership, all those priorities and values were looked at from a transformational and pragmatic research paradigm. Musaazi (2006) indicates that to make education a profitable enterprise and a contributor to social development, planning must come to be accepted as the essential prerequisite. With education comes the need for effective leadership especially at Higher Education level. It is within schools that the minds of people are shaped and trained in favor of development in different sectors of society.

Background of the study

Rapid, sweeping and long-lasting change is altering our planet environment in and unprecedented manner, while societies are undergoing profound shifts in their demographic makeup and social economic fabrics. Political agreements, financial incentives or technological solutions alone do not suffice to grapple with the challenges and demands of sustainable development. It will require a wholesale change in the way we think and the way we act- a rethink of how we relate to one another and how we interact with the ecosystems that support our lives (UNESCO, 2014).

To create a world that is more just, peaceful and sustainable, all individuals and societies must be equipped and empowered by knowledge, skills, and values as well as be instilled with heightened awareness to drive such a change (Ibid.). Because of this, the model we are going to use to guide this research is from a pragmatic paradigm dimension of research for positive transformation. Effective leadership should lead to intentional practical application of knowledge for both individual and collective transformation.

To achieve genuine, sustainable results, leaders in the "Pragmatic leadership" Program are exposed to six different learning dynamics, which, when combined, influence and enable meaningful, longer-term growth (www.pragmaticleadership.ca).

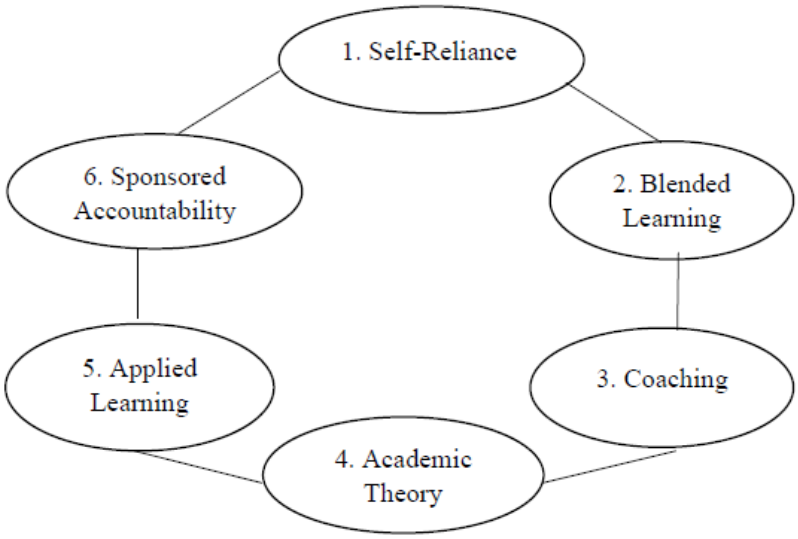

Figure 2. Pragmatic leadership theory

Before leading others, learners must first develop the tools to lead themselves. This process begins with the leadership circle profile, which delivers insights into a learner's current proficiency in creative competencies and provide an awareness of their reactive tendencies. These insights inform the learner's development agenda and opportunities throughout the program (www.pragmaticleadership). With Blended Learning, Great leaders can adapt to changing environments. Program learners will be exposed to a combination of online self-study and group discussion, as well as in-class learning. Learners must be self-motivated to complete study requirements and pursue interaction with cohort members (Ibid.) Coaching is highly effective for helping learners maintain accountability and clarity of their goals…

Practice makes progress. Learners complete a series of field assignments throughout the program, as well as a three-to-six months workplace Learning Development Initiative (LDI) after the program, Practicing the skills they have learned in a real-world context, learners must assess a given situation, identify opportunity for growth, set a vision, and achieve the desired outcome (Ibid.). Having someone else's support can have a powerful effect on personal growth. Learners will have an executive sponsor sign off on their final Leadership development Initiative. This institutional accountability and sponsorship increase the learner's potential to achieve observable and meaningful growth in their leadership and workplace effectiveness (Ibid.).

Literature review

Leadership opportunities in higher institutions of learning

There is an urgent need to study leadership setting especially in HILs and assess how people and systems are influenced. HILs offer a more reliable platform to exercise leadership. Both students and staff in such institutions can be taught and practice leadership. Topping (2002) says,

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If we can teach them how to be more effective leaders, even very modest improvements in each person can reap big rewards for the entire organization. So, can leadership be taught? Not in the way we can teach mathematics or discounted cash flow, but a heightened understanding of how leadership behaviors affect others and impact performance can help anyone enhance his or her effectiveness. And isn't any gain in this area worth the effort?

There is no doubt that there is gain in perspective. What is important is to see what is happening and consider it as an opportunity to learn and analyze the situation and make necessary adjustments for change. But it is important to know that, in the world, "All organizations throughout history have needed and displayed varying levels of success with their own leadership. And the world does not just consist of Europe and America. Leadership was, is, and always will be a global issue, one which involves all people, whatever their organizational or social setting (Hooper and Potter, 2001). From a global education perspective, efforts have been made to help countries in the developing world. It is one thing to help a country deliver the right to basic education; it is quite another thing to agree to help secure that right for the foreseeable future (King, 2004).

For this future to be great, there should be leadership opportunities that have to be seen by leaders at different levels of social interaction especially leaders in HILs and political and administrative leaders of both national, regional and local government. In Africa, Musaazi (2011) indicates that the sociopolitical objectives of Education in Nigeria, Uganda, and Kenya are relatively unformulated beyond vague invocations to educational institutions to promote democracy, egalitarianism, self-reliance, respect for dignity of labor and to adopt a rural orientation and to install nationalism. The education system in any country should consider what Musaazi is indicating here. A lot needs to be done to better the education system in Africa if we truly need to lead true democracy, egalitarianism, self-reliance, respect for dignity of labor to adopt rural orientation and to install nationalism.

Uganda as a country is aware of that change and is making necessary efforts to improve the quality of leadership and education in HILs. HILs are frequently challenged by education officials. It is time for policy makers to revisit their mission, practices and operational models to comply with set standards for quality assurance that will allow Africa and Uganda in to be effective catalysts of educational dynamics as far as globalization and its effects on education and development are concerned.

Another factor to be considered as a leadership opportunity is the population explosion which leaves behind a high percentage of the youth. Uganda is very particular in this because its population is predominantly young. The guardian (2014) reveals that Uganda has the world's largest percentage of young people under 30 making 78% of the population according to the 2012 State of Uganda population report by the UN Population Fund (Ibid.).

In the past decade, Uganda has experienced strong Growth Domestic Product (GDP) growth, averaging 7% annually, but this has not generated jobs, a trend seen across the continent. The lack of employment is causing some young people to take deadly risks. Last July, 36 young people, who had been running motorcycle taxis, were burnt to death as they tried to siphon fuel from a truck that had been involved in an accident (The Guardian 2014). Some young women are taking jobs overseas only to find themselves forced into prostitution, according to Uganda police. "Every month, we get reports of over 20 Ugandans stranded seeking help. If the figure is multiplied in a year, it comes to over 250 Ugandans stranded abroad every year," says Moses Binoga, Coordinator of the Anti-Human Trafficking National Task Force (Ibid).

Other young people are involved in drug trafficking. Dr. Paul Nyende, a Senior Lecturer at Makerere University's School of Psychology, says young people with nothing to do are more easily lured into crime. "They can easily be lured into drug trafficking on promise of big pay," he says. "Many young people don't want to go back to the villages and do farming after campus. They want to stay and enjoy city life." (Ibid). Yet the city cannot support them. It is estimated that more than 40,000 young people graduate from Ugandan universities each year. Yet the market can provide only 8,000 jobs annually (Ibid).

The same report indicates that worldwide, there are about 1.2 billion 15- to 24-year-olds. About 200 million are in Africa. This portion of the world's population needs to be considered as a reliable springboard

for sustainable development for the world but more urgently for developing countries, Uganda included. In Uganda for example, the National Council for Higher Education (NCHE) has developed a Quality Assurance framework to help HILs maintain quality. In this framework proper standards have been set to guide HILs to focus on what is required to meet the expectations of the Ministry of Education and Sports (NCHE Quality Assurance Framework, 2011). In line with this, Uganda has established the Uganda University Quality Assurance Forum (UUQAF). This Forum is meant to promote quality Education and appropriate school leadership for more efficiency and efficacy. This is a great opportunity for appropriate leadership in HILs in Uganda. Globalization, Partnerships, freedom of thoughts, the youth population and unemployment must be taken as opportunities to rethink leadership in HILs and see what these institutions and government organizations at all levels (national, regional, and local) can do to develop curricula that promote need-based knowledge, appropriate skills, and research oriented to community problems and issues that must be urgently addressed.

Leadership potentials in higher institutions of learning

School Leadership cannot be developed apart from the existing population and the country's general resources. According to UBOS 2014, Uganda has a population of 34. 85 Million. Life expectancy in Uganda is 58.65 years (https://www.google.com/#q=uganda+population). It is also known that the Ugandan population is dominated by youths representing around 78 % of the total population as initially pointed out. These statistics are very significant for school leadership. In them lies, a great potential for school leadership empowerment on which depends the future of the education sector for integral development.

Uganda has quite several natural resources that the youth can be exposed to. With adequate training, skills and appropriate technologies, they can be helped to gain insights to use all those resources according to their individual giftedness that could lead to the betterment of their lives. There are institutions in Uganda in general and in Eastern Region particularly which target to train future leaders because they have realized that there is potential in the youth. One of these institutions is Cornerstone Leadership Academies-Uganda who aims at molding young people coming from disadvantaged backgrounds, but with high potential - into future leaders (Cornerstone Leadership Academy, 2013).

Unemployment is another social situation that gives potential for training the youth to fight it and make them able to be job creators than job seekers. In fact, statistics show that there is job scarcity in Uganda. The Vice Chancellor's Forum (2016) indicate that more than 400.000 Students graduate from Higher Institutions of Learning but only 150.000 get jobs. Apart from these academies you have other projects that focus on the economic potential of different communities. In Eastern Region, you have groups like Transforming Community Initiatives (TCI) (https://www.csrmatch.org).

Such organizations can work with HILs so that communities with special initiatives can be equipped with more knowledge through capacity building to sustain those initiatives and maintain and increase growth. In fact, knowledge accumulation in all countries depends on steady investments to increase science education as well as to improve the Science, technology, Innovation (STI), policy environment to foster endogenous innovations, through all means of learning, including research and development (UN Post 2015 Development Agenda). Unemployment is a great potential for transformative education that leads to creativity and job creation.

Leadership challenges in higher institutions of learning

Hans (1994) posits that Leadership is dangerous. He says that, World history can be best be written by studying the lives of great and terrible leaders and what they accomplished through others. We who are in leadership can on the one hand move men, women, and mountains for tremendous good. At the same time, we hold in our hands the power to do irreparable damage to our followers by the mistakes we made.

Most leaders do not accept or easily admit that they make mistakes. The fact of one ignoring his or her own mistakes is a big challenge to effective leadership. This is a reality that concerns almost all organizations globally, regionally and locally. HILs in Uganda and Eastern Region Local Government are included. In addition to one not accepting his or her mistakes, other factors challenge significantly

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leadership. These include personality traits, school of thoughts, purposes of organizations, political, economic, social and cultural dynamics in the country, etc.

In South Africa for example, Shivambu (2015) indicates that the students' protests around the country give us cause to reflect on the politics behind the higher education funding crisis in South Africa. He also points out that, "Students with affiliations to different political parties are at the forefront of the protests, and the demands are centered on securing no fee increases for the academic year 2016, and variety of genuine worker demands (Ibid.) So political dynamics in a country is one of the challenges that affect both schools and District leaderships here and there. Shivambu further denounces other challenges such as the failure of the education systems to address students' demands and the lack of will evident in parliament.

Another area that challenges HILs is the advancement in the Information technology sector and its impact on education especially at these initial stages of development in the 21st Century. The impact on school leadership is felt. In relation to this, Ali, Haolader, Muhammad (2013) say that, "The effective integration of technology into classroom practices poses a challenge to teachers and administrators" This is crucial for globalization to have a positive impact in Uganda and in Eastern Region in particular. An average leader faces at least five problems in learning to lead: today's leaders replicate the poor leadership habits they have observed in others, today's leaders often lack basic skills for common leadership demands, today's leaders lack good models and mentoring, today's leaders lack formal training in leadership and finally today's leaders suffer confusion over the conflicts between secular and biblical leadership (ethical values), (Finzel, 1994).

How does this apply to Uganda and Eastern Region in particular? Is it true for all functioning institutions? What is the situation in Eastern Region? What challenges leaders of HILs in Eastern Region are facing? What lacks are HILs exhibiting that could hinder them to be catalysts of effective school leadership in the Region for a holistic development that needs to take place?

Involvement in Formulation of education policies

The current education systems in Uganda and Africa in general were borrowed from Western models from colonial times. Previously, people went to schools so that upon completion of their studies they will join jobs waiting for them. In other circumstances because of the needs foreseen by government or different non-government organizations, selected people were sent to schools and were encouraged to come back to serve.

Samoff &Budemi (2003) support, Although Africa boasts a tradition of indigenous and Islamic higher education institutions that predate western colonization, the roots of nearly all of the modern higher education institutions in Africa can be traced back to the colonial period and to external support from varied sources. Education was among the tools colonial governments used to manage society and channel social change, a process in which the church often played a major role. By 1816 the Church Missionary Society had established a Christian institution in Sierra Leone for training clergy, which in 1827 became Fourah Bay College, the first institution of higher learning in sub-Saharan Africa. By the end of the 19th century, critics including educated African elites, challenged the clerical focus and called for publicly financed African universities that would emphasize science and technology or provide a liberal education. It was not until after the First World War that colonial governments started to develop official policies for the provision of high education in Africa. The general pattern was to create institutions in Africa as satellites of European universities, which retained responsibility for staff appointments, curriculum, examinations, and degrees.

Africans were not involved in policy formulation whereas Involvement in the formulation of policies is one of the key expectations of any leader especially the leader in charge of a higher institution of learning. Marton (2006) says:

It is hard to ignore today that the role of education in our societies is taking on increased importance. The term" knowledge society" has become a common phrase for most citizens, heard almost daily in the

media, in the school corridors and promulgated by our politicians. Education is now viewed as the key component to economic competitiveness in an increasingly global world**.**

It is the role of any leader of any institution of higher learning to stress the role education can play in our societies today. Technology and communication have seriously impacted the way we speak and do. The current trend of life is based on those two. Knowledge about technology and communication is crucial for any development to take place. Education policy for this century must have at its center knowledge, know-how to do things (hands-on knowledge) to remain competitive. Job opportunities and job creation rely completely on that. The World Bank influence has been both direct and indirect. Much of that influence has come in the form of technical assistance and efforts to shape the development of higher education policy (Samoff & Bidemi, 2003). HILs are educating students who are called to meet the expectations of this 21st Century. One of the expectations is that education should lead to sustainable development. UNESCO (2009) indicates:

The Millennium Goals for Development (MDGs) provide a universal framework for development, agreed to by all UN Member States in 2000. They provide a means for developing countries and development partners to work together in pursuit of a sustainable future. Education for sustainable development (ESD) can contribute to the achievement of all the MDGs. It can help governments and development partners to ensure that capacity exists for achieving the MGDs. ESD provides learning goals that help achieve the MDGs. Thus, there is a call to revisit current education programs that are developed based on western models. With globalization, and speed with which technology and communication are developing, it is more than urgent to rethink current existing policies and formulate new policies that address the demands of the century.

The MDGs include the following: eradicate extreme poverty and hunger, achieve universal primary education, promote gender inequality and empower women, reduce child mortality, improve maternal health, combat HIV/AIDS, malaria and other diseases, ensure environmental sustainability, develop a global partnership for development.

Unemployment, poverty, and other social vices such as drug and alcohol addictions are stumbling blocks for true development to take place in this century. Thus, education policy should address those by developing empowering policies for total transformation of both individuals and communities. HILs are the laboratories where the minds of people can easily be shaped and molded to allow both students and individual members of communities to usefully use their full potentials through the opportunities that those institutions can offer. Therefore, education curricula should be planned to create an intention to act positively for development. This development should lead to sustainability, hence self-reliance which must be for self and for. There is a need to train for action as again UNESCO has stressed Education, leadership, and development are key ingredients of sustainable development. For this to be possible, we need MGDs to be followed. One of them underlines action competence. UNESCO (2009) puts it, "Developing action competence of leaders, politicians and youth groups for service delivery and work (MDG 8)." UNESCO posits that education for sustainable development is needed to develop action competence for improved natural resource management. This is a critical learning goal for developing countries, if they are to meet MDCs 1, 3 and 7 simultaneously (ibid). Samoff & Bademi (2006) declare.

But most of Africa's strained economies cannot expand education's share of the total budget. Even where that share grows, declining total revenue may still reduce spending on education. In these circumstances, available resources will reach far more students at the bottom than at the top of the education pyramid. That general argument is then supported by research that reports higher social rates of return for investment in basic education and high private benefits for higher education. The redirection of resources can thus be presented as necessary, sound financial policy, and eminently fair.

All that cannot be significantly done if HILs are not involved. The leadership of HILs with clear vision should be at the forefront of policy formulation since they have necessary information to share with decision makers. Leaders of HILs master opportunities they can offer to students, staff, and community. Involving

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them in the formulation of educational policy and their related bylaws will allow HILs to be efficient catalysts of sustainable development.

Methodology

In line with this, this research study mainly used the qualitative research approach in the search of data to solve the problem. The purpose of selecting qualitative methodologies was two-fold: to collect information from individual perspectives of the needs that are associated with the exploration of opportunities, potentials in HILs and determine challenges that leaders face in their effort to lead HILs; to determine whether HILs are involved in the process of policy and bylaws formulation at both national and district levels. In-depth Interview and Focus group discussions were chosen as techniques to collect useful data.

Population of the study and sampling techniques

Participants of this study were selected from the 30 HILs that have been established in the eastern region of Uganda that stretches from the Nile River to the boarder of Kenya. The study targeted leaders who play key roles of leadership and development in HILs from the GP to lecturers, Deans and Top administration. The non-probability sampling was used. Kothari (2014) points out that under non-probability sampling, the organizers of the inquiry purposively choose the particular units of the universe for constituting a sample on the basis that small mass that they so select out of a huge one will be done at their convenience.

Results

All who responded were mature and their ages varied between 20 and 60 years old. All were Female and male leaders. Selected institutions were public and private institutions of higher learning. Participants agreed that in higher institutions of learning are the following opportunities, Potentials, Challenges. They also indicated what was their opinion on the level of involvement between them as leaders of HILs with the ERLG.

Opportunities

Opportunities for students

Change of mindsets of both students and staff as well as community, instill the desire to be a change agent, training for training others and not for selfish ambition, promotion of globalization, modernization of traditional systems of production, learning and employment opportunities, revisit existing training materials and adapt it to the expectations of the 2st century, counseling and economic empowerment for betterment of life, networks between people of different cultures, opportunity to demystify the illusion of the white color job after graduation, possibility of job creation, training and practice of leadership, technological know-how, problem solving through research, skill-based education, alumni associations for networks and job creation, cooperation with other institutions of learning, training for leadership exercise, sharing of resources with sister institutions, partnership opportunities at both national and development levels, implementation of policies, accessibility to study (talent based), exposure to existing jobs in both national and international markets, training for expert skills, generational gap: is an opportunity for appropriate leadership training and transition between the younger and older generations, rethinking of curricula for more relevance, exchange programs between students from developed and developing countries, preparation for change of mentality for destiny ownership, sensitizing students on globalization and consequent competition and develop strategies to cope up with the expectations, exposure to practice knowledge before graduation and begin participating in the shaping of society, skills for service delivery, network opportunities with alumni, career development from experts from different disciplines, internship placement, personnel development in all areas, holistic education for development, opportunities as eye openers to the outside world, acquisition of appropriate knowledge to challenge the current political dynamics in our midst, bring education to individuals and communities, opportunities to fight poverty

through knowledge, know-how, and attitude change, exchange programs between students from different HIL**s.**

Opportunities for community

Opportunity for appropriate education that goes with the needs within the community thus community empowerment, scholarship for the needy students, community education for community engagement and ownership, security opportunities of communities through electrification, empowerment of the poor and other vulnerable members of the community, project development for community services, infrastructure development for the community, employment for community members, scholarship for communities, giving hope and skills to the community, ability to solve individual and community problems, education for vulnerable people, advocacy and lobbying for community development

Opportunities for both students and community

Higher Institutions of Learning do offer platforms to change the mindsets of both students, staff as well as members of the community, mentoring, sponsorship, exposure to politics that can lead to the promotion of sustainable development, eradication of the dependency syndrome, developing of a saving culture for self-reliance, enhancement of initiatives for social cohesion, exposure to different cultural values, traditions, customs and norms, formation of associations for different purposes, development of individual and community according to the potential they have, promotion of technology because society is shifting, training for entrepreneurship, training for work for general interest and avoid selfishness, exposure to globalization and its impact of students, staff, and communities, empowerment for decision making, incite students, staff, and community to love working, practical knowledge (industrial training), opportunity for self-expression, network opportunity for students, staff and communities, sense of community ownership of HILs, social cohesion, communication opportunities, platform to grow in responsibility, development and implementation of policies to harmonize work and education, knowledge generation.

Potentials

Potentials in relation to students

Students have natural talents (abilities) to be used by leaders in HILs (sport, students connections through networks with different families, organizations and potential employers, organizations sponsoring students, manpower for development (work force), innovation and invention (renewing and improving what already exists), experimentation of theoretical knowledge, organize workshop and promote research, prior knowledge of the community, training people and pruning them for effective leadership, capacity to give out services to universities (students with already existing businesses), potential for international adventure, character and attitude shaping, values and traditions are potentials for sustainable development. people are defined by their cultures and traditions as well as other determinants such as activities they are involved in, associations and clubs for development, guest/motivational speakers (eye opener for personal talents discovery or diagnosis) on real life stories and opportunities, holistic development focusing on the head, heart, and hand, leadership exposure, study tours in various fields and learn from them, marketing opportunities for hils through co-curricular activities, increase enrolment through community services, promote self-image and confidence, center for sharpening skills, potential to promote team work, potential to market the university.

Potentials for community

Natural resources, local manpower, security, community influent people (traditional, religious and administrative and political leaders), employment for the best and needy students (equipping them with skills), business empowerment, mechanization of labor to increase productivity.

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Potentials for both students and community

Capacity building for good governance, relationship building, relationship for fostering more social cohesion and development, promotion of technology, involvement with political leaders, cultural leaders, students' talents, promotion of research for community empowerment, exclusive periods and places for practicals, cooperation and partnership for shaping the younger generation, potential for leadership training and delegate authority, reduce the gap between the young and old generations through sharing of practical experience for empowering the young to face the future, exposure to community members opinions for more ownership, potential to design adequate curriculum for the promotion of self-reliance and fight dependency for Africa is more internally and externally dependent, lobbying opportunity, needs within the community.

Challenges

Challenges in relation to students

Change of the mindset, laisser-faire mentality, inadequate funding, inadequate pay for education professionals therefore most lecturers tend to moonlight to boost their income, training is not complete therefore half-baked products, low income of higher institution of learning does not help the smooth running of the institution, poor relationships between lecturers and students, lecturers and lecturers and students, unemployment becomes a threat to enrollment, ignorance is the big obstacle to development, political dynamics make education look like a threat, understaffing, lack of education facilities, dropping in enrolment, quality of education is decreasing, mismatching of policies: two different ministries handling institutions' issues such as salary, discrepancy between government involvement and HILs: public institutions are not treated equally with the government and yet they are called to work hand and in hand in order to boost the government in its effort to push education step forward, lack of clear mission and vision for some institutions, lack of training material for more practicals for students, lack of personal engagements: young people do not know what to do, generational gap, dependence mentality of young people, avoidance of work and use short cuts for wealth making, lack of the teamwork mentality, selfishness and lack of know-how of the dynamics, young people want payment and good life before work, administration is also a stumbling block sometimes, lack of self-vision and confidence, trust and mistrust among students and administration, insecurity (bushy environment, lack of lightning arresters), strike threats in HILs, dictatorship approach to leadership, context of operations in institutions does not favor resourceful people, inability to improve salaries thus high turnover of personnel, unclear governance structure which leads to poor management of HILs, low enrolment (why should i go to school if graduates are lacking jobs), poverty level is high (inability to pay tuition), communication between institutions and the government leaders, gap between gained skills and practicing those skills (gap between theory and practice), lack of tracing of graduates to see whether knowledge into practice, commercialization of educational institutions (profit oriented) which affects quality of education, striking balance between students' needs and institutions ability to deliver to the satisfaction of students, staff, and communities, religious, administrative, and political discriminations on campus or country, lack of opportunities for students to exhibit their full potential, massive brain drainage to foreign job opportunities especially to the west and east, communication gaps between local government and higher institutions of learning.

Challenges related to community

Traditions and values, resistance to change, institutions not involved in discussions concerning sustainable development, terrorism is hindering institutions' efforts for development, poor self-image: there are people whose self-image is poor. they think others must respect them, accumulated deficiency of the youth, freedom and erosion of values, dependency mentality, leaders sticking on to power for long, government leaders do not understand the needs of leaders of HILs, inadequate ratio between key factors: students and staff, some communities are not open to education, lack of platforms to sharpen skills, new curriculum is challenging to staff since it calls for extra funds and yet money is not there, illiteracy is high

in some villages and the poverty level is very high, gender imbalance, the pace of development in technology and communication so fast that institutions have to struggle to catch up, communication gaps between institutions especially HILs and local governments, land wrangles, lack of open communication between leaders, benefactors of development, and communities, people in community do not want to work, human rights mentality is causing social disconnection, lack of positive legacy for the young generation, colonialism, post colonialism, neo colonialism, the roles of universities are kept in the drawers of decision makers, difference in leadership styles leading to the wrong perception of the managers at different levels of social interaction, lack of role models, technology is changing unemployment, resistance to change, communication gaps between top leaders and middle-level leaders, lack of cooperation between local leaders and institutions, gap between the rich and the poor, lack of appropriate research vis-à-vis community needs, qualification of staff is doubted wrong sense of community ownership, lack of unity between community and institutions', lack of true partnership between institutions and communities, political dynamics affect day-to-day operations of higher institutions of learning, lack of planned meetings between local governments and higher institutions of learning.

Challenges related to students and the community

Lack of benchmark with other institutions, taxation, high expectations of students, staff, and communities, fraud and forging of receipts, lack of resources, perception of leadership, misconception of leadership concept, exposure to high risk such as fire, types of communities (some are aggressive), donor fatigue, abusive rewarding systems, poor time management, communication gaps between senior management and the students in some institutions, lack of transparency and accountability between leaders of institutions and student leaders, globalization, competition between institutions, higher expectations from the leaders, limited resources to do work, lack of emotional support, conflict management, struggle to remain competitive, lack of truth telling between students, staff, and communities, wrong job expectations for both students, staff, and community, research unfunded, yet it is one of the three mandates of any university, lack of parental follow up, interaction gap between leaders, laziness in the community, embezzlement of funds, misuse of property, corruption, tribalism, cultural discrepancies, racism, gender imbalance, nepotism, higher institutions of learning are not listened too when discussing development issues, inexistence of memoranda of understanding between higher institutions of learning and communities and or other existing bodies necessary for development.

Objective 4: Level of involvement in Discussions on Development Issues between leaders of HILs and Leaders in Eastern Local Government

Involvement with local government

In Uganda, policies are developed by the Government and related bylaws are formulated at local government in the Districts. Participants responded that HILs should be involved in the formulation of both policies and bylaws related to development issues. This is important for HILs to fulfill their mandate of imparting knowledge, conduct research and offer community services to the people of communities where they are established. Unfortunately, that is not the case as responses in this study show. Findings revealed that there is no much involvement between leaders of higher institutions of learning with those with local governments in eastern region. Out of 30 HILs, respondents from only 3 institutions (1%) supported that there is a sort of involvement although HILs try to have local leaders as members of higher institutions governing bodies especially at University Council and Board of Trustees levels. The remaining 27 institutions visited representing 99% higher institutions of learning visited indicated that the level of involvement in local government issues is very low and even when they get involved most of the time meetings are unplanned. A respondent said, "they do come when they need their taxes to be paid." This view was given by students and staff. Communities get involved only when there are projects that are initiated by the government. Times often, projects are initiated from national level and not at grassroot level.

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Discussions and summary

The researcher referred to Guvstavson (2016) who says, "When you focus on your mission and stay mindful of your purpose, you can adjust to new and exciting vision opportunities." Leaders of HILs should adhere to this statement. It is difficult to cause development without a mastery of mission and vision and the sense of purpose. Leaders of HIL should remain vigilant on new developments and discover opportunities that are there in HILs and outside HILs and which can be used during learning. In fact, as students join HILs, they expect to be exposed to knowledge, acquire skills and, they want to be exposed to existing job or even be empowered to use their skills so that they create jobs for themselves and even give employment to other members of the communities where they live. Equipping them for that will enable graduates to look for jobs but also since jobs are rare to the African graduates as pointed out, these graduates after acquiring appropriate knowledge and skills could start their own business and reach the final goal for this century: using education for sustainable development.

For today and tomorrow's society, we need leaders with clear vision. This is critical for leaders in higher institutions of learning in the world or Africa. Education should have a clear mission, purpose, and a clear vision if it should be the drive of sustainable development. In relation to this, Musaazi (2011) pointed out in chapter two that development is an educational process. Any leader in HIL must have the vision of leading graduates to sustainable development as training goes on not only by exposing students to opportunities but enable them to grasp these opportunities to make them useful citizens who will help them not only to induce but also to maintain and promote sustainable development. In the preceding section, opportunities were given. They should be used to cause development.

Each group of people has its own values and traditions. This affect both institutions (HILs included) and these values and traditions lead to definitions of a kind of organizational philosophies, missions and vision. These enables the definition of individual identities that lead to self-image. Those values and traditions when positive, they are crucial factors to consider for development: hard work, courage and determination are values. The researcher supports that if properly used, they will allow both individuals and communities to move forward. All these elements are key ingredients of self- image and can increase confidence and trust in self for more intentional action. In connection to this one of respondents gave the example of men in the Massai communities. He said that "the Massai people are known of their tradition of being able to kill lions. They are known to be fearless and capable of facing challenges courageously." Development is a very ambitious call. To achieve sustainable development, courage and determination combined with hard work are indispensable on the road to development because with development many challenges come: resistance to change because people want to remain where they are as they are. To cause a change of mentality is not an easy task.

Findings also revealed that there are lots of potentials for both students, staff and communities. It is now for the leaders of HILs to let students, staff and communities discover their full potentials. Once exposed to them they will have to use them and build onto them to make them able to become important participants in critical discussions and then after useful participants in the efforts to promote sustainable development.

The findings in this study have shown that there are many opportunities that are there for students and staff as well as communities in which HILs have been established. The youth population in Uganda is the youngest in Africa. As this youth is educated, they have a lot of expectations from the government and the families where they come from. They need jobs, unfortunately the VCF (2016) revealed that out of 400, 000 students who graduate every year as, only one third of graduates get jobs. What about the remaining two-third? If nothing is done, then they become unemployed and can easily embark dragged in activities that make them become threats for sustainable development instead of being catalysts of true development. They become preys to drug and alcohol consumption. Most of them get involved into criminal activities and become perpetrators of other social vices capable of engendering a cycle of crimes, misery and poverty altogether.

In regard to this and According to the UBOS 2014, Uganda has a population of 34. 85 Million. Life expectancy in Uganda is 58.65 years (https://www.google.com/#q=uganda+population). It is also known

that the Ugandan population is dominated by youths representing around 78 % of the total population as initially pointed out. These statistics are very significant for school leadership in both public and private HILs. In them lies a great potential for school leadership empowerment on which depends the future of the education sector for integral development of Uganda as a country in general and Eastern Region in particular. There is potential for positive influence as far as leadership is concerned even though unemployment can be considered as a social threat by many. These youth have potential that needs to be analyzed politically, economically, socially, culturally and assess all possible means of empowerment which can lead such a population to be very productive. Uganda can capitalize on that to induce development that the final goal will be sustainable development, hence self-reliance.

Any research leads to findings that need to be critically looked at and compared to existing knowledge. The review of literature informed on opportunities and potentials that exist in Higher Institutions of Learning. This section also pointed out existing challenges that hinder leaders of Higher Institutions of Learning to play their key role of being catalysts of sustainable development. Participants in this research have clearly pointed out existing opportunities, potentials and challenges as we presented them in chapter four. They also indicated what they think could help promote sustainable development as established for this 21st Century.

Musaazi (2006) indicates that to make education a profitable enterprise and a contributor to social development, planning must come to be accepted as the essential prerequisite. The researcher agrees with Musaazi. Now that opportunities in HILs are known as well as potentials and challenges, there is a need for proper educational planning so that school programs will offer not only knowledge but also platforms for practical application of the acquired knowledge. This will enable leaders of HILs to have a great impact on the lives of students after they graduate for, they will somehow able to have enough confidence through acquired knowledge the how to use the knowledge and be able to be creative and innovative. With these practical skills, unemployment and issues of poverty can be addressed accurately and lives can be improved, through economic empowerment which is the backbone of sustainable development.

The researcher through the outcomes of this study reveals that there is no way self-reliance will be attained if there is no intentionality to action that needs to be talked about from the very beginning of the education process of the learner. Intentional action needs to be at the center of any education endeavor if we need to speak more about pragmatic leadership. That's why he sought to expand a step further that existing theory and establishes therefore a new theory that he calls Pragmatic Leadership Theory with Intentional Action (PLTIA). This new theory is represented in the following diagram:

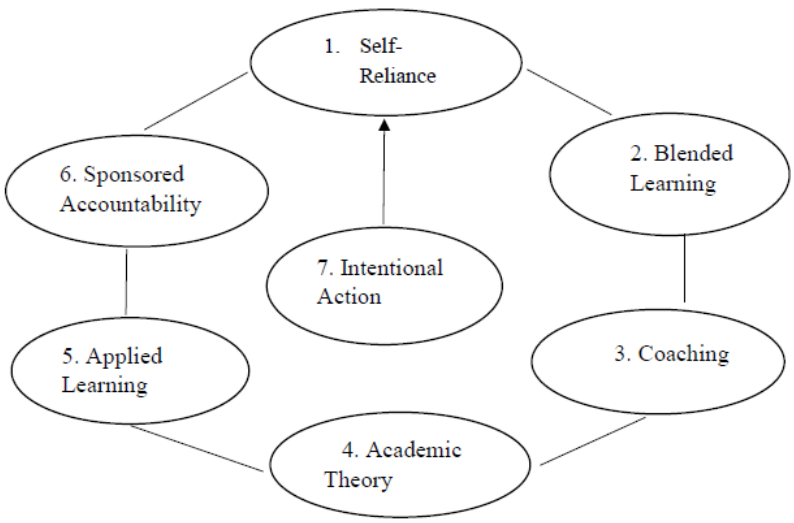

Figure 5.1. Pragmatic Leadership Theory with Intentional Action (PLTIA)

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Conclusion

To conclude, the researcher builds on Pragmatic Leadership Theory to propose a new theory that he calls *Pragmatic Research Theory with Intentional Action*. The study has revealed that many opportunities and potentials that exist in HIL which if well used will make HIL indispensable catalysts for sustainable development. This type of development is based on Intentional Action that will absolutely lead individuals to self-reliance. Africa as a continent has people and resources and it is a paradox to talk about resources and poverty or unemployment. This remains true for Uganda and Eastern region as well. It is time to wake up and suggest a new educational approach that will cause Africa to reach Sustainable development as expected in this 21st century. In fact, the millennium goals for development speak about education for sustainable development as pointed out earlier. For the researcher, it is unworthy to speak about self-reliance if the education curricula from home to schools at different levels of education do not stress intentionality to Action for self-reliance. And this self-reliance is not for selfish ambition but for self-empowerment and the empowerment of other members of the community.

Implications of the study

The findings and results had different implications: Opportunities and potentials do exist in Higher Institutions of Learning. Therefore, there is a need to review leadership at HILs' level and try to unveil their weaknesses to avoid producing half-baked graduates who cannot be employed because they do not fit with the needs of society. The education system needs to be revisited so that *Pragmatic Leadership Theory with Intentional Action* be considered as the best educational approach that can help cause sustainable development.

Directions for future research

The research study has been conducted only in the Eastern Region of Uganda, there is need to expand it to other regions in the whole country and if possible, someday on the whole continent. The quantitative approach with the use of descriptive and inferential statistics could then be used to compare livelihood of those who benefit from PLTIA versus those who continue to study under the traditional educational approaches and see which group is better.

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Yield Analysis and Adaptation for Bacillus Thuringiensis (BT) and Non-Bacillus Thuringiensis (BT) Cotton Varieties in the Kingdom of Eswatini

Author by Daniel Khumalo
PhD, Management, Texila University
E-mail: dmkhumalo66@gmail.com

Abstract

Cotton in Eswatini contributes 2.1 % of the country's Gross Domestic Product owing to low cotton yield due to high pest pressure. Eswatini farmers grow Alba QM 301 a conventional non Bt variety which is affected by bollworm. Cotton is no longer profitable and farmers are quitting the industry, yet it is the only source of livelihood in drought prone areas of Eswatini. Countries like India and South Africa have replaced conventional cotton with high yielding Bt or genetically modified cotton. The study analyses yield and adaptation of Bt cotton under rain fed condition. Bt cotton hybrid was evaluated under field condition for adaptation and yield performance in 2016 and 2017 season. Two Bt cotton varieties JKCH 1947 Bt and JKCH 1050 Bt were tested against the local variety Alba Plus QM 301 and JKC 724 both Non Bt (NBt). JKCH 1947 recorded significantly higher seed cotton yield per ha of 3070 kg/ha on the first year. It was closely followed by JKCH 1050 with a yields of 2955 kg/ha. The number of boll per plant was also significant higher compared the control. Alba Plus QM 301 and JKC 724 both Non Bt (NBt) recorded the lower yields of 2066 and 821 kg/ha respectively, under the same condition with less number of bolls per plant. Similar observations were recorded on the second year, JKCH1947 and JKCH 1050 recording 1765kg/ha and 1865kg/ha respectively. A similar trend was observed on the number of bolls per plant, higher number of bolls were recorded in JKCH 1050 Bt followed by JKCH 1947 Bt. Alba Plus QM 301 NBt and JKC 724 NBt recorded fewer boll in both years. All varieties showed good adaptability to local environment with good plant stand.

Keywords*: Bt cotton, rain fed conditions, seed cotton.*

Introduction

This paper is about introducing genetically modified cotton in the Kingdom of Eswatini. Discussions in the paper are guided by management processes of introducing a new product or new technology in a market. In the Kingdom of Eswatini, agriculture plays a major role in the economy; it's a major source of food, and also employs more than 60% of the country's population (ISAAA, 2014; Thomson, 2012). Eswatini's agriculture is mainly dependent on sugar cane, cotton and forestry. Cotton is the second biggest cash crop after sugarcane in Eswatini. It is an important cash crop for most Swazis who live on drought prone areas and smallholder farmers who are reliant on the crop for their livelihood (Central Bank of Swaziland, 2013). Eswatini farmers are still entirely reliant on conventional hybrid cotton seeds. Hybrid cotton seeds have long been used in the industry as the sole means for cotton production.

Genetically modified cotton is a variety of cotton that has been modified through a biotechnological process in order to achieve a higher yield. Bollworm resistant, *Bacillus Thuringiensis* (BT) cotton is the most popular genetically modified cotton seed used throughout the world. Genetically modified cotton was first introduced in the early 1990s and has since been adopted by major cotton producing countries such as the USA, India, China and South Africa (James, 2011). The genetically modified cotton seeds are engineered via a biotechnological process to reproduce the soil bacterium *Bacillus Thuringiensis* in a crystal form in order to exterminate certain types of insects and pests which damage the cotton crop and reduce farmer's yields (Craig *et al.*, 2008). The new genetically modified seed has outstripped its traditional hybrid counterparts in terms of yield (Brookes & Barfoot, 2013).

In Eswatini, the cotton industry is currently facing a decline in production and this has affected the textile industries which relied on Eswatini cotton as their main source of inputs. Most textile industries have closed due to the shortage of cotton. The few textile factories that are operational survive through importing cotton supplement locally depressed supplies for the daily operations. The government of

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Eswatini has to revive the cotton industry by introducing a new product in the market. The purpose of this paper is to analyse yield and adaptability of genetically modified cotton in Eswatini. The paper will compare two Bt cotton varieties against the locally grown conventional cotton variety by evaluating the agronomic characteristics of the varieties under condition of the in the Kingdom of Eswatini.

The cotton industry in Eswatini is currently facing many challenges. The country's largest cotton ginnery which is under the stewardship of the Swaziland Cotton Board (SCB) and located at Big Bend, has a capacity to handle 25 000metric tons of cotton. Currently, a mere 10% of the ginnery's capacity is being utilised owing to unavailability of inputs and decreased cotton production, among other reasons (Mavuso, 2014). The cotton industry is solely dependent on conventional hybrid cotton seeds. This product has been used by all cotton farmers for the past two decades (Cotton Board, 2014). However, the hybrid cotton seed has reached their decline phase and this is characterised by a rapid decrease in the yield of this product. The decrease in cotton production threatens the 90 ginnery employees' jobs at the Big Bend ginnery (Cotton Board, 2014).

Hybrid cotton that is currently grown by Eswatini farmers is no longer producing high yield as it used to do in the past years. The product has reached a decline phase which is characterized by high production cost, low yields, and heavy pesticides application requirements. From a management point of view a product in decline phase needs to be phased out and replaced because it will be fool hardy to rejuvenate the product (Kotler, 2012). Cotton acreage has drastically been reduced from 20,000 hectares to merely 3000 hectares (Cotton Board, 2013). Correspondingly, the number of cotton farmers in Eswatini has also decreased from 9000 to 3000 in the past 6 years (Cotton Board, 2013). The sector has a potential capacity to create employment directly and indirectly through the textile industry, ginning, spinning, and weaving of fabric respectively, has gone down. This has been aggravated by labour migration from rural areas to the cities (Thomson, 2012). The country has to find strategies of filling the demand gaps created by dwindling cotton production over the years and cheaper technology to continue producing enough cotton to meet increasing demand. Opportunities that are not utilised when they arise will always be taken up by one's competitors (Bryman, et. al. 2014). It is the researchers' conviction that the introduction of genetically modified cotton seed is one of the viable options to tackle the cotton industry's prevailing challenges. There is an urgent need to test the Genetically modified (Bt) technology under local condition and adopt genetically modified (Bt) cotton technology to replace hybrid cotton seed.

In an effort to address the problem in the cotton industry of Eswatini it was essential to conduct agronomic trials of genetically modified (Bt) cotton and test its adaptability under Eswatini soil and weather conditions. This study aimed analyzing yields and the agronomic traits of two Bt cotton hybrids, JKCH 1947 Bt and JKCH 1050 Bt against a popular control variety Alba Plus QM 301(non Bt) NBt and an inbred JKC 724 NBt for yield potential and adaptability. The field experiment was conducted over 2 year, 2016 and 2017 season.

Materials and methods

Field experiment was conducted at two years on the same site in Eswatini during 2016 and 2017 planting season. The trials focused on agronomic and yield performance of two Bt cotton hybrids (JKCH 1947 Bt and JKCH 1050 Bt), inbred (JKC 724 Non Bt) developed and owned by JK Agri Genetics Limited and the control was a locally grow conventional variety (Alba Plus QM 301 Non Bt). The Lowveld Experimental Station (LES) is located in the Lowveld region (26° 57.95S, 31° 31.52E; 89m asl), with mean temperatures ranging between 26.4 to 30.5°C and annual rainfall of 450 mm. The soils are M-series, which are sandy loam, well drained and fertile (Murdoch, 1968). The experiment used a randomized complete block design (RCBD) with six replications. Gross plot size of experiment was 4 rows of 6 metres length planted at an inter-row spacing of 90 cm and 25 cm between plants. Whereas, the net plot constituted of 2 middle rows with each row having 20 plants thus a total of 40 plants for the net plot.

Observations were recorded on six randomly selected plants from each variety per replication for the characters viz., plant height (cm), no. of lateral branches, no. of lateral branhes (≥ 4 bolls), days to 50% flowering, no. of damaged bolls, no. of bolls/plant, damaged bolls (%),50 bolls dry weight (g), ginning out turn (%) and cotton yield (Kg/Ha). Out of all the bolls per plant, fifty bolls were randomly selected

and weighed using a digital balance. Thereafter, the seed cotton yield per plot was estimated after picking the cotton from the whole plot and adding the weight of the collected bolls. The values were up scale from kg/plot to kg/ha for each cotton strain and replication. Field management was done general agriculture practice in the cotton industry of Eswatini. Multiple foliar sprays were applied on control variety Alba Plus QM 301 NBt and inbred JKC 724 NBt to manage cotton bollworm infestation. No foliar sprays were applied on Bt cotton hybrids.

Statistical analysis

All data were expressed as mean with standard deviation. Agronomic and yield traits data from the cotton varieties were pooled and analysed using one way ANOVA. Analysis of variance was performed by using the ANOVA procedure of the SAS software (version 9.3 for windows). Significant differences between varieties agronomic and yield traits means were determined by Fischer's Least Significant Difference Test at the level of $p \leq 0.05$.

Results and discussion

Table 1. Year 1 agronomic traits of Bt and Non-Bt cotton results

Cotton Variety/Hybrid	Plant Height (cm)	No. of Lateral Branches	No. of lateral Branhes (≥ 4 bolls)	Days to 50% Flowering	No. of Damaged Bolls	No. of bolls/plant	Damaged Bolls (%)
Alba Plus QM 301 NBt	83.4a[1]	9.5a	2.5b	106.5a	20.5a	58.8b	35.6
JKC 724 NBt	48.1b	7.7b	3.0ab	110.5a	16.2a	56.2b	29.0
JKCH 1947 Bt	87.7a	9.4a	3.8ab	84.8b	6.7b	92.0a	7.6
JKCH 1050 Bt	78.0a	9.8a	4.2a	86.3b	6.1b	90.2a	6.6

[1] Means with the same letters within the same columns are non-significant with Fischer's Least Significant Differences (LSD) test

Table 2. Year 1 yield components of Bt and Non-Bt cotton results

Cotton Variety/Hybrid	50 Bolls Dry Weight (g)	Ginning Out Turn (%)	Cotton Yield (Kg/Ha)
Alba Plus QM 301 NBt	283.3a[1]	44.7a	2066b
JKC 724 NBt	207.2b	40.8c	1173b
JKCH 1947 Bt	311.5a	43.1b	3070a
JKCH 1050 Bt	294.7a	43.3b	2955a

[1]Means with the same letters within the same columns are non-significant with Fischer's Least Significant Differences (LSD) test

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Table 3. year 2 Agronomic traits of Bt and Non-Bt cotton results

Cotton Variety/Hybrid	Plant Height (cm)	No. of Lateral Branches	No. of lateral Branhes (≥ 4 bolls)	Days to 50% Flowering	No. of Damaged Bolls	No. of Bolls/Plant	Damaged Bolls (%)
Alba Plus QM 301 NBt	131.0a[1]	12.52a	2.56c	158.6b	1.0a	41.2b	2.4
JKC 724 NBt	89.0b	11.03a	2.36c	165.a	1.2a	37.3b	2.7
JKCH 1947 Bt	148.0a	12.58a	3.67b	101.5c	0.3a	65.5a	0.5
JKCH 1050 Bt	131.0a	12.92a	5.39a	106.1c	0.5a	67.2a	0.7

[1]Means with the same letters within the same columns are non-significant with Fischer's Least Significant Differences (LSD) test

Table 4. Year 2 yield components of Bt and Non-Bt cotton results

Cotton Variety/Hybrid	50 Bolls Dry Weight (g))	Ginning Out Turn %	Cotton Yield (Kg/Ha)
Alba Plus QM 301 NBt	220.3a[1]	45.7ab	1337b
JKC 724 NBt	172.2b	44.0b	821c
JKCH 1947 Bt	226.8a	46.3a	1765a
JKCH 1050 Bt	218.8a	47.3a	1817a

[1]Means with the same letters within the same columns are non-significant with Fischer's Least Significant Differences (LSD) test

Early flowering was observed in hybrids JKCH 1947 BT (85 days) and JKCH 1050 Bt (86 days) compared to the control variety Alba Plus QM 301 NBt (106 days. Damaged cotton bolls were prominent in Alba Plus QM 301 NBt (35.6%) compared to minimum damaged bolls in JKCH 1947 Bt and JKCH 1050 Bt almost (7.0%) each (Table 1). Industrially acceptable ginning out turn percentage (GOT%) ranged between 43.1 to 44.7% in cotton varieties except JKC 724 NBt with 41.0%. Yield indicated that out of the four varieties tested, JKCH 1947 Bt (3070 Kg/ha) and JKCH 1050 Bt (2955 Kg/ha) produced significantly superior seed cotton yield compared to control variety Alba Plus QM 301 NBt (2066 Kg/ha) on the first year. The same trend was observed on the second year. The lowest yielding variety was inbred JKC 724 NBt (1173 Kg/ha). Bigger boll size was observed in JKCH 1947 Bt (312 g/50 bolls) followed by JKCH 1050 Bt (295g/50bolls) and Alba Plus QM 301 NBt (283g/50 bolls) (Table 2). Agronomic performance of Bt cultivars may vary substantially from their non-Bt counterparts (Jenkins et al., 1997).

Significantly higher number of bolls were recorded in JKCH 1050 Bt (67.0) followed by JKCH 1947 Bt (66.0) compared to Alba Plus QM 301 NBt (41.0). The hybrids Bt varieties JKCH 1947 Bt and JKCH 1050 Bt (106 days) were significantly faster in boll formation taking (102 days and 106 respectively. Alba Plus QM 301 NBt took the longest time of 159 days. Control entry Alba Plus QM 301 NBt (% boll damage 2.4%) had more boll damage compared to minimum boll damage in JKCH 1947 Bt (0.5%) and JKCH 1050 Bt (0.7%) (Table 3). Industrially acceptable ginning out turn (%) was observed in JKCH 1050 Bt (47.3%), JKCH 1947 Bt (46.3%) and control variety Alba Plus QM 301 NBt (45.7%). JKC 724 NBt exhibited a low GOT% (44.0 %). Based on the weight of 50 balls per variety, Hybrid JKCH 1947 Bt (227 g/50 bolls) had bigger boll size followed by Alba Plus QM 301 NBt (220g/50 bolls) and JKCH 1050 Bt (218 g/50 bolls). Significant differences were again observed on yield of the four

cotton varieties trials on the second with JKCH 1050 Bt (1817 Kg/ha) and JKCH 1947 Bt (1765 Kg/ha) compared to control variety Alba Plus QM 301 NBt (1337 Kg/ha). The lowest yield was observed in inbred JKC 724 NBt (821 Kg/ha) (Table 4).

Discussion

Yield is dependent on many component characters, such as boll weight, number of bolls per plant and harvest index. Bt cotton hybrids produce increased seed cotton yield over their non-Bt counter parts and check hybrids, Bt cotton hybrids recorded more than 100% increased seed cotton yield over non-Bt and control hybrids (Anon, 2002).

The Increased yield is attributed to the Bt-genotypes in JKCH 1947 Bt and JKCH 1050. Bolls in the Bt hybrid varieties were protected, while only those that survived the pest pressure were harvested under the local Alba Plus QM 301NBt and the inbred JKC 724 NBt. The two Bt-genotypes eliminate shedding of bolls due to bollworm infestation. Alba Plus QM 301NBt and the inbred JKC 724 NBt suffered from significant boll worm damage. This culminated to the higher seed cotton yield on Bt- genotypes over the local checks.

Since cotton is grown under rain fed condition, the number of days to flowering became is important to cotton producers. The earlier the cotton flowers it the earlier is the maturity time and exposure to heat unit required for crop maturity compared to late flowering varieties. This contributed to high-yielding ability, JKCH 1947Bt and JKCH 1050Bt in both years of experiment. Bt hybrids recorded significantly higher yield than the corresponding non-Bt hybrids. Early-maturity and high-yielding ability is double benefit to the rain fed farmers. The early maturity provide farmers with drought escape toward climate change. Quick trait will help the hybrids to escape from terminal moisture stress in the season. This makes the cultivar to be preferred under rain fed areas (Hofs et al., 2006).

Numbers of bolls per plant play a vital role in determining final yield of a cotton variety. This is influenced directly or indirectly by the growing conditions and its genetic ability to perform in the given environmental condition (Luqman et al., 2015. The statement by Luqman et al. 2015 clearly correspond to the observation of this study where in both years, the Bt cotton cultivars expressed a higher mean number of bolls per plant compared to the local variety and the Non Bt hybrid in both locations. The results obtained from the field trials corroborated those of a trial by Sudha et al. 2011 in Govankoppa village in India.

Conclusion

This study analyzed the yield performance of two Bt cotton varieties in Eswatini over a period of 2 years based on rain fed conditions. Cultivation of hybrid Bt cotton did not only give a significantly higher yields but also realized significantly reduced insecticidal usage, hence giving security to farmers about the cotton yield. The study conducted over two year's clearly depicted good adaptability of both Bt (JKCH1050 and 1947) cotton hybrids to Eswatini environment. The varieties were early maturing and high-yielding. Adoption of these Bt varieties can help empower Swazi cotton farmers to embrace and benefit from product of modern biotechnology. It is therefore concluded that the two Bt varieties (JKCH1050 and 1947) be released to farmers for commercial growing.

Recommendation

It is recommended that the kingdom of Eswatini commercialize the growing of Bacillus thuringiensis cotton to cotton growers.

It further recommended that further studies be conducted on the four regions of Eswatini on the performance and adaptation of this technology.

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Cloud Computing Environment Security Issues

Article by Khanyisile Patience Dlamini- Shabangu
Nursing, Texila American University
E-mail: patiencedlam@gmail.com kshabangu@texilaconnect.com

Abstract

Cloud Computing is a technology that provides on-demand computing services such as applications, storage, and processing to consumers over the internet (cloud). It is centered on the pay-per-use model meaning that a user has to pay only for the services utilized. This technology is based on the virtualization perception. Such services allow the companies/establishments to scale-up or scale-down their in-house grounds. Cloud computing has numerous advantages such as flexibility, efficiency, scalability, integration, and capital reduction (upfront fixed cost), and shared resources. Moreover, it offers an advanced virtual space for companies to deploy their applications or run their operations. However, companies which consider embracing cloud based services must also appreciate that regardless of its benefits, the transition to this computing paradigm raises security concerns which are subject of several researchers. The goal of this article is to identify the main security issues and to draw the attention of both decision makers and users to the potential risks of moving data into "the cloud".

Keywords*: cloud computing, cloud service, data security, infrastructure data confidentiality.*

Introduction

The term "cloud" is used as an icon of the Internet and other communications systems as well as an idea of the underlying infrastructures involved. Cloud computing usually refers as the result of a progression of the widespread acceptance of virtualization, service-oriented architecture, autonomic, and utility computing. The specifics of site of infrastructure or component devices are not known to most of the end-users, user do not require to comprehensively appreciate or control the technology infrastructure that supports their computing activities and the users do not necessarily have their own resources.[17].

Cloud Computing is Innovative Information System architecture. It is a driving force challenging its observers to rethink their understanding on operating systems, client-server architecture and browsers. Cloud Computing is an enticing technology which is a combination of many existing technologies such as parallel computing, grid computing, distributed computing, etc. It offers services like data storage, power supply, low cost to its consumers over the internet at anytime from anywhere. The pricing model is centered on pay as you go method. Millions of individuals and companies are depending on cloud for their data.

Although cloud computing is realizing increased popularity, concerns are being voiced about the security issues introduced through the adoption of this model. Data security issue is the major challenge which is hindering the progression of cloud computing. It needs to be resolved in order to make it widely acceptable and to accelerate its growth.

National Institute of Standards and Technology (NIST) describe cloud computing as a model for allowing ubiquitous, convenient, on demand network access to shared pool of resources (e.g. networks, servers, storage, applications and services) that can be promptly provisioned and released with insignificant management effort or service provider interaction. This cloud model promotes availability and is composed of five essential characteristics, three service models and four deployment models [5].

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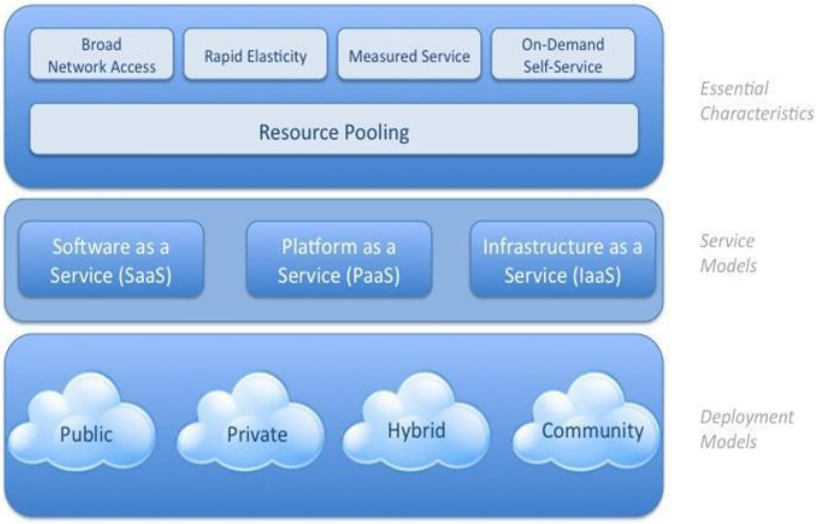

Figure 1. NIST- Visual model of cloud computing

In cloud computing the available service models are: [5, 8]

A. ***Infrastructure as a Service (IaaS):*** Focuses on hardware and IT infrastructure management. The facility provided to the client is to lease processing, storage and other computing resources. The client does not manage or control the basic cloud infrastructure but has control over the operating systems, storage, deployed applications and possibly limited control of select network components.

B. ***Platform as a Service (PaaS):*** Concentrates on middleware and design tools as a service. Clients obtain access to the platforms by enabling them to organize their own software and applications in the cloud.

C. ***Software as a Service (SaaS):*** Clients obtain the facility to access and use the application or service that is hosted in the cloud. The applications are designed for end users and it is delivered over the web. Deals with traditional software applications such as customer relationship management or social networking as a service, and business process as a service (business cloud) offers value added services.

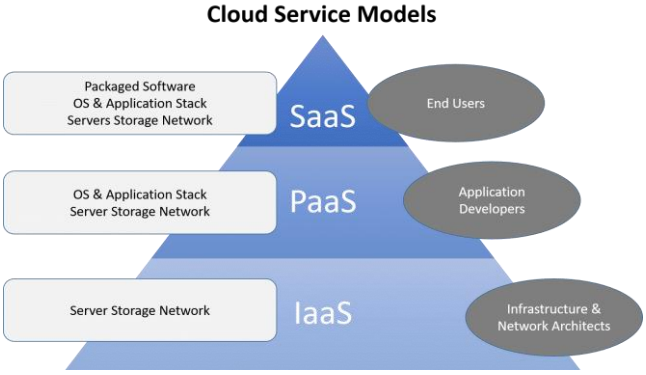

Figure 2. Cloud service model [3]

The four deployment models for cloud architecture solutions are: [2,4]

A. ***Private Cloud:*** Clients have complete control over how data is managed and what security measures are in place while data processing in cloud. Clients are considered to be trusted (employees, contractors, and business partners).

B. ***Community Cloud***: The cloud infrastructure is shared by several organizations and supports a specific community that has shared concerns (e.g. security requirements, compliance consideration, policy, etc.). It may be managed by the organizations or third party, may exist on premise or off premise.

C. ***Public Cloud:*** Services and infrastructure are provided to different clients. The clients access the application (web) or services over the internet. The clients do not know how the cloud is managed or what infrastructure is available. The clients of this service are considered to be untrusted.
D. ***Hybrid Cloud:*** It is a combination of two or more clouds (private, community, or public) that remains unique entities, but are bound together by standardized or proprietary technology that enables data and applications portability (e.g. cloud bursting for load balancing between clouds).

The essential qualities of cloud computing are: [5, 18]

A. ***Shared Infrastructure:*** Cloud environment uses an effective software model that allows sharing of physical services, storage and networking capabilities among users.
B. ***Network Access:*** Cloud services are accessed over a network from a wide range of devices such as PCs, laptops, and mobile devices by using standards based APIs.
C. ***Scalability of Infrastructure:*** New nodes can be added or dropped from the network as can physical servers, with limited modifications of infrastructure set up and software. Cloud architecture can scale horizontally, or vertically, according to demand.
D. ***Reliability:*** Improves through the use of multiple redundant sites, which makes cloud computing suitable for business continuity and disaster recovery.
E. ***Location Independence****:* There is a sense of location independence in that the customer generally has no control or knowledge over the exact location of the provided resources, but may be able to specify location at a higher level of abstraction.

Some of the Cloud Domains that should be addressed by service contracts are: [5]

A. Architecture Framework
B. Governance, Enterprise Risk Management
C. Legal, e-Discovery
D. Compliance & Audit
E. Security, Business Continuity, Disaster Recovery
F. Incident Response Issues

A number of standard bodies are creating standards for cloud environment. Clients have a liberty to move between cloud providers. This may be due to different reasons. E.g. other service providers offer better prices; relationship with a vendor may not be working, etc. The community of cloud computing has already developed numerous standards by several forums. These standards are developed to offer interoperability between clouds and to develop an excellent environment in cloud computing industry [2, 18]. Some cloud security standard organizations are:

A. National Institute of Standards and Technology (NIST)
B. Open Cloud Consortium (OCC)
C. Open Grid Forum (OGF)
D. Cloud Security Alliance (CSA)
E. Cloud Computing Interoperability Forum (CCIF)

Methods

A number of researches have been performed in the literature for cloud computing and its security issues. Here I present the review of some of the researches.

A. Data Integrity, Data Location, Data Confidentiality, Data Leakage, Investigation, Data Availability, Third Party Control, Privacy & Legal Issues and Backup are the key issues related to data security in cloud computing identified by the researchers [16, 1, 7, 11, 12, 17, 4, 15]. Data Availability, the unavailability of data may lead to outages which may have cost implications to the company. For Data location, cloud clients usually wish their data may reside in their specific country based on the policies, standards and legislation of the country. They usually feel cross border storage may pose risk in terms of data confidentiality, data leakage and privacy and legal issues and the regulatory legislation framework of another country. Therefore, with this the data security becomes the main concern.
B. In the recent years, cloud computing has developed from being a promising business concept to one of the fast-growing sectors of the IT industry. Security is the key issue, as it has lot of loose

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ends which worries a number of cloud users and prospective users. Cloud service users require being attentive in comprehending the risks of data breaches in this new environment.

C. Open Foundation have revealed that more than 2000 cloud related data breach incidents globally have been reported since 2012, which still calls for security concern.

D. The International Journal of Computer Science & Networks revealed/publicized some well-known outages of leading cloud providers, unavailability lead to service outages. Availability is one of the most critical information security requirements in Cloud computing because it is a key decision factor when deciding among private, public or hybrid cloud vendors as well as in the delivery models.

Results

A. According to study [6] security has always been the key issue for Information Technology Executives when it comes to cloud acceptance. They state that in two surveys conducted by International Data Corporation (IDC) in 2008 and 2009 respectively, security came top on the list. Refer to fig.3/4

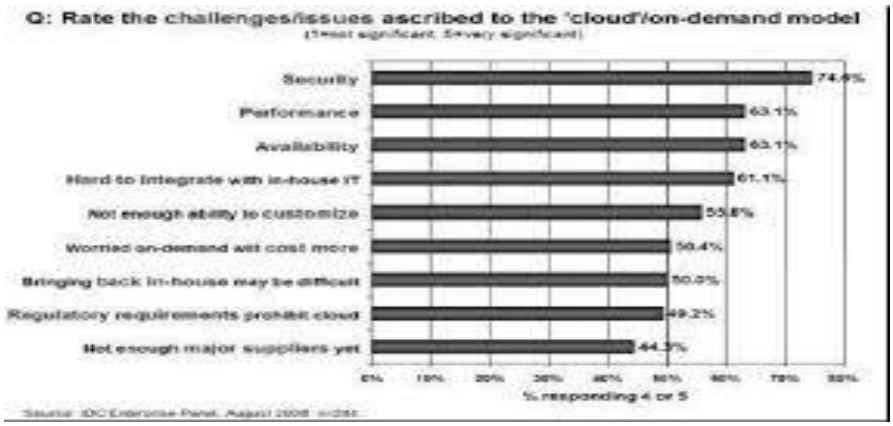

Figure 3. Source: IDC Enterprise portal, 2008

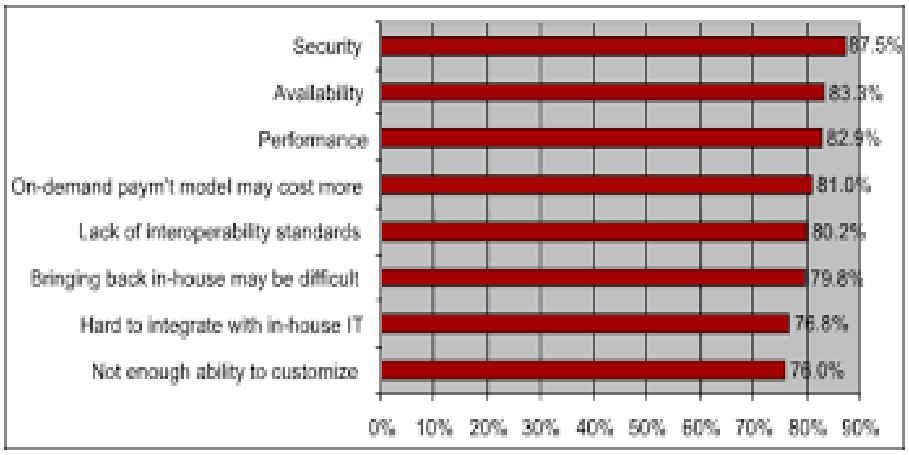

Figure 4. Source: IDC Enterprise portal, 2009

B. In another survey conducted by IDC [3] shows the importance of the challenges for those considering cloud computing as an option. It is shown in Figure 5 that security is the utmost concern. It is no surprise that data security tops the list of concerns that hold institutions back from cloud acceptance. 73% of survey respondents indicated this is a big red flag for them. Cloud service providers are targets data breaches.

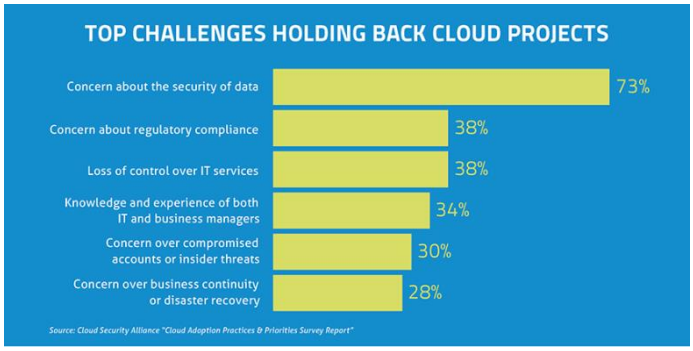

Figure 5. – International Data Corporation (IDC)

C. The 2017 Annual Cybersecurity Report revealed the possible financial bearing of attacks on enterprises, from small medium enterprise (SMEs) to large companies/enterprises. More than 50% of companies encountered public scrutiny after a security breach. Operations and finance systems were the most affected, followed by brand status and client retention. For companies that experienced an attack, the consequence was significant: [2]

i. 22% of breached companies lost their clients, with 40% of them lost more than 20% of their client base.
ii. 29% lost income, with 38% of that group losing more than 20% of income/revenue.
iii. 23% of breached companies lost business chances/opportunities, with 42% of them losing more than 20%.

D. There have been many instances where the Data Centers of the Cloud Service Providers have slowed down or have stopped working altogether. In June 2012, a big storm in North Virginia affected the Amazon's Data Center. The effect was that, websites like Netflix, Instagram, Pinterest, and Heroku were down for few hours because they dependent on Amazon's cloud service [13].

E. In another instance, a flawed storage software update over Google prompted an unpredicted bug in March 2011. Around 150,000 Gmail accounts were affected and all their messages were erased in the wake of that software bug. [13].

F. In April 2012 there was a Gmail interruption that made Gmail services inaccessible for almost 1 hour. The company initially reported that it affected less than 2 % of their clients, then they updated to 10 %, which added to around 35 million clients of a total of 350 million users. These occurrences are not unusual and indicate the client lack of control over their information. [10].

G. According to a study by Open Security Foundation, there were more than 2000 cloud related data breach incidents globally since 2012. Studies done on some randomly selected enterprises show that 82% of those enterprises saved money moving to cloud while only 14% downsized their IT after cloud adoption. [13].

Discussion

Cloud computing provides efficient, flexible and cost-effective services. However, this model is not 100% safe. The major concerns in cloud computing are privacy and security. There are various security issues in cloud computing. Of many security issues, data security seems to be the major obstacle towards the adaption of cloud computing. Data security in cloud is must, in order to ensure that the data has not been accessed by any unauthorized person.

According to a number of researchers [16, 1, 7, 11, 12, 17, 4, 15], the different key data security issues of cloud computing are discussed as follows.

A. **Data Integrity**: It is one of the most critical issues in cloud security. Data integrity describes the wholeness or completeness of data. It can easily be achieved in standalone system by using atomicity, consistency, isolation, durability (ACID) properties. But it is not easy to achieve data integrity in cloud environment because transaction management is the biggest problem with web services. [1].

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B. **Data Location:** Clients keep their data on cloud without any clue about the location of their stored data, therefore requiring the service provider commitment to comply with privacy restrictions. Data locality is of utmost significance because some companies do not want data stored outside the country borders. Cloud model should ensure security and reliability of the location of the data. Location of data stored in cloud can be prioritized according to client's users wish or requirement. [7].

C. **Data Confidentiality**: In Cloud computing, confidentiality plays a key part especially in maintaining control over enterprise's data located across multiple distributed databases. It is essential when employing a Public cloud due to public clouds accessibility nature. Unauthorized access to critical data of an enterprise can cause disaster. Therefore, it is cloud providers duty to ensure that data can be accessed only by a legitimate user. Data confidentiality is achieved by encryption. Cloud provider should implement suitable authentication and accounting mechanism to achieve confidentiality and should guarantee the client that their data is safe and confidential. [11].

D. **Data Leakage:** Although adoption of cloud computing is providing paramount advantages to an entity, but because of data leakage fear, they are holding back. Data leakage has become one of the main worries from security perspective. Cloud is an outside party where customer's data is hosted, and it has potential to access customer's data. Cloud environment provides resource sharing, so it seems to be risky to move data in hands of cloud provider. Data in cloud stored in a shared environment, so it could be hacked easily either due to malicious hacker attack or accidentally. To alleviate the effects of this problem a sensible data encryption technique should be implemented. Encryption should be done at client side and he should have control over the keys used for encryption. Furthermore, encryption should not be performed at any intermediary place before transmission to cloud. [12]

E. **Investigation**: Breach or intrusion attempts are difficult to be trailed and spotted over the cloud due to the dispersion of the data and resources. While in some cases it could be impossible because of the high complexity level. [14]

F. **Data availability:** Another significant concern of mission and safety company in the cloud computing is availability of services. Data availability is a term used by some computer storage manufacturers and storage service providers (SSPs) to describe products and services that ensure that data continues to be available at a necessary level of performance in situations ranging from normal through" disastrous." In general, data availability is realized through redundancy involving where the data is stored and how it can be reached [13]. The unavailability of data may lead to service outages. Table 1 shows some well-known outages of leading cloud providers. [16].

Table 1. Cloud service outage

Cloud Service	**Outage Duration (Hours)**	**Dates**
Amazon S3	7	**20/07/2008**
Google Gmail App	24	11/08/2008
Google Gmail	30	17/10/2008
FlexiScale	18	31/10/2008
SalesForce.com	0.667	6/01/2009
Windows Azure	22	13-14/03/2009

G. Third-Party Control: As, the value of company data is escalating the third party access can lead to a possible loss of trade secrets and intellectual property. There is also the issue of a malicious insider who misuses access rights to clients information. The fear of corporate espionage and data warfare also stems from third party control. Provider compliance with regulations such as those on auditing also raise questions on how that can be affected on site in a globally distributed multitenant environment [16].

H. Privacy and Legal Issues: Data in the cloud is usually globally distributed which raises concerns about jurisdiction, data exposure and privacy. The researchers [4] summarized the key privacy issues of cloud computing. Users are made to contribute their personal information without knowing where it is kept or what future drive it might work for. Businesses stand a risk of not conforming to government policies as would be explained further while the cloud vendors who uncover critical information risk legal obligation. Virtual co-tenancy of sensitive and no sensitive data on the same host also carries its own potential risks.

I. Backup: Cloud provider should guarantee that all of its consumer's data is backed up across multiple servers in multiple copies often to provide recovery in case of disaster like hardware failure. And to avoid accidental leakage of backed up data, a strong encryption scheme should be used. High Security Distribution and Rake Technology (HS-DRT), Parity Cloud Service Technique (PCS), and Cold and Hot Backup Service Replacement Strategy (CBSRS) are some backup and recovery techniques that have been developed in cloud domain [15].

Conclusion

In this paper I explained cloud computing and the its key security issues. By utilizing various facilities and services provided by cloud one can upsurge performance, agility and efficiency in addition to reduce cost and management responsibilities of an enterprise. Though there are a number of benefits of cloud, there are yet numerous challenges to be faced by cloud computing such as privacy issues and data security. In this paper we have tried to address most critical data security challenges of cloud. Also, it should be eminent that different standard organizations such as National Institute of Standards and Technology (NIST), Cloud Security Alliance (CSA), Cloud Computing Interoperability Forum (CCIF), etc. are trying to establish standards to correct numerous security issues of cloud. Cloud computing has the potential to provide a secure and economically viable IT solution in the future.

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Evaluation of Interpretation and Implementation of the Newly Revised School Curriculum in Zambia: A Case of Schools in Chongwe District of Lusaka Province

Article by Sikalumbi Arona Dewin
Chalimbana University, P/Bag E1, Lusaka, Zambia
E-mail: adsikalumbi@gmail.com, dewinarona@gmail.com

Abstract

The study evaluated the interpretation and implementation of the newly revised curriculum in primary and secondary schools in Chongwe district of Lusaka province in Zambia. The ascertaining of the effectiveness of the newly revised school curriculum calls for establishing the purpose of learning in Zambian schools today. The study employed a descriptive survey design. The target population comprised of the public and private school Head teachers, teachers, pupils, and district education officers who are mandated to set standards in Zambian schools and ensure that every school meets the minimum standard. The study used purposeful and randomly sampling techniques. Questionnaires, interview guide and observation were used as research instruments to collect data. The study reveals that 31% of the schools have just implemented the academic career pathway only which is a blue print of the old curriculum and 30% of the head teachers still prefer the old curriculum to the new one. It has also been observed that the implementation of the new school curriculum was launched before the schools were made ready. Therefore, the old strategies, school routines and resources for the old curriculum are being used to force the implementation of the newly revised curriculum. The study thus recommends more investment in the Ministry of General Education for more school orientations and close monitoring of the interpretation and implementation of the school curriculum.

Keywords: *Curriculum, career pathways, academic pathway, vocational pathway, implementation.*

Background

Just like other countries, Zambia is undergoing rapid socio-economic development and the education sector is no exception. Education is an agent of change. While education has always been perceived as a social sector, it is also an economic tool for development.

Education plays the wider role in economic development of societies. This implies that for individuals to fully function in a particular society, they need to have knowledge, skills and positive attitudes which can enable them to function effectively in it. Taneja V. R (2013, p.g 17) observes, “Education must fit the pupil to environment so that he (she) may survive while enjoying the pleasure of satisfying his instincts.” Taneja V. R. (2012) also observed that education is a conscious purpose to train the children for fulfilling the responsibility of adult life. This calls for quality education. Without it school leavers experience poverty and unemployment and some get involved into criminal activities.

In every sense, education is one of the fundamental factors of development (Cowes Alain O., 2011). No country can achieve sustainable economic development without substantial investment in human capital (Ouimet, J.A. and Smallwood, R.A., 2005; Christensen & Allison, 2017). It improves the quality of life and leads to broad social and economic benefits to individuals and society. Education advances people’s productivity, inventiveness and promotes entrepreneurship and technological advances. Furthermore, it plays a very critical role in securing economic and social progress and improving income distribution. Not only should a person learn to fit in the environment but should also learn how to modify it to make his life convenient and enjoyable (Kasanda, 2009; Paul Eggen and Don Kauchak, 2010; David Stocks and Nick Wilson, 2017). However, this all centres on the type of curriculum offered in schools and how it is offered to the learners. It is therefore, through a good curriculum that learners should acquire these needed knowledge, skills and positive attitudes if they are to be instrumental in economic development of any given society.

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In 2011, Zambia realised the gap that existed between the school leavers/graduates and the expectation of society and embarked on education transformation. The target was the school curriculum. It was observed that the old curriculum was not addressing the needs of society adequately hence the need to come up with the new curriculum. The newly revised school curriculum was formulated in 2012, launched in January, 2013 and implemented in January, 2014. Dr. John Phiri, by then the Minister of General Education, stressed out that the new curriculum was the only tool for the Ministry of Education to be producing school leavers who are entrepreneurial and instrumental to the economic transformation of the nation. Chongwe district of Lusaka province joined the rest of the districts in Zambia in implementing the revised curriculum.

Chongwe is a peri-urban district located 45 km East of Lusaka town, the capital city of Zambia. Because of its location it has been used by the government and NGOs for conducting studies as well as for pilot projects before they are implemented in the rest of the districts in Zambia.

The challenges that rural districts may face in curriculum implementation may not be the same as those in urban districts. Therefore, Chongwe district being a peri-urban district was chosen in this study so as to come up with a more balanced report.

Problem statement

As the needs and aspirations of society change, so should the school curriculum. To address the needs of the Zambian society, the government of the republic of Zambia launched the new school curriculum in 2013 and it was implemented in schools in 2014. The curriculum aimed at equipping the learners with skills so as to transform societies towards social and economic development. Developing a good school curriculum is one thing, interpreting and implementing it successfully is another. In as much as there has been more documentation regarding the learner academic performance among others in Chongwe district for the past five years, less has been documented regarding the effectiveness in the interpretation and implementation of the revised school curriculum after three and half years since it was launched. This rose the need to fill this gap by establishing the effectiveness in the interpretation and implementation of the revised curriculum in schools. Hence the study.

Research objectives

The research objectives of the study were to;

- To investigate the interpretation of the new curriculum in schools in Chongwe district.
- Assess the implementation of the career pathways in schools in Chongwe district.
- Suggest measures to enhance the implementation of the new curriculum in schools.

Research questions

- How has the new curriculum interpreted in schools in Chongwe district?
- To what extent have the career pathways implementation in schools in Chongwe district?
- What measures should be put in place to enhance the implementation of the new curriculum in schools?

Methodology

The study employed a descriptive survey design. The target population comprised of the public and private school Head teachers, teachers, pupils, and district education officers in Chongwe who are mandated to set standards in Zambian schools. Chongwe district by the time of the study had 7 secondary schools and 35 primary schools, making a total of 42 schools with 1200 teachers and 9 principal officers at the district education office. The sample size was 24% of the total schools, 5% of the total number of teachers and 33% of the district education principal officers in Chongwe. The study used purposive sampling technique when choosing the head teachers and District Education Officers and randomly sampling technique when choosing schools, teachers, and pupils. Questionnaires, interview guide and observation were used as research instruments to collect data. After gathering data, it was analysed using the Statistical Packages for Social Sciences (SPSS) so as to draw conclusions.

The national curriculum for schools

The term curriculum refers to "All that is taught in school including the timetabled subjects and all those aspects of its life that exercise an influence in the life of the children," Farrant J. S (1980, p.g 24). However, Taneja V. R (2013, p.g 292) defines curriculum as "the instructional and the educative programme by following which the pupils achieve their goals, ideals and aspirations of life." Depending on how broadly educators define or employ the term, curriculum typically refers to the knowledge, skills, attitudes and values which students are expected to acquire; which includes the learning specifications and standards or learning aims, goals and objectives they are expected to meet; the units, content and lessons that teachers teach; the assignments and projects given to students; the books, materials, videos, presentations, field trips and readings used in a course; and the tests, assessments, and other methods used to evaluate student learning.

In 1996, the Ministry of Education developed the National Policy on Education, 'Educating Our Future', in order to respond to the developmental needs of the nation as well as those of the individual learners (MOE, 1996). This policy has since become the basis of all the educational strategies that ensure the provision of quality education through suitable teaching and learning at all levels of education in Zambia. It is against this background that the Zambia Education Curriculum Framework (ZECF) was developed in 2013 as the national curriculum to provide further guidance on the preferred type of education for the nation. This ZECF, therefore, provides the curriculum guidelines as well as the structure at all the levels, from Early Childhood Education (ECE) to Tertiary Education and Adult Literacy (MOE, 2013). This national curriculum was implemented in all the Zambian schools in 2014.

MOE (2012) observes on the new curriculum, "Since curriculum is one of the foundational elements of effective schooling and teaching, it is often the object of reforms, most of which are broadly intended to either mandate or encourage greater curricular standardization and consistency across states, schools, grade levels, subject areas, and courses."

The Zambia Education Curriculum Framework (2013) indicates that the philosophical rationale for educational provision is to nurture the holistic development of all individuals and to promote the social and economic welfare of society. To pursue this rationale, the ministry developed two career pathways for secondary schools.

The career pathways and the two-tier system

Career Pathways have been created in the curriculum to meet the needs and ambitions of different learners. "To carter for diverse interests, differentiated curriculum is essential," (Ewell, P.T., 2010; Taneja V. R., 2013). Hence the ministry of General education has developed two career pathways namely; academic, and vocational and technical career pathways (Education Curriculum Framework, 2012). The vocational and technical career pathway promotes practical skill acquisition and knowledge while the academic career pathway is for learners who wish to study only academic subjects (Teachers' curriculum Implementation Guide, 2013).

In the new curriculum, some subjects have been phased out, others combined like Civics, Geography and History to make Social Studies; Office Practice and Book Keeping to make Business Studies at Junior Secondary level. Furthermore, Computer Studies has been introduced from Grade 1 - 12 to address the needs of the Zambian society and world over. Some subjects have been made more practical like Integrated Science; and new important concepts have been introduced to make the subjects more meaningful. However, the interpretation and implementation of this newly revised school curriculum deserves much attention more especially in Chongwe district and this could only be reviewed by visiting schools where this new curriculum was being implemented.

Findings

To establish the extent to which the newly revised school curriculum has been interpreted and implemented in schools, 10 Head teachers and 40 teachers were interviewed making a sample of 24% and 5% of the total schools and teachers respectively in Chongwe district. All the respondents confirmed that they had implemented the new curriculum in schools. However, they rated average the following; their interpretation and implementation of the new curriculum, Career Guidance and Counselling services offered, and Teachers' interpretation and implementation of the new syllabi. These three are

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cardinal in the implementation of the new curriculum but none is rated above average. Why did they rate them average? The following findings justify their rating. On curriculum orientation, 30% of the sampled teachers confirmed that they had never attended any curriculum orientation seminar or workshop since its implementation in 2014 and 70% of those who attended rated the orientation exercise fairly and never oriented their colleagues upon arrival. This shows that 30% of the teachers who never had curriculum orientation have no proper direction on what to implement, how to implement it and for what purpose. Hence the Head teachers were very right when they rated teachers' interpretation and implementation of the new syllabi as average. The study indicates that this was due to inadequate orientation and supervision by both internal and external monitors who are mandated to set standards.

Monitoring

The research findings indicate that 33% of the sampled schools had never been monitored by both the Senior Education Standard Officers (SESOs) and the District Education Standard Officers (DESOs) on new curriculum interpretation and implementation since its inception in 2014. There has been no confirmation or correction to 33% of the schools regarding curriculum interpretation and implementation by external monitors. This means that for three and half years, these schools have continued moving in whatever direction they have taken and there is no one to praise them or correct them where they have gone wrong.

Career pathways

The study reveals that only 60% of the sampled schools have implemented both the academic and vocational career pathways as stated in ZECF (2014) while 40% have just opted for the academic career pathway which is in line with the old curriculum. The 60% of the schools who said they had both career pathways implemented were heavily hit by lack of text books for new syllabi, lack of computers for I.C.T, lack of science kits and equipment for practical subjects and ill qualified teachers especially in Business Studies, practical subjects, I.C.T and Sciences. Some of the primary school trained teachers who were teaching the junior secondary classes revealed to the researcher that they were teaching those classes just because there was no one in school to handle such subjects. The ultimate result has been poor academic performance in those subjects and non-acquisition of the needed knowledge, skills and values that are needed to steer the social and economic development.

The 40% of the schools that indicated that they just have the academic career pathway implies that they have no vocational and technical skills to offer to pupils in schools. In some schools, it was due to ignorance while others it was due to lack of teaching and learning materials, non-qualified staff in certain specialised subjects, and inadequate funding. However, the study reveals that 90% of the respondents indicated that there was inadequate teaching and learning materials for the new curriculum syllabi. This implies that the schools were not adequately prepared for the implementation of the new school curriculum.

Conclusion

The study reveals that schools were not prepared for the new curriculum implementation, some teachers have not been oriented; 40% of the schools do not have the vocational pathway, the Career Guidance and Counselling services are inadequate, the teaching and learning materials available are not supporting the new curriculum, and the Education Standards Officers are not adequately monitoring schools to set the standards by giving a close supervision to all schools. If there will be no quick interventions, it will be the old curriculum running in the name of the new curriculum.

The curriculum has not been implemented successfully as most schools have opted for the academic pathway only which was the basis of the old curriculum despite the vocational pathway being compulsory. This is as a result of lack of knowledge by many teachers and Head teachers, having a negative attitude towards the new curriculum, politicising the new curriculum, lack of qualified teachers, and lack of teaching and learning resources for vocational subjects. Schools were not adequately prepared for the implementation of the new school curriculum.

Based on the findings of this research, the following are the recommendations:

i. The Ministry of General Education should consider investing more in education in line with the human capital theory especially at primary level. This will help to support efforts aimed at implementing the new school curriculum successfully. The ministry should invest more in curriculum implementation by purchasing all the needed teaching and learning resources more especially in practical/vocational subjects and conduct intensive in-service training on the new curriculum implementation. As the colleges and universities are restructuring their curricular to address the demands of the new national curriculum for the trainee teachers, the Ministry of General Education should conduct workshops for in-service teachers about curriculum and syllabi interpretation and implementation.

ii. There is need to consider the speed up of the decentralisation process in decision making in education provision. This will not only help to stop delays associated with disbursing of funds but it will also enhance effectiveness in curriculum development, interpretation and implementation as schools will be engaged at every stage of curriculum development and implementation.

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Critiquing of the 'Operation Mechanism of the Driving Force System of Ecosystem of Cyber-Society Based on the System Dynamics'

Article by Ikechukwu F. Ezeugo
PhD., Information Technology, Texila American University
E-mail: iykye@yahoo.com

Abstract

This research project is purposed for critiquing an academic work that centres on the dynamics of the emerging cybersociety phenomenon driven by the influences of ICT innovations on society and its sociocultural systems. The original research work being critiqued is titled: 'Operation Mechanism of the Driving Force System of Ecosystem of Cyber-Society Based on the System Dynamics'. The work investigated the ecosystem of the Cybersociety phenomenon with the aim of enriching the body of knowledge with an understanding of the operation mechanism of its driving Force System; the Authors considered the ecosystem operation mechanism with reference to system dynamics operating principles. The project result is intended to close the knowledge gaps surrounding the growing interest of the research community in understanding the internal and external forces that stimulate the development, growth, and sustenance of the visible effects of the Cybersociety phenomenon and its ecosystem. The relevance of the study is underlined by the need for deeper scientific insights into the factors that are responsible for the evolution and thriving of the cybersociety phenomenon within the existing societal frameworks which are also fast redefining contemporary society and general lifestyle. This work is aimed at producing a systematic and objective review of the original research for the purpose of highlighting its strengths and weaknesses, and its applicability in real life practice. The project's output value and contributions to the body of knowledge is founded on the need to satisfy the urgent requirements for professionals, academics and industry practitioners to be equipped with empirical evidence of the validity and reliability of a published material obtained through scientific means involving detailed peer review. In delivering its goals, this project will use empirical research methods for assessing the critiqued article, and synthetization of published materials of evidential values to critically evaluate the published research work for a knowledgeable evaluation report.

Keywords: *Cyberculture, Cybersociety ecosystem, System dynamics, Driving forces, Operating Mechanism, Article Review, academic critiquing, Networks Sociology, Social Ecology, information age, societal structures, self-determination theories, self-regulation theory, Article stability.*

Introduction

Operation Mechanism of the Driving Force System of Ecosystem of Cyber-Society Based on the System Dynamics is a research project report published by Xiaolan Guan, Zhenji Zhang, and Shugang Zhang in 2013. It was published in the International Journal of Computers, Communications & Control. Whereas the focus of the original work is on the dynamics of the cybersociety ecosystem and the mechanisms of its driving forces, this very tributary research work is focused on consolidation and extension of academic works on the subject. This is achieved through the critiquing of the original work undertaken in the context of academic article review project. This is by nature a second-degree empirical study of the research subject as proposed by the original Authors. It involves a critical review of the initial research report, and methodical assessment of the research processes alongside the obtained results and the authors' extrapolations. Article critiquing as an academic project is generally achieved through synthetization of the original work alongside other related publications to find materials of evidential value for benchmarking the critiqued work's findings against submissions from other authorities. The report of this work will of necessity appear different form the generic research reports because findings are presented following the structures and standard for academic article review and critiquing projects.

In line with the requirements for critiquing research works that are tailored as in-depth article review based on tributary research, the report presentation commences with a description of the source of the article; this is followed by an introduction (this section); then, analysis of the critiqued article research

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processes which includes assessment of the depth of the original article's review of related literatures, the article's summary, the analysis of the paper presentation structures, detailed critiquing of the authors' submissions; and conclusion based on the tributary research findings. Additionally, this also methodically examine the article for an in-depth insight into the article's structures and the effectiveness of the Author's presentation. The examination is on the basis of the background of the setting out of the report content; the objective is to determine if a normal academic article reader can read and understand with minimal efforts, even from a non-technical perspective (taking each material presentation on its face value). In achieving the above, the reviewed article was examined following its declared plan as indicated in its title and elaborated in the abstract section; also, this was evaluated alongside the significances of the Author's submissions to determine the validity of the report presentation method. Using empirical evidence from a second-degree research work undertaken for this purpose, the article was further judged on the strength of its own review of existing literatures in its subject domain. The Authors' authorities were examined, and the accuracy of the presented facts was also tested alongside the currency of the research subject and the used materials. The overall relevance of the research work and the significances of its submissions to relevant bodies of knowledge were examined together with the objectivity of the Author's arguments. The right application of graphs, charts, tables and images in the article was also assessed. The article's stability was x-rayed together with its alignment with recent developments in related areas. From my assessment, the article is generally above-board in its research methods, its contents layout, logical alignment of its points, and its presentation style is excellent. However, the substance of the report and allusion to critical facts that should have formed empirical proofs of the Authors' simplifying assumptions remain substantially arguable and not with convincing quantitative scientific detail relevant in the domain of study.

For relevance and applicability purposes, it is important to note that apart from a structured extension of the original research work from a critiquing perspective; reviews of this nature are particularly for applications in the knowledge construction domain. Its relevance is underlined by the fact that it is an independent authenticating second degree research work purposed for providing practical demonstration of how academic critiquing works can be taken beyond head-knowledge, but through an in-depth tributary research works particularly structured for enriching researchers understanding of the peculiar requirements and industry expectation in carrying out original research works and in presenting research reports that meet global academic standards. In this, a practical example is made of a real work to demonstrate the nature and structures of academic works critiquing while still extending the breadth and depth of the original work with a view of providing additional body of knowledge from a critical and objective perspective that can be relied upon for judging the validity of the work with respect to its processes, findings and submissions.

Research question

The research question bothers on whether the article titled '*Operation Mechanism of the Driving Force System of Ecosystem of Cyber-Society Based on the System Dynamics'* meets academic project's report quality, accuracy, validity and reliability standards measured in the context of academic article critiquing. This is tested through empirical studies involving direct assessment of the article and benchmarking of findings against standards and submissions from other authorities.

Materials and methods

Empirical research method is the study approach adopted for this project. Empirical evidence was gathered through direct assessment of the critiqued article, and benchmarking of the findings against critique's experiences, and deductions from other related published materials with evidential value synthesized in the course of the project. The critiqued article was directly assessed, analysed and dissected by the researcher using scientific standards for measuring academic research and report presentations. Findings were qualitatively analysed using data gathered from the article as the primary data source and triangulated with data gathered from the synthetization of related published materials from journals, mass media, and textbooks as the secondary data sources. The research question bothers on the quality of the article which is a factor of its accuracy, validity, objectivity, currency, authority, and reliability.

A unique value that this work adds to the body of knowledge includes the fact that it directly measures the quality of the critiqued article in a repeatable form using established standards as against the dogmatic doctrines of accepting and relying on an academic article because it is published in a popular journal, or

because it has the look and feel of an academic report from its presentation face value and use of language. This is based on the fact that the article and its submissions are judged with knowledge arising from empirical evidence gathered specifically using practical repeatable approaches, and experience measured against scientific standards. Achieving this involves academic rigor, in-depth analysis of the original work, and accumulation of data for judging each component of the report against the industry requirements. Results are presented in a descriptive form under each subject of the specific requirements of standards for academic works reporting. These are presented as the Critique's assessment of the original articles in sections like literature review (for example) which is meant to judge the article's presentation of what is currently known about the researched topic. Other sections include assessment of the research design or methodology, results - sometimes referred to as "findings" and so on. Because of the depth of this kind of reviews, the critiquing report is usually larger than the original work in volume.

Results: review of literature

Within its limitations, the article has a stylish literature review fully embedded in its introduction section. As a prologue to the literature review, the authors remarked that the study and its perspective is a new research area and therefore literatures that have direct and total view of the research subject are not yet available as at the time of the research. The article, therefore, identified that available related materials relevant to the study are focused on two core secondary areas: the **sociology of network** and **social ecology**. It further observed that those focused on the study of **sociology of network** are also split into two main school of taught: those advocating its **classification as part of information science**, and those advocating for its **classification under media and dissemination** for reasons of its unique features that deeply intertwined with media and dissemination. Still on the side of **sociology of network**, the 2001 ***Rise of the Network Society*** published by Custer M. through the Social Science Academic Press (China) was used to establish the interest of researchers on the emerging network society which will eventually become the present-day Cybersociety. Also, to make allusion to the opinions of some school of taught which Custer M. Belongs, Custer's perception of the networked society was reported as follows: "...a new social form of society that is different from the reality, ...characterized by social forms than the superiority of social action" (Guan X., Zhang Z., and Zhang S. 2013). The 2003 publication of Gong Qi titled '**Essence of the Networking Society: A Digitalization Social Relationship Structure**' added to the evidence of researchers' recognition of the emerging new social order, though with a more simplified definition captured in the following words: "a virtual space of human and humans life, study and work in this alternative space" (Guan X., Zhang Z., and Zhang S. 2013).

Comparing the age of the two divisions, the article asserted that research works on **social ecology** found in the course of the study point to the fact that this aspect may have started much earlier than that of the **sociology of network**. The 1979 work of American Cornell University's **Brown** titled, '**Ecology of human development'** was exhumed probably to put the work in context with the natural ecology and also to support some of the Authors' claim on human activities in social networks for supporting their basic assumptions. In attempt to categorize developments in the research subject's domain, the article asserted that research in this area has crystallized into the following two key directions:

1. Analysis of the human social life through related theories and methods of natural ecology that bothers on human activities, social development, etc.
2. Investigation of the coordinated development between the society, economics and resources, taken from the quantitative and qualitative dimensions rooted on the theory of ecology.

The first group which focused on the analysis of the human social life through related theories and methods of natural ecology was collectively supported with two 2004 Harvard Business Review material titled '**Strategy as Ecology'**, and '**The Keystone Advantage: What the New Dynamics of Business Ecosystems Mean for Strategy, Innovation, and Sustainability'** written by Iansiti, M., and Levien, R. The second group which focused on the investigation of the coordinated development between the society, economics and resources was supported with a 2010 Beijing Jiaotong University publication by Feng J. titled '**Research on the Coordinated Development between Internet Uses and Network Environment of the Ecosystem of Cybersociet**y'; and an International Journal of Computers, Communications & Control, publication written by Cubillos C., Donoso, M., Rodriguez N., Guidi-Polanco F., and Cabrera-Paniagua D., titled: '**Towards Open Agent Systems Through Dynamic Incorporation';** and also, the Neghina, D., Scarlat, E. 2013 publication titled: '**Managing Information**

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Technology Security in the Context of Cyber Crime Trends'. The authors insisted that the driving force system of Ecosystem of Cyber-society concept as proposed is a cross-subject research between **sociology of network** and **social ecology**, particularly as it emphasizes analysis of the network space from a sociological perspective in addition to providing a reflection of the theory of system dynamics in the ecology. Notwithstanding, the authors considered the 2008 'Ecosystem of Cyber-society' by Zhang Z., Zhang R. (which appears to be their earlier work) as significant to their present work in this subject.

Overall, sixteen (16) articles were listed to have been consulted in the cause of the research. The paper's in-line citations which depicted the referenced literatures with numeric values were appropriately applied and corresponding numeric values were rightly placed against the particular materials they were meant to represent in the reference section. The article's literature review is smart and also readable.

Article summary

The article presented a report of a research project titled: **Operation of the Driving Force System of Ecosystem of Cyber-society Based on the System Dynamics**. In the report, the driving force system of Ecosystem of Cyber-society is analyzed using the theories of system dynamics. The researcher's goals were encapsulated in addressing their perceived need of a scientific mechanism of intervention and regulation in the Ecosystem of the emerging Cybersociety for the purpose of:

1. Solving the integration problem of different organizations and forces influencing the ecosystem of Cyber-society;
2. Reducing the Cyber-society evolution processes and harnessing the driving force system to ensure synchronization and orderliness in the operation of the driving force system of ecosystem of Cybersociety.
3. Strengthen the driving forces to enhance the formation and speedy development of the ecosystem of Cybersociety.

The article made a good attempt at delivering in the above goals by analyzing the driving force system of ecosystem of Cyber-society through what looks like a superimposition of the theory of System Dynamics. The paper's final delivery is the Authors' proposition of a basic theoretical framework of the driving force system of ecosystem of Cybersociety with what it termed a systematic presentation of the ecosystem's operation mechanism using the theory of System Dynamics. In analyzing their concept of the driving force system of ecosystem of Cybersociety, the Authors opined that driving force system is constituted into three main categories, namely:

a) The subsystem of driving forces;
b) Stimulate subsystem of driving forces;
c) Carrier subsystem of driving forces.

The article construed the driving force system to be "a virtual manual system with the characteristics of integrity, structure hierarchy, orderliness and openness" (Guan X., Zhang Z., and Zhang S. 2013). In describing the operation mechanism of the driving force system, the article averred that it is a combination of push and pull, organization and conduction, Integration and collaboration, and innovation and development mechanisms. However, the article's presentation of the above postulations and their proofs do not seem to have followed simple intuitive logics. For example, it is illogical to have ***the subsystem of driving forces*** as a different category from the ***stimulate subsystems of driving forces and carrier subsystems of driving forces*** in their outlining of the categorization of the concepts of the driving force system of ecosystem of Cybersociety. If a category is named ***the subsystem of driving forces***, it is only logical that every other category construed to be part of that subsystem to come under that category instead of having stimulated and carried subsystems being placed independent of the primary subsystem. In this light, the framework should have looked like the representation in figure 1 below:

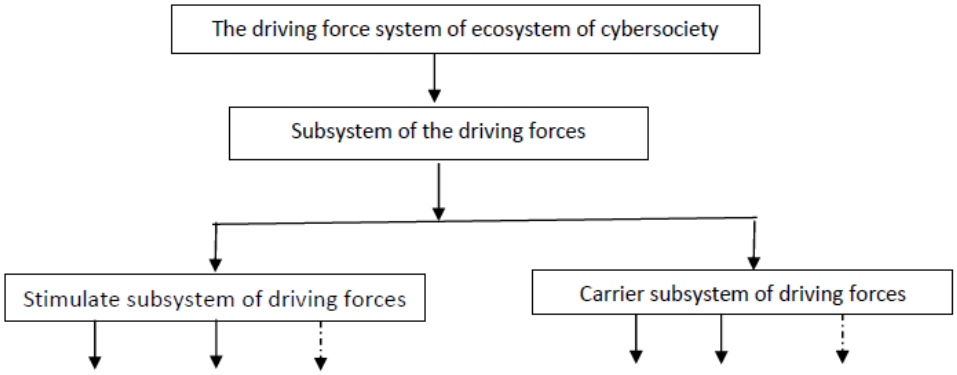

Figure1. Alternative: Atheoretical framework of the driving force system of Ecosystem of Cyber-society

In its conclusion, the article submitted that the formation and development of Ecosystem of Cyber-society is the function result of different driving forces that work together in a combined mode to control the formation and development of Ecosystem of Cyber-society (Guan X., Zhang Z., and Zhang S. 2013). Whereas the above concluding submission seems insightful and logical, the presumption about the dynamics and operating mode of these different driving forces working together to control the formation and development of Ecosystem of Cybersociety seem somewhat shallow and without detailed quantitative analysis for their scientific proof. Presumably, the operating principles of these driving forces and their dynamics are captured in the Authors' description of the system as a ***virtual manual system***. However, it appears to me that a more accurate description of this operation is that of a ***Self-determination/regulation theory as applied to nature and autonomy in higher order social organizations***. Therefore, my argument is that the functioning of the driving force systems of the ecosystem of cybersociety is more aligned to **Nature and Autonomy theory** instead of the **Manual and Control** theory as suggested by the Authors.

Conceptually, the above submission of Sherry is not far from the interactions between today's society and the evolution of the internet with its innovative solutions that have caused the cybersociety phenomenon to emerge and thrive, even to the extent of making its ecology an important research subject. Clearly, it is apparent that the paper under review assumed that the formation and development of Ecosystem of Cybersociety operates by a coordinated manual control principle. The implication is that a consciously coordinated manual effort is required to control all or most of the driving forces in order to advance and hasten the development of the Ecosystem of the emerging internet mediated Cybersociety. Contrarily, the emergence and sustenance of the cybersociety phenomenon and the thriving of its ecosystem are collectively predicated on present-day ICT evolutions and contemporary society's willing embrace of the innovations for their apparent usefulness and all-encompassing value additions to living in modern times. Whereas proofs of coordinated combined regulation of the influencing factors in the whole operation are still lacking, the compliance of the individuals' rolls to the Self-Regulation Theory is not in doubt. I make the above submission in view of the fact that internet usage is arguably the key driving force behind the emergence of the Cybersociety phenomenon, and also the fact that the attitudes and habits of individuals in their conscious use of the internet in meeting their various needs play very significant roles in the sustenance and thriving of the concept. In demonstrating the influence of the self-regulation theory in Internet Usage, Robert LaRose, and Matthew S. Eastin averred that self-regulation has emerged as an important predictor of Internet consumption. They further submitted that "The self-regulatory mechanism describes how individuals continually monitor their own behavior (self-monitoring), judge it in relation to relevant personal and social standards (judgmental process), and apply self-reactive incentives to moderate their behavior (self reaction). Self-regulation is an important point of distinction between SCT and "functionalist" or stimulus-response theories of human behaviour in that it describes self-generated influences that free the individual from blindly following the dictates of external reinforcement. …Self-regulation may normally be expected to moderate media consumption. (LaRose R., and Eastin M. S., 2002). Now, that leaves us with the question whether individual of the 21st century can be truly said to have been blindly following the dictates of external reinforcement in their use of the internet for creating and participating in virtual communities that have become part of their daily living? All the same, the Authors have done excellently well in opening a new horizon of research that will

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stimulate cross-disciplinary empirical investigations for finding suiting answers to the critical questions about the operations of the driving force systems of the ecosystem of cybersociety raised by reason of their work in this project.

Article structure

Principal among the things considered in assessing the article structures are *Contents Alignment, Presentation Format, Intuitiveness and Logical Flow of Information* as necessary in academic papers. As expected, the report presentation started with the research subject title followed with identification of the Authors and indication of their authorities through their institutional affiliations. As usual, the abstract was introduced immediately after the listing of the Authors' institutional affiliation. The abstract presented the research goals with a summary of what was finally achieved as analysis of the driving force system of Ecosystem of Cyber-society using the theory of System Dynamics, proposition of a theoretical framework, and presentation of its operation mechanism in a methodical way. The abstract was also followed by section 1 (introduction) of the report which presented the report Introduction and literature review reports. Section 2 was featured with a proposition of the theoretical framework of the driving force system of Ecosystem of Cyber-society. Section 3 followed with the analysis of the operation environment and formation process of the driving forces. Section 4 was next with the operation mechanism of the driving force system presented. Section 5 had the paper conclusion, followed by acknowledgement and bibliography which listed the materials consulted in the course of the work. Apparently, the article is well organized in its presentation structures as the article structures and contents are rightly aligned in a manner that makes a good read.

Discussions

Article critique

Authority

This article was published in the International Journal of Computers, Communications & Control (IJCCC) which is the journal publishing arm of the Romanian Agora University. IJCCC was founded in 2006 with ISSN 1841-9836. As indicated in the name, IJCCC publication interest centres on Computers, Communications & Control. With respect to indexing coverage, IJCCC is covered by THOMSON REUTERS and is indexed in ISI Web of Science Knowledge. Also, IJCCC is indexed by SCOPUS under the following Subject Categories: Computational Theory and Mathematics, Computer Networks and Communications, and Computer Science Applications. As an indication of the acceptance of IJCCC journal publishing control policies and commitment to excellence, IJCCC was nomination by Elsevier for the 2015 Romanian Journal Excellence Award. Also, "IJCCC is in Top 3 of 157 Romanian journals indexed by Scopus (in all fields) and No.1 in Computer Science field: Elsevier/ Scopus" (univagora.ro, 2016). IJCCC is a member of the Committee on Publication Ethics (COPE) by whose principles it also abides.

In addition to the above, the Authors' authority is primarily established by the Authors' affiliation with the Beijing Institute of Graphic Communication, School of Economics and Management, and Beijing Jiaotong University, School of Economics and Management, China. However, details of the Authors academic qualifications, fields of study are not indicated. All the same, if the Authors do not have the basic qualifications, the project would not have received the sponsorship of General Research Project (18190113002) and the Quality Improvement Project of Personnel Training (03150113016) of Beijing Municipal Education Commission, and that of the Institute Level Project (E-b-2012-20) and the Course Construction Project (22150112088) of Beijing Institute of Graphic Communication (Guan X., Zhang Z., and Zhang S. 2013).

Accuracy

The article was published in 2013 with sixteen listed references, half of the referenced materials have their publication dates spanning from 2007 to 2013. From the beginning, the Authors stated that the project is exploring a new research area of which the chances of finding materials with direct bearing to its research problem is very slim. Notwithstanding, there is no obvious lack in paper's citation accuracy - all referenced materials were appropriately cited in-text and also listed fully in the reference section.

On the other hand, report structures and presentation procedural accuracy is attested to by reason of the fact that the article is published in a regulated academic publishing platform of high repute IJCCC, and

also further assured by the fact that the research is partially sponsored by research oriented organizations; therefore, the organizations' due diligence processes and the publisher's strict editorial and approval procedures must have worked together to reasonably assure the paper's accuracy.

However, accuracy of material facts and simplifying assumptions is highly subjective and difficult to conclusively ascertain in the early stage of the article's subsistence, particularly for research work that is said to have no previous literatures focusing in its research subject where with the submissions and results can be benchmarked. This is more so as the logics, experimental proofs, and arguments raised in the paper must of necessity be subjected to critical review by authorities in the field. In the light of the above, it is imperfective that I present my reservations against some of the submissions of the paper as already raised in other sections of this review. Major part of these observations includes the objection earlier raised in the summary section concerning the structuring of the framework produced by the paper as part of its deliverables. This is in addition to the objection raised about the paper's suggested operating principles of the driving forces as a virtual manual system in which I opined that it is more of a Self regulation theory as applied to nature and autonomy principles.

Ostensibly, accessible internet, mobile ubiquity, affordable communication devices, idiot-proof innovative networking, transaction, informative and communication platform solutions, and the subsisting human needs for conformity, efficiency and convenient living which resulted into unprecedented embrace of the numerous solutions offered by ICT innovations are the key driving forces behind the emergence, sustenance and thriving of the Cybersociety phenomenon and its ecosystem.

As the internet has transformed the traditionally isolated parchments of communities that made up the wide world into a global village, cybersociety emergence and the evolution of its ecosystem has technically defiled the theory of strong dependency on economy, politics and culture. Possibly, there may be basis to argue that the influence of economy is not completely broken; however, such residual influence must be a very limited one and also predominantly operating skeletally at individual levels. Nevertheless, political and cultural factors have since lost their grips as driving forces of the ecosystem of cybersociety with any significant influence. The above fact became more apparent during the 2011 Arab Spring social media revolution (Gire S. 2014) where a stronger, more resolute, united, coordinated and powerful society emerged from the cyberspace to redefine the polities, economy and culture of a whole region with known thriving economy, strong political structures and most reserved cultural heritage.

There is no better proof of the cybersociety pre-eminence in contemporary society, or better test of the robustness and thriving of its ecosystem than that demonstrated in the Arab spring. Certainly, researchers can never make an end to the discovering of the principal factors and the dynamics of this phenomenon (Cybersociety) which started from the more liberal American and English society to traverse through the entire world - ravaging the very conservative Arab cultures, spreading over to even the poor African society without skipping the uptight Asian cultures, Japan, China and Korea inclusive. Therefore, juxtaposing the observations against the below submission of the paper leaves more for argument: "Only if the force of economics, politics and culture can complement with each other, coordinate their actions and optimize the allocation of various needs and interest pursuit of the subjects of Ecosystem of Cyber-society, then it can give appropriate positive driving force to the formation and development of Ecosystem of Cyber-society, and thus effectively promote the formation and development of Ecosystem of Cyber-society" (Guan X., Zhang Z., and Zhang S. 2013). Contrarily, availability and accessibility of **TECHNOLOGY** (Internet, gadgets and devices, platforms, software and applications), **Needs and Desires of the People** (social networking, interacting, communication, and transaction) alongside **Societal Institutional Pressures** (social media, e-banking, e-governance, e-services, e-education, e-commerce, etc.) and **Individuals' Attitudes and Habits** (dispositions and the influence of self-determination theories (SDT) in usage) are showing up as the true key driving factors as the cybersociety phenomenon continues to evolve.

Invariably, if the above is anything to go by, the validity of the bellow submission of the paper will require further examination: "Only through the coordination between the driving forces within and outside the system, then it can generate new driving force structures and joint force, improve the operation efficiency of the driving force system, and thus promote the fast forward development of Ecosystem of Cyber-society with its powerful functions" (Guan X., Zhang Z., and Zhang S. 2013). The sustenance of the cybersociety phenomenon or the evolution of its ecosystem is no longer being occasioned or sustained by coordinated manually controlled mechanisms preserved by efforts of any

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government. We have seen cases of some governments trying to prevent their citizens from free access to internet, we have also seen situations where some social activists try to discourage people from using the internet n a certain manner, and some technology companies trying to withhold or delay products' release or innovation, yet, none of these have significantly impacted the evolution or growth of the cybersociety phenomenon. Rather, what seems to have a measurable influence is the self-regulation theory in usage. In demonstrating the influence of the self-regulation theory in Internet Usage, Robert LaRose, and Matthew S. Eastin averred that self-regulation has emerged as an important predictor of Internet consumption. They further submitted that "The self-regulatory mechanism describes how individuals continually monitor their own behavior (self-monitoring), judge it in relation to relevant personal and social standards (judgmental process), and apply self-reactive incentives to moderate their behavior (self reaction). Self-regulation is an important point of distinction between SCT and "functionalist" or stimulus-response theories of human behavior in that it describes self-generated influences that free the individual from blindly following the dictates of external reinforcement. …Self-regulation may normally be expected to moderate media consumption. (LaRose R., and Eastin M. S., 2002).

Originality and referencing for non-original ideas

A logical indication of the originality of the research project's pursuit is readily seen in the paper's declaration that "...there is still not much comprehensive and systematic research about the cyber-society from the perspective of ecosystem. And there is no literature that has proposed the concept ...related research mainly focuses on the sociology of network and social ecology"(Guan X., Zhang Z., and Zhang S., 2013). This is further underlined by the arguments that I have so far raised on the authors' submissions. Also, in carrying out this research, many academic materials were consulted and there are no indications that due credits were not given to the owners of the intellectual materials by way of appropriate referencing.

Currency

The article was written in 2013, about four years ago as the time of this review. The research problem it was focused on addressing is about deepening understanding of the ecosystems of the emerging cybersociety as an extension of existing works on the sociology of network and social ecology of the information age. Its objective is to propose the concept of driving force system of Ecosystem of Cyber-society with a methodical analysis of its mechanisms. Evidently, this is still a current research problem whose relevance is also not in doubt. Besides, there is yet no indication that the research problems bothering on understanding of the evolving cybersociety and the driving forces of its ecosystem, their mechanisms and operating principles have sufficiently been resolved. In fact, as cybersociety continue to evolve defying established sociological theories, political formations and restraining laws to break through ancient traditional institutions and cultural boundaries, the knowledge gaps in this area has continued to be more obvious and curiosity in the research cycle has also continued to grow as many pertinent questions are yet to receive globally accepted matching answers. Majority of the materials referenced in the article are still current, others are original materials that are effectively dealing with the certain fundamental theories touching the subject matter with timeless intrinsic values.

Relevance

International Journal of Computers, Communications & Control (IJCCC) in which the article was published was founded about eleven years ago and it is operated by the Romanian Agora University. It has continued to host many academic materials of high repute in the specialized areas of Computers, Communications & Control. IJCCC publications are indexed in THOMSON REUTERS and SCOPUS under very important categories of information and communication technology. As a mark of the collective relevance of IJCCC published materials and excellence in their operations, IJCCC was nominated by Elsevier for the 2015 Journal Excellence Award, Romanian. Additionally, JCCC is listed as number three (3) of the one hundred and fifty seven (157) Romanian journals indexed by Scopus in all fields, and it is the number one (1) in the field of Computer Science. The article was published about four years ago (2013) as a complete research paper, not a company's whitepaper meant to promote a particular organization's product and service, also, it is not a literary art work designed to entertain.

Importantly, the cybersociety phenomenon is a recent development which has continued to evolve defying all known sociological theories, political formations and restraining laws to break through ancient traditional institutions and cultural boundaries; yet, the understanding of its ecosystem's dynamics does

not appear to be growing in the same speed and dimensions. The fact that I have challenged some of the key submissions of the article notwithstanding; the propositions are my personal opinion which are subject to critical analysis by other experts. Nevertheless, the work has its relevance as it has opened a new horizon of research interest in an emerging subject area. Also, the relevance of this work is further underlined by the fact that this research project accurately aligns with the core issues surrounding the understanding of the key driving forces and the mechanisms behind the evolution of Cybersociety ecosystems. Another indication of the relevance of the work is the sponsorship granted by the General Research Project (18190113002) and the Quality Improvement Project of Personnel Training (03150113016) of Beijing Municipal Education Commission, and that of the Institute Level Project (E-b-2012-20) and the Course Construction Project (22150112088) of Beijing Institute of Graphic Communication.

Objectivity

In most cases, the presentation of facts in support of the Authors' propositions indicates a balanced developed opinion. An instance is the authors' submission stating that: "The driving forces that affect the formation and development of Ecosystem of Cyber-society are not chaotic. However, they are an organic whole with a multi-level structure. The formation and development of Ecosystem of Cyber-society are driven by the driving forces that interact and constraint with each other, and ultimately form the multi-layered driving force system" (Guan X., Zhang Z., and Zhang S., 2013). In confirming the above alongside the pressing need for a new theory that methodically analyze the formation mechanism of the cyber-society ecosystem and the associated problems, excerpts from **science-definition.com** affirmed the objectivity of this paper, even in its presentation of cyber-society as an emerging social form created by information technology innovations. More so, in its description of the phenomenon as: "a huge complex system, which is composed of cyber-society resources, cyber-society communities and related cyber-society environment and achieves the dynamic balance under the interaction between these elements. It emphasizes the interrelationships and integrity between the various elements in this large-scale system. It is not an isolated form of society, but rather the evolution of traditional society in the new information age. It retains parts of the traditional factors, but also demonstrates completely different new features" (science-definition.com 2017).

Stability

Since after the paper was published in 2013, there is not yet an evidence of retraction of any of the Authors' claims, or publication of new editions or versions with the intent of making corrections, clarifications or significant additions to the material facts submitted by the authors in the article. The above is in addition to the fact the article's source is a journal operated by an internationally recognized institution of higher learning that has been a stable source of academic journals for the past 11 years holding a very large academic database in very specialized areas. Therefore, there is no evidence of lack of stability on the part of the article.

Analysis of graph/Image/Table

The article made reasonable use of illustrative figures/ images, a graph and a table in its presentation. Figure 1 graphically presented the theoretical framework of the driving force system of Ecosystem of Cyber-society proposed by the Authors which also is in the core of the solution promised by the paper. Figure 2 presented the function process of the stimulate subsystem of driving forces of Ecosystem of Cyber-society as proposed by the authors. Figure 3 was used to illustrate the operation lifecycle of driving force system of Ecosystem of Cyber-society while Figure 4 illustrated the composition forces model of the formation and development of Ecosystem of Cybersociety; the paper described this as the 'development stages of ecosystem of cybersociety'. Figure 5 served for illustrating the interactions between the driving forces and the environment of ecosystem of cybersociety, and it is presented with the title: 'Cross combination of driving forces to the formation of Ecosystem of Cyber-society'. Figure 6 illustrated the interaction between the hierarchy structures of the driving forces and the institutional collaboration functions, and it was titled: 'Organizational conduction of driving forces to the formation of Ecosystem of Cybersociety'. Table 1 apparently showed the Contents of the mechanism of integration and collaboration of driving force system of Ecosystem of Cyber-society (EC).

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Alignment with contemporaries and recent advances in the subject area

There is no doubt about the fact that the cybersociety ecosystem is made of a mixture of participants that interact for multiple purposes just as in the natural ecosystems of the physical society. Exploring understanding of the functioning of the driving forces for a healthy resilient, more efficient and satisfying cyber ecosystem, and also to enable preventive and defensive courses of action to be coordinated within and among communities of devices and users is the goals of this paper. Given the Author's description of this as a new research concept with limited or no literature that has direct bearing to the subject, it may be out of place to readily see a perfect alignment with existing works. However, in his 2008 book titled ***Internet & Society***, Christian Fuchs did a good job at illustrating the Information Age's Social Theory. He emphasized the ubiquitous nature of the Internet in everyday life and enumerated some of the common application areas as: information searches, trips planning, news grabbing, studies, communication with others, business e-mails, instant messaging, social networking, e-meeting, banking transactions, shopping, civic activities, entertainment, dating, games, buying and selling, etc. He averred that: "the emergence of the Internet has transformed society. In research, this has resulted in a plurality of concepts such as Internet economy, digital democracy, cyberculture, virtual community, cyberlove, eParticipation, eGovernment, eGovernance, online journalism, social software, Web 2.0, and so forth. There is no clear meaning of these terms; some of them remain very vague or contradictory". But, "...The Internet obviously is here to stay" (Fuchs C. 2015). Of importance to this material is his identification of the fact that the internet is here to stay and the emergence of the same physical emotions and associating them with virtual interaction like users feeling of belongingness, sense of satisfaction or fulfilment alongside feeling of lost, disorientedness, dissatisfaction, phobia, boredom, stress, feeling of alienation, lonesome, etc. within the internet environment. These are strong indication of an emergence of a social setting with a new environment that has basic attributes of the natural society in virtually all aspects of human interactions. Although this internet created social setting is a virtual one, people are in reality able to engage in the same socio-cultural, socioeconomic, and socio-political activities that are found in the physical settings with the same satisfaction and feedback parameters at individual and group levels.

Even as the effect of this evolving environment is been felt by everyone, the understanding of its mechanisms and dynamics is not as common. Therefore, if we must make the most of it from all directions, we must also understand its ecosystem mechanisms and their dynamics. I believe the above led to some of the vital questions by Fuchs: "How has this system transformed our lives and our society? What are the positive effects? What are the negative ones? Which opportunities and risks for the development of society and social systems are there?" (Fuchs C. 2015). Certainly, the answers to those questions have potentials to work out some level of understanding of the relationship between the Internet mediated society and driving forces of its ecosystem; this also may be useful in figuring out the best ways that this emerging society is shaping itself in order for us to enhance our efficiency, minimize associated risks and maximize our opportunities. The above appears to be what this article '**Operation Mechanism of the Driving Force System of Ecosystem of Cyber-Society Based on the System Dynamics'** is aligning to**.**

Conclusion

In reviewing this article (**Operation Mechanism of the Driving Force System of Ecosystem of Cyber-Society Based on the System Dynamics)**, a summary of its goals, achievements and presentation appraisal has been provided. This can be summed as creating a better understanding of the operations and dynamics of the driving forces systems of cybersociety ecosystem based on system dynamics approach. Using System Dynamics theory, the paper delivered a theoretical framework of the driving force system of Ecosystem of Cybersociety with an explanation of its operation mechanism. The paper also affirmed the fact that the cyber ecosystem is made of a mixture of participants that interact for multiple purposes just as in the natural ecosystems of the physical society. The article's content, structure, relevance, novelty of the idea, alignment with current research and development interests in the subject area of Cybersociety, and also the article's strengths and limitations were critically analyzed. The article's contribution to the body of knowledge is evident in the novelty of its ideas as expressed, and its set goals of exploring understanding of the functioning of the driving forces for a healthy, resilient, more efficient and satisfying cybersociety ecosystem aimed at enabling preventive and defensive courses of action to be coordinated within and among communities of devices and users.

As concluding remark, my observation however is as follows: Presently, the key driving forces of the ecosystem of cybersociety are encapsulated in the contemporary ICT innovations, ubiquitous personal and mobile communication devices, affordability and accessibility of the internet, the global trend of computerization that has inadvertently enforced compulsory layering of essential government, public, commercial and social services on the internet as the primary communication, transaction and interaction media; this is in addition to the user-friendly social networking solutions, and the society's unbridled embrace of technology as a way of life in the information age. All of these appear to be working seamlessly but at a state of self-regulated equilibrium like fluid that naturally finds its level and course in the midst of other constrains within its containing frame or elevated boarders being the larger society of users. Therefore, as the world continues to thrive in ICT innovations and internet-mediated globalization manifested in seamless communication, limitless transactions, boundless human interactivities and collaborations, what will be most significant among the driving forces will be the cyberspace users' efforts towards self-regulating their habits or addictions. This is particularly as everyone will be under some sort of naturally occurring but subtle socioeconomic and socio-cultural pressures to metamorphose his/her living essentials and lifestyle into the cybersociety dictates in order to be able to truly live in the physical environment. As the traditional society settings continue to disappear into the emerging cybersociety, it will come to a time when nobody can appropriately fit into the society and experience proper living without succumbing to the dictate of the cybersociety ecosystems. Cybersociety has indeed come to stay, the society is fast changing, the ancient socio-cultural landmarks are being removed, everything is changing in the speed of technology, including the societal structures, processes, and the people.

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Community Reflections on Intergenerational Sexual Relations in Solwezi District

Article by Daniel L. Mpolomoka[1], Christine Mushibwe[2], Mbono Dube[3], Mwewa Musonda[4], Phyllis Sumbwa[5], Michael M. Mabenga[6], Esther Kanduza[7]
[1]*Lecturer, Zambian Open University*
[2]*Vice Chancellor, University of Africa*
[3]*Head, Department of Secondary Education, Zambian Open University*
[4]*Assistant Commissioner of Police, Lusaka, Zambia Police*
[5]*Resident Lecturer, Department of Adult Education and Extension Studies, University of Zambia*
[6]*Director, Quality Assurance & Extension Studies, Zambian Open University*
[7]*Head, Department of Guidance & Counselling, Zambian Open University*
E-mail: mpolomokadaniel@yahoo.com[1], christine.sankhuleni@hotmail.com[2], mbonodube@yahoo.com[3], mwewamusonda@yahoo.com[4], mabengamm@yahoo.com.sg[6], kanduzae@yahoo.com[7]

Abstract

This article details occurrences of intergenerational sexual relations in Solwezi District, North-Western Province of Zambia. Today, there is an increase in the number of intergenerational sexual relations in the District because of the influx of migrants from other parts of Zambia and world over, who want to take part in mining in the area, as well as engage into business. Using a retrospective research approach, the study targeted all males and females engaged in the vice, sampled by snowballing. Findings of the study were analysed descriptively and thematically. Findings reveal the following:

1. That poverty is the major drive towards intergenerational sexual relations.

2. That though poverty may drive individuals to engage in the vice's other reasons such as peer pressure, pleasure, desire for luxuries, having an edge over others, culture etc. may be the cause for intergenerational sex

3. Despite well-known consequences of engaging in the vice socially sanctioned attitudes and behaviours are linked to cross-generational sex.

4. People's aspirations and expectations may be influenced by the size of the economy such that as the economy keeps growing new needs and desires consistent with the economy may be the drives of behavior.

This study recommends that the people be equipped with necessary tools that will enable them to find alternatives to replace the need to engage in sexual relations with older men and women as a means of survival. Another important recommendation is that mandatory sensitization should be undertaken by investing companies to avert the social backlash that arise in such situations.

Keywords: *Intergeneration, Sexual Relations, Migrants.*

Introduction

Solwezi is home to one of Zambia's biggest copper mines. It is the capital of the North-Western Province, one of Zambia's poorest provinces. It is a fast growing district as most people are migrating to the District to work in the mines. Solwezi has seen drastic economic growth with the discovery of the copper mines. According to the Solwezi Effect (2018) Solwezi is now home to FQMs Kansanshi Mine producing 260 000 tonnes of copper a year. Such an occurrence is seen as a catalyst for economic development. Solwezi town is currently a big busy shantytown growing economically. While The Solwezi Effect contest that mines stimulate local economies and drive growth resulting in the creation of jobs, wealth and disposable income, hidden in all these attractive activities is the

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intergenerational sexual activities taking place among the adolescent girls. The population increase in the district is due to the mining activities.

The article provides the profile of individuals who engage in intergenerational sexual relations in Solwezi District and details the motives for engagement, challenges and benefits. Thereafter, it provides a critical reflection, conclusion and recommendations.

Objective

The main objective of this study was to describe occurrences of intergenerational sex relations among males and females in the urban areas of Solwezi District.

Statement of the problem

Solwezi District has become a final destination and dwelling place of choice of many Zambian and foreign migrants. Being a booming mining harbor, second to the Copperbelt, many are moving to that part of the country to take up mining jobs and conduct business. This has made the lifestyles, personal life traits and trends change. There has been a notable increase in intergenerational sexual relations amongst boys and girls, men and women of all ages. Media reports, revelations from various communities and rampant police reports are evident enough of this vice. This prompted the researchers to undertake this study.

Literature review

The phenomenon of cross generational sex defined as sexual relationships between an adolescent girl and a partner who is older, usually by 10 or more years can be linked to many lifelong consequences. In the case of girls, premature sex can trap them in an adverse poverty and vulnerability cycle as they may become adolescent mothers, may be forced to leave school; are at risk of entering marriage early to preserve the honor of their family and themselves; and, particularly when having sex with older men, are more exposed to contracting sexual diseases, including HIV and AIDS (Kelly et al., 2003, Konde Lule and Morris, 1997; Luke and Kurz, 2002; Nyanzi et al., 2000). Mavhandu-Mudzusi (2014) argues that adolescent girls are vulnerable to exploitation due to poverty. While Mavhandu-Mudzusi agrees with the concept of transactional intergenerational sex, the author contests that young adolescents in poor households are more likely to engage in intergenerational sexual relationships.

Common in cross generational relationships is that the older partner tends to be financially better off. This is used as bet to draw the young adolescent girls desiring financial help. Benje (2017) states that the older as a ‘keeper’ of the young through material objects. This proposition sits well in the description of these relationships whose basis is “give and take”.

In most cases, these cross generational relationships become transactional. However, Bantebya et al., (2014) insist that the nature of cross generational relationships can take the form of transactional and “pull and push” depending upon the setting. They claim that in a rural setting, adolescent girls tend to be pulled and pushed into the vice while in the high-density urban setting, the adolescent girls transact for quick cash or ‘luxury’ material items and services. The rural setting tends to be characterized by poverty driven desires to a better economic future, protection and stable marriage. The adolescent girls, impoverished and vulnerable will do anything to get into cross generational relationship in an effort to get themselves out of poverty. The relationship emerges as an easy and readily attainable tactic to meet an increasing list of both needs and wants that can range from food, tuition fees to makeup, designer handbags, artificial/human hair and access into exclusive social circles. Such assumption is strongly supported by Leclerc-Madlala (2008). In contrast, the high-density urban setting is characterized by competitive life styles driven by desperation to earn quick income as an access to “luxury” materials and services and hence will transact in cross generational relationship in “keeping up with the Joneses”.

Benge (2017) highlights how the media tend to portray intergenerational relationships as ‘unnatural’ and ‘wrong’ due to the age-discrepancy. The age difference in the relationship is not expected and hence the assumption of it being ‘unnatural’ and ‘wrong’. Rubin (1993:11-12) contends that “the lowest of all on the hierarchical system of sexual value are those whose eroticism

transgresses generational boundaries." The cultural disposition of Zambia, remains a proclivity of many who hold dearly their cultural obligation, hence, may perceive cross generational relationships as a taboo and incestuous because there is crossing of cultural boundaries of acceptable sexualities. However, there has been a steady shift and intergenerational relationship have assumed various definitions. Intergenerational relationships, therefore, remain equivocal making it difficult to frame, structure and implement the child protection policies and interventions as concluded by Bantebya et al., (2014).

It is interesting to note the characteristics of intergenerational relationships, one of which is power. This can be physical, economic or age power. Benge (2017) argues that intergenerational relationships demonstrates imbalance of power. For Benge, power can lie in the hands of the younger partner who is seen as exploiting the older partner. Such an assumption may not apply in the case of Zambia where the older is perceived as exploiting the younger with his wealth to gain sexual favors in turn. Critically, power could lie in the hands of both or the older partner. The older partner can be considered as the 'keeper and spoiler', while the younger can be the 'erogenous sex giver'. Both partners have distinct roles to play and to maintain and sustain the relationship. The roles have to be played well; the young has/must remain sexually attractive and the older keep providing as noted by Leclerc-Madlala (2008). Unfortunately, such an imbalance of power can result into what Bantebya et al., (2014) posit as physical abuse, sexual and exploitation abuse can be the consequences of this relationship and depending upon power in a partner.

A review of the literature on cross generational sex in Sub Saharan Africa uncovered that the motivations behind adolescent girls engaging in sexual relationships with older men were varied and overlapping, with gifts and other financial benefits the major incentive for such relationships (Luke and Kurz, 2002). Motivations for financial rewards tend to be complex, ranging from economic survival to desire for status and possessions.

Across Sub-Saharan Africa, researchers have documented the practice of exchanging sex for money or gifts in relationships. The phenomenon exists beyond the realm of prostitution. While many studies have recognized transactional sex as a consequence of women's poverty and economic dependence on men, literature has increasingly proposed that material exchange for sex is not necessarily linked to urgent food and shelter needs (Wamoyi et al, 2010:1). For example, in Southern Uganda, a study found that half of secondary school girls studied would not have sex for free, no matter their socio-economic status (Nyanzi et al, 2001). Furthermore, in rural Tanzania, intensive participant observation discovered that material exchange for sex was very common, regardless of affluence (Wamoyi et al, 2010:14). In this practice, obligations do not necessarily involve a pre-determined payment or gift, but there is a definite motivation to benefit materially from the sexual exchange.

The term "transactional sex" is often used in public health literature as a neatly defined term, but the concept is very complicated and highly contested According to Jewkes et al (2012) transactional sex seems to be open to many interpretations; it is highly dependent on the social, cultural, and personal context of a relationship. The practice lies on a continuum of sexual behavior that exists universally. On one end of the spectrum lies prostitution; on the other end of the spectrum lies the common practice of the exchange of gifts in sexual relationships (Sawers & Stillwaggon, 2010; Kaufman & Stavrou, 2004). Leclerc-Madlala (2008:7) argues that "age disparate sex assumes a reciprocal/transactional element which is part of a system of interdependence that is maintained by two interlinked and long-enduring cultural prescriptions."

As a result, the exact definition of transactional sex can be very difficult to ascertain. As wealth accumulates with age, many transactional relationships are also intergenerational. Various literature defines intergenerational relationships as those that exist across an age disparity of 10 or more years (Leclerc Madlala, 2008). An age disparate relationship, on the other hand, refers to a separation of 5 years or more (Leclerc Madlala, 2008:18).

Despite this, young women cannot be viewed as simple victims in the transactional, cross generational relationship. Age disparate relationships are meaningful for both men and women involved; they are perceived as socially, physically, psychologically, economically, and symbolically beneficial by participants (Leclerc Madlala, 2008: 17).

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The consequences of intergenerational sexual relationships are many. These include, early marriage, unwanted sex and children, single motherhood, physical abuse, sexual abuse and exploitation, psycho-emotional trauma and HIV/AIDS (Bantebya et al., 2014). Mavhandu-Mudzusi (2014) identifies intergenerational sex as a key driver of the HIV/AIDS epidemic.

Methodology

This was purely a qualitative research study, which employed a retrospective research approach. It was easy to fall back on data from similar studies undertaken by NGOs and Government ministries like the Ministry of Community Development and Social Services, Ministry of Health (Education Division), Central Statistics Office, and Ministry of Education.

A total of 30 females, 25 males, 10 Government Heads of Departments (Ministry of Community Development and Social Services; Ministry of Health – Hospital and District Office; Ministry of Education – Education Standards Officers; The Council; The Police; The Church; The Traditional Leadership; Parent Teacher Association representatives; Head Teachers – Primary and Secondary Schools; and Guidance and Counselling Teachers – Primary and Secondary Schools. All the aforementioned were targeted because of their familiarity with the topic under study. In one way of the other, they relate with, interact with and or handle cases of persons who engage in intergenerational sexual relations. They provided valuable information as key informants.

Snowball sampling strategy was employed to select participants. One participant with familiarity of persons under study led to a family member or friend who had similar knowledge and or experiences. Thus, it was easy to interview key informants who actually provided very helpful and valuable information regarding the topic area under study. Information was collected using interviews with key informants. In addition, observations and document review provided helpful information to the study. Descriptive analysis and thematic methods of data analysis were predominantly employed.

Findings and discussion

Study setting

The setting influences the nature of the cross-generational sexual relationships adolescents engage in. In rural contexts, impoverished and vulnerable adolescent girls are ‘pulled’ into sexual relationships with older male partners in the hope of stable marriage, protection and/or a better economic future. Girls are also ‘pushed’ into cross-generational relationships as a result of their or the family’s inability to meet basic needs, violence and maltreatment in the household, lack of awareness of alternatives and lack of recourse to essential services. In addition, environmental conditions in rural areas tend to raise the circumstance that drive the adolescent girls to fall prey of older men seeking casual sex in exchange of money. A good example is long distances in isolated environments which expose girls as easy target for men with cars or money when assistance is sort from older men, generally in exchange for sexual favours.

While poverty is a driver of girls or boys taking part in cross-generational sex, and the negative consequences are well known in both rural and urban contexts, socially sanctioned attitudes and behaviours linked to cross-generational sex, especially that involving men and teenage girls, are not well understood among policymakers and practitioners.

In high-density urban Solwezi settlements, the relationships adolescents engage in have largely taken the form of transactional sex, driven by desperation to earn quick cash for daily survival, but also increasingly as a ‘lifestyle choice’ fostered by peer pressure to gain easy access to ‘luxury’ material items and services that would not otherwise be affordable through other income generation options available to adolescents in these contexts. One distinction that is apparent is the different perceptions held by men and women, both young and old: men and boys have a tendency to perceive that girls seek ‘luxuries’ in cross-generational relationships, whereas girls and women often declare a stronger interest in meeting basic needs.

As the economies of Solwezi District keeps expanding, so too are people’s aspirations and expectations. Young women have new needs and desires consistent with the ideals of a modern lifestyle, gender equality and relationships that mimic globalised images of glamour and romance. For many young women, relationships with moneyed older men provide a readily available and socially-

acceptable way of meeting a growing list of needs and wants, from bread and school fees, to designer handbags and access to elite social circles. Such aspirations in societies where the rich-poor gap is widening and women have limited means to financial independence, coupled with cultural allowances for mixed-age relationships and the intertwining of sexual and economic power, drive.

Economic drivers

Participants revealed that economic challenges, manifested in acute income and subsistence poverty and ill being in both rural and urban, were critical in pushing adolescent girls and boys into transactional, cross-generational sexual relationships. Economic challenges in Solwezi are typified by low agricultural income and subsistence poverty, characterized by inability to meet basic needs such as food, clothes, decent shelter, health care and school fees for children. Largely based on subsistence agriculture, poverty is attributed largely to chronic cash shortfalls resulting from meagre household incomes, poor agricultural yields and large families comprising numerous dependent young children. In the high-density Solwezi slums (Zambia compound, Kyawama, Kazomba, Wisdom, Chijingejinge, Kimakolwe, Kandemba, Muzabula and Highland), where the economy is more cash-based and where family size is comparatively smaller, poverty is seen as leading to fewer and riskier livelihood choices. In this case, entrenched poverty and hardship are attributed mainly to limited employment opportunities in both the formal and the informal sector.

Some studies such as that conducted by Adogu et al (2004) have linked economic motives to the level of poverty of the adolescent involved: whereas very poor adolescent girls engage in these relationships to meet their basic needs, others who are less poor might do so in order to gain access to what they see as 'luxury goods' or through peer pressure (Hawkins, et al., 2009). For example, poorer girls in rural areas might agree to have sex with an older man in exchange for food, whereas girls in urban areas, with more diverse livelihoods, might enter into these transactional relationships to access items they could not otherwise afford, such as certain clothes or perfume.

The pivotal role of poverty and ill being as drivers of cross generational sexual relationships in the high-density Solwezi slums (Zambia compound, Kyawama, Kazomba, Wisdom, Chijingejinge, Kimakolwe, Kandemba, Muzabula and Highland) is illustrated in the following quotes by research participants:

Inability is mainly about lack of money, and land where to dig (farm). This is where our children's problems originate. If you cannot buy your daughter even a skirt, an old man will offer her one, and entice her into a sexual relationship *(Traditional Leadership, Village 2)*

'If you are poor and unable to give your daughter what she wants, she will be pushed to the old man, who is enticing her with modern goodies. But if you give her these things she may be contented, and avoid the old man.' *(Traditional Leadership, Village 1)*

'Because of poverty, the girls look for (taxi drivers, truck drivers, bus drivers, salaried workers) to buy them what us their parents and guardians don't give them. You just notice when they lose respect for you that they are seeing boys and men'. (*PTA representative, Male, aged 58; Female aged 51)*

'Because of poverty, there is domestic violence which forces girls out of homes; because of poverty the girls look for alternative means of survival'. *(Police Officer, Female; Guidance Teacher, Male; Clergy, Christian)* Adolescent girls and boys interviewed also acknowledged the overriding role of poverty as a factor driving them into sexual relationships with older men or women in their communities:

'At home they would give me money and send me to the mill to grind maize. Yet I needed that money for my personal things. So, I befriended the mill attendant, much older than me. We made a deal, where he would grind the maize "freely" in exchange for love. Meanwhile, I would pocket the cash meant for grinding the maize.'

Research has shown that in poor rural areas lack of access to education, health services, employment and a weak economy often push women and girls into age-disparate sex for potential economic gain. For example, Luke and Kurz (2002) in Bantebya et al (2014) elaborate how girls end up in relationships with men who can provide the money they need for school fees and other supplies. Money obtained is used to pay for education, buy food or clothes and luxuries such as soaps, body lotions, and snacks. Simple gifts such as a pencil or a packet of peanuts are sometimes enough to lure

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a girl into sex with an older person. In addition, Parental pressure to relate with an older working man is also a factor as a means of getting cash and household necessities and of marrying and fetching bride-wealth.

In urban areas material gain was found to be a leading factor luring young women to have sex with older men. Entertainment and fun emerged as major bases for such unions, with fun tied to glamour and enjoyment of material goods and lifestyle consistent with urban life. For young women whose parents provide the necessities of life, relating with older men was not about meeting subsistence needs, but about acquiring a 'top up' that helped boost their status in the eyes of peers and being known to society with well-to-do, rich-like people, renowned individuals in society. This was revealed by one 17-year-old involved with a 37-year-old man:

"It's all about peer pressure, we compete with the type of cell phone we have, our hair styles, the type of vehicle our boyfriends drive, and the amount of money they give."

The fieldwork found that the engagement of adolescent girls in transactional sex with older men was not always driven by dire income poverty and meeting basic needs such as food, shelter or education. According to many of the adolescent girls and boys interviewed, transactional sex is rather driven by new 'needs' or an aspiration to achieve social mobility as a result of living in an urban environment with more external influences, peer pressure and expectations of access to material goods such as mobile phones, cosmetics, fashionable clothing and the ability to afford services like hair styling in salons, among others.

Although for extremely poor girls in the urban setting the initial engagement in transactional sex might be aimed at fulfilling basic needs, this transforms over time to include other material goods. This situation has resulted in a different way of viewing these adolescent girls, more as agents finding a means to achieve their ends than as girls who have limited opportunities and options in a context of peer pressure and external influences, which pressure them to engage in risky sexual relationships where they have limited control and are unable to negotiate their sexual and reproductive health through the use of condoms. This perception is reflected in the following quote by a young female peer educator working for a local NGO:

'Most girls go with sugar daddies because of greed for money. Their male age mates lack cash, and so play hit and run. With the sugar daddy you don't have to beg for money. He gives it readily so that you don't reject him. Then you can go to the salon and change your hair style, buy clothes and cosmetics, pay your school fees or adopt a trendy life style (swagger) and the other girls will envy you' *(Small group discussion)*

Motives for engagement

Evidence from the majority of participants indicates that cross-generational sexual relationships are common among adolescents, particularly girls, and that most of these have a transactional element. In both the rural and urban settings researched, the drivers of intergenerational sex were broadly similar, and included economic hardships characterized by acute income and subsistence poverty; discriminatory social and cultural norms; a high-risk physical environment; peer pressure; and inadequate care environments at home, characterized by, among other things, parental abuse and neglect. The following sections explore the drivers through findings captured during the fieldwork.

Socio-cultural and religious drivers

Culture and traditional practices also emerged as significant in the cause and perpetuation of intergenerational sexual relationships. In predominantly rural areas, where cultural norms and ethos still influence dominant thinking and the functioning of society, the determination of both girls' sexual maturity, age of sexual debut and marriage is still based mainly on bodily and physiological changes, which are characterized by the onset of puberty and not age per se.

'In this community a girl is seen as mature when she grows breasts and starts menstruating. For a boy once he breaks his voice or grows a beard, he is a man. Either of them think they are not bound by any Law in Zambia not to engage in any sexual relations with persons older than them, once they come of age. Yet, the Zambian Law prohibits sex with minors [Sec 138 of the Penal Code

(Community Development Officer, Female aged 48; Community Development Officer, Male aged 45; District Education Standards Officer, Male, aged 51).

The Bemba speaking people are right when they use this proverb: *"umwanakashi uwa ma bele, talangwa inshila*" meaning that a female child who attains sexual awareness does not appreciate any advice or warning based on the fact that they too have breasts. As a result, these girls do not take advice no matter how much is said to them and no matter what they see their elderly ones undergo or face. The examples they see of other girls whose lives have come to a standstill, education opportunities lost, early marriages with early divorce and HIV/AIDS seem somewhat invisible to them. The girls think they are special sleeping with these older men of fame and are renowned in their communities, when in the actual sense the men just mess up their lives. Teachers interviewed observed the following:

As teachers, we now just look at these girls. They do not take our advice. Ministry of Education is partly to blame. The Education for All has its own bottlenecks. We are now enrolling big girls in grade one who already have had sex. They are ready for any offer in return for sex. They even offer themselves for sex flirting with teachers, and teasing that we are not men enough *(Interview, teachers)*

Drivers based on family instability, sexual abuse and neglect

Instability, abuse and child neglect, inside the family or household, were reportedly very common and to be driving children into intergenerational sex. The quotes below illustrate this:

'There are situations where the children are in the hands of stepmothers. There are situations where the girls are badly beaten and even chased away from home at night and unfortunately the only people who can accommodate them are the older men since they have houses or can afford to rent lodges which their male peers cannot' *(Small group discussion A).*

'Unfortunately some fathers, especially those who use drugs and alcohol, force their daughters into sex with them. Such girls get frustrated and run away from their fathers' home only to land in the hands of other men who use them for pay. The girls trust their fathers who betray them. Such an incestuous act begins with a seemingly innocent comment by the father such as, "My daughter you resemble your mother. In fact, it is okay to have sex with me as your mother does' *(Small group discussion B).*

'I got a man when my father died. I thought he was going to help me. He promised to marry me and when I became pregnant, he kept quiet. We stayed together for two months. When I became pregnant, he would give me many things. Even when the baby was like one month, he would provide but now he has changed.' *(Interview, Girl aged 15)*

'My story is long. I fist had sex with a big man when I was 13 years old. He ate my virginity. I was sent to buy eggs by mother in night because my father refused to eat the relish she had cooked. A midst their quarrel my mother asked me to rush out and get eggs to cut down the argument because he couldn't stop. Angry with my father for failure to understand my mother, I agreed. I went out running and crying only to bump into this man. I knew him as he lived in the area, he was very good and to protect me, he walked around with me looking for eggs. As we walked back home, he sweetly convinced me into having sex with him. He insisted that no one would know. That he would be gentle and that it was something all my friends were doing. He gave me some money and that was the beginning of a relationship. We had sex every week after that especially when my father returned from his drinking spree. I managed to escape from home to meet up with him as my mother's attention was all on my father. I now have two children with him but no one knows they are his. Now I have sex with many older men. The boys are inexperienced for me.' *(Interview, Girl aged 17)*

'I am a product of an intergenerational relationship. My mother was chased from home when she got pregnant with me. She left home and to support me she continued her sexual activities to bring me up because, my so-called father refused claiming she was trying to break his so-called stable marriage. I grew up in a home where different older men came in and out. That is where my story begins. My first sexual experience was when I was 12 years old with one of my mother's *usual's*. She [my mother] was not home and I decided to help her [she smiles]. That man almost shuttered my vagina. I have never seen such a package [the penis, she emphasizes]. When my mother learnt, because I was

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limping around with pain, she chased me from home. Now am 15 years old living on my own and older men keep me by providing me money in exchange for sex.' *(Interview, Girl aged 15)*

'I am in grade 11 and I pay my tuition fees from my encounters with older men. I use contraceptives to protect myself from falling pregnant am sure you will ask. Older men pay very well. I started having sex with my teacher in grade 8. He convinced me as a means to help me through school. I didn't want but I started. I think he told his friend because I started getting offers from more teachers. They don't pay me but I know they help me pass. I am now in grade 11 and I know I will pass my grade 12. If I want sex for money, I go to the lodges where expatriates working in the mines pay very well. My mother and father divorced when I was in grade 8. My mother knows what I do but she is not bothered because I am helping her too' *(Interview, Girl aged 17).*

Peer pressure and lifestyle choices

In addition to economic and sociocultural drivers, youths identified peer group pressure as an emerging push factor of both girls and boys into intergenerational sex. Adolescent girls and boys explained that girls, but also some boys, engaged in relationships with older men (or women) even if their basic needs were met, as it was seen as way to gain access to 'luxury' goods they would not otherwise have, but for which there is social pressure among peers to obtain – from perfumes to clothing articles. In fact, some respondents mentioned that even those coming from stable well-to-do families were known to engage in cross-generational sexual relationships with older men for various reasons, including sexual gratification and acquisition of luxury items such as smart phones and plasma screen TV sets:

*'*Some girls are blessed with everything but still go with the old men. They are influenced by their peers who are doing it. Now it has become a trend, even girls from well-to-do families are going out with old men, fit to be their father'. *(Guidance and Counselling Teacher, Male, aged 47; Community Development Officer, Male aged 45; Education Standards Officer, Female, aged 50)*

The narration from the girl below is proof of what the Guidance and counselling Teacher claims. The girl does not need the money at all but engages in the cross generation sexual relationship because of peer pressure.

'I come from a good family. I have everything. My father gives me money when I ask him but you, sex is a hot topic among my friends. I had to try because I didn't want to be the only one out. So, my friends took me to the shanty compounds, Wisdom, where there are rooms that these older men hire. These are important, well placed married men who do not even live in the slums but go there for sex only. They don't want to be known. They pay very well, I should say although I can still say, I do not need the money I get' *(Interview, Girl aged 16).*

'Many others who fall in sexual relationships with older people are not needy, they see it as a trendy life style' *(Small group discussion B)*

This focus group discussion revelation collaborates with what the Community Development Officers, District Education Standards Officer and Parent Teacher Association unanimously observed too.

This is a 'touch and go' generation. Technology has brought so much good and bad at the same time. There are so many beautiful things which are just there waiting for you to make a move and it looks like everyone is managing to get these things. Many girls are falling into great temptations. Their families are unable to provide for. These are just wants; latest phones, handbags, human hair, powders.

The sentiments of the church are true of the example of the girl below.

Look around yourself. Anywhere, in the bus, at school, in church, in town etc. everyone looks like they have the money to buy anything. I could not refuse the offer of money to buy human hair from an admirer in the bus. I sat with this man who lavished me with praises of my beauty. He then suggested that if I braided with human hair and change the makeup I was wearing, my beauty would be turning every boy and man towards me. I was flattered but I agreed. Payment was just sex for one night with him. So, I rung my mother that I was staying at my cousin's that night to do my hair. I spent a night with this man and he paid me well. I now do it for anything I want and I tell my parents a lot of lies to

prove where I get these things. I am sure it's not me alone who is doing these things. Do you think all these girls with latest things are given by their parents? *(Interview, Girl aged 14).*

Girls are not difficult to get into bed. I have done it a number of times. Just offer them these latest things, they are ready to offer you sex. Now I buy mobile phones to give away. So, I will have three smart phones ringing on me and then I just offer one out to this unsuspecting girl with no phone. You should see the excitement! *(Interview, Male aged 55).*

Sexual gratification

The proliferation of pornography, especially 'blue films', was affirmed as a reality in communities. Makeshift video halls where pornography is shown are reportedly abundant in communities. It was also noted that old men and women show blue films in their homes to lure girls and boys, respectively, into illicit sex. Male youth said girls deliberately opted to have sex with old men to explore the myth or perception of heightened erotic virility and pleasure often associated with having sex with old men but described as lacking in boys.

'The penetration of an old man is deep, not attainable or comparable with that of a boy' *(Small group discussion C).*

This perception was echoed by most of the sexually active out-of-school adolescent girls. They agreed that their male peers compared poorly with old men when it came to matters of sexual intimacy.

I told you earlier that, the first older man I had sex with had a big penis. Woooo, when I tried with a boy, I mean a boy he literally swam inside me. It was like sex with a fellow woman. You need to feel a man inside you. So, for me I go for older men *(Interview, Girl aged 15).*

Young girls are intact. You squeeze yourself in and the heat and the sensation are unforgettable. You want more and more and all you do is run away from your wife to experience this again and again *(Interview, Male aged 61).*

It's a shame really that an old man can expose himself to a girl the same age or even younger than your own daughter. I am even ashamed to talk to you about this. I have to stop. These girls watch so many things on their phones and they do anything. My wife will never accept giving me a blow job but these girls will do it. That is all I do so I don't get them pregnant. I pay so much money than those that go all the way but I think I get the most satisfaction *(Interview, Male aged 66).*

Restricted access to community resources and essential services

Restricted or lack of access to community resources such as wells/bore holes and essential services such as health care, education, water and sanitation, child protection and other welfare facilities can combine to complicate and deepen the various risks and vulnerabilities girls and boys are exposed to in terms of cross-generational sex. For example, the physical distance to facilities, particularly wells, bore holes, mills and even schools, means adolescent girls can be exposed to sexual abuse by men on their way. When distances are particularly long, places are difficult to access or loads are difficult to carry, girls may be compelled to seek the assistance of older men, with the promise of reciprocating with sexual favours. Taxi drivers are regarded as frequent victimisers, luring girls into sex in exchange for 'free' rides to school. But not all girls hold this view, as evident by the narrative by 10 girls (whose age range is between 16 and 21) interviewed captured below:

I have no trust in older men. There is no help that they will give you without seeking for favour. I can give you a lot of examples of men I have had sex with [she lifts her right hand and begin to count using her fingers, she started pointing at the first figure…one:

1. A policeman who said he can escort me home because it was late demanded sex off me as payment.
2. A village elder, who claimed he would give me free land if I had sex with him.
3. A bus driver, who allowed me not to pay for the ride but instead demanded sex.
4. The head teacher who instead demanded sex from me in exchange for the punishment for the offence I committed.
5. My father's friend, who saw me with another older man and so he cannot report me to my father, I pay every time with sex on demand.

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6. It's a long list. I do it now for anything. I move with condoms in my bag [she broke down], I don't know if I will ever get married because I think men know me now (she continued, sobbing until the interview was stopped].

Challenges

The consequences experienced and/or perceived by adolescent girls and boys involved in cross-generational sex or regarding its occurrence can be categorized into positive (leading to improved economic wellbeing) and negative (causing or exacerbating ill being). The analysis below notes when they described consequences that are the result of experiences of adolescent boys and girls involved in these types of relationships or of perceptions by others, either adolescents or adults in the community.

Negative consequences were widely identified, both by those who had experienced cross-generational sex and by others in the community identified for this study. Bantebya et al., (2014) has explained such consequences for the girls who indulge in cross-generational sex. The girl above is an example of negative consequences of intergenerational sexual relationships. The girl is traumatized and has lost trust in older men who have sexually abused her. It's clear that this girl has now become vulnerable to some older men.

I have aborted five pregnancies. I do not regret because I would not have reached grade 12. I know a woman in the village who uses traditional medicines and I go to her to help terminate the pregnancies *(Interview Girl aged 18).*

I first gave birth from an older man when I was 14 years old. Since, I have never healed. The hospital says I have fistula, a condition that occurs when a young girl gives birth at a young age. I leak so I wear pads every time *(Interview Girl aged 19).*

Unanimously, respondents in the Health sector revealed that Fistula is a health complication occurring in young adolescents today, prevalently. The Policy Brief on the Status of Sexual and Reproductive Health and Rights in Zambia (2017) attest to this. The brief explains that teenage girls who fall pregnant tend to drop out of school, enter into early marriages and have a proclivity to teenage pregnancy health complications that include fistula and unsafe abortion.

Some of the negative consequences, lived and perceived, included heightened vulnerability to infection with HIV/AIDs and other STDs, which female respondents associated with old men, who tend to be more sexually active and to have had multiple partners; increased vulnerability to unwanted and risky early pregnancies; unsafe abortion and the associated higher risk of maternal morbidity; and injury or trauma of the reproductive system when young, physiologically immature and sexually inexperienced girls are initiated into penetrative sexual intercourse with older and sexually experienced men. Most of these sexual and reproductive risks are attributed to the inability of young, naive and timid girls to demand or negotiate safe sex.

Compared to those respondents in urban, positive consequences mentioned by respondents focused on adolescents having more immediate material concerns, such as money in the short term either to pay for basic needs or, more commonly, to pay for goods they could not otherwise afford. These respondents nevertheless reported the same protective and security concerns as those in the urban environment.

It was reiterated that, despite their high prevalence and trivialisation, cross-generational sex rarely offers tangible and sustainable benefits for the adolescent girls involved. Girls who are abandoned while pregnant or soon after birthing do not only drop out of school but also suffer considerable psychological trauma associated with the pain of rejection not only by their male partners but sometimes by their natal families as well. As a result, these girls suffer a loss in self-confidence and self-worth. Many, after engaging in one transactional sexual relationship with an older man, start to do this more frequently.

In contrast with the above, some adolescent girls who had engaged in transactional sex with older men had become pregnant and were now adolescent mothers, and blamed their situation on economic hardship and ill being, as they felt these rendered transactional sex their only option for survival, even when it carried the risk of STDs and sometimes violence. Although they described the old men who prey on young girls derogatorily, at the same time they expressed their preference for cross-

generational sex owing it is assured financial and material advantages compared with sex with their peers.

More often than not these girls become destitute, with no place of abode. Some adolescent girls with young children mentioned feeling that their children, particularly girls, would also have to sleep with older men when they got older to survive, particularly as it was what they had witnessed from a young age.

In addition, many interviewees mentioned abuse and physical violence as being common in these relationships. According to the participants, this results from girls trying to negotiate use of contraception; sometimes it is just because some men are violent and feel entitled to be violent with the girls they are with. Meanwhile, the guidance and counselling teachers, community development officers and social welfare officers revealed that there is an increase in the number of young men engaging in intergenerational sexual relations, many are also beaten by the older women and ladies they are involved with or married. Violence comes in because the women feel they are providing all the young men want and need (shelter, car, money and food) and are over-protective, always thinking that the young men quote or have extra-sexual relations with ladies of their age range.

Furthermore, participants disclosed that given that cross-generational relationships can result in marriage or cohabitation, other negative consequences identified included increased proneness to premature widowhood as a result of pronounced inter-spouse age differences; insecurity in the matrimonial home owing to potential eviction by hostile in-laws on the demise of the husband; vulnerability to physical abuse or disrespect by grown-up children who deliberately refuse to recognize a girl's new and heightened stepmother status; poor health and premature ageing associated with prolific child bearing, owing to old men's desire and demand for many children; living with the social stigma that marriage to a man of advanced age attracts; and above all abandonment while pregnant as a result of back tracking by the male partner/husband on his earlier promise of marrying the girl and providing her with social security.

However, studies have shown that risk perception by both partners is often low. Young women may view the older man as a safer sexual partner; the older man is often perceived as less risk taking, more stable, and more responsible (Leclerc Madlala, 2008).

But it is not just money. Of special concern is the risk of contracting HIV and AIDS in age-disparate partnerships. While young women associate ability to attract and exploit older partners with modern freedoms linked to gender equality, and while securing and maintaining relationships with older, employed men is considered 'clever' and an important contribution to young women's self-perception as sexually-liberated, the strategy exposes them to HIV (Shefer, Clowes, & Vergnani, 2012; Jungar and Olinas 2004; Patton 1990; Seidel 1993).

Benefits

Women see many benefits in having older 'sugar daddy' boyfriends. Some aim for marriage, with older men seen as more serious and better potential marriage partners than same-age partners. Across southern Africa, girls are encouraged to seek older men as partners and husbands. Families caution against marrying a man of similar age as this is believed to increase the risk of marital instability.

Some who wish to avoid marriage still aim for economic independence with older men seen as a means to achieve this goal. With the men's help, they can further their education, secure better jobs, build capital, or gain social mobility.

Some young women claim that older men are better at and more interested in satisfying them sexually. Their need for love, affection, and affirmation has been stressed in some studies as important but it often overlooked the young women's motives for going with older men. As a young woman attending one of the region's tertiary institutions put it:

'Older men are nicer than the young ones. They listen, they are patient and tender. You can see they appreciate you more.'

There is prestige in dating a man who is a well-known or respected public figure. To be seen riding in an expensive automobile, or dressed in trendy clothing, or with a top-of-the-range cell phone are viewed as status-enhancing by young women in the region.

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From this social benefit comes a personal benefit, the boosting of self-esteem and self-confidence that some studies have reported as especially important for young women. Their ability to improve young women's status, including social mobility, has earned older men tags such as 'sponsors' 'investors' or 'ministers'. The concept of the 'Three C Girls' (young women who sexually exploit men for cash, cars and cell phones) is well known across the entire southern Africa region.

Studies also tell us that notions of manhood are closely tied to a man's ability to attract and maintain sexual partners. The need for entertainment, variety and relief from domestic and workplace stress are considered as some of the drivers of men's sexual involvement with younger women. A desire for 'clean partners' perceived to be free of STI or HIV infection is reportedly a major reason for men going for young women.

Myths that HIV can be cured through sex with a virgin or that an older man can be sexually revived by sleeping with a younger woman are common excuses for intergenerational sexuality. In some communities an ageing man is entitled to a young woman to 'make his blood move again', and often his ageing wife has to find the young woman to 'service' her husband.

Literature on transactional sex, in sub Saharan Africa, has often separated drivers of the practice into sex for consumption and sex for subsistence (Hunter, 2002; Zembe et al, 2013). Although young women were often placed in the context of poverty, all respondents in this study believed that young women most frequently pursued transactional sex for goods of consumption, such as fashionable clothing, cell phones, drugs, and alcohol. Often times, the young women reported that the older man simply provided money; the women then would use the funds to purchase these material goods.

While sex for consumption was more commonly referenced, all the young women cited the use of transactional sex for subsistence needs. The exact parameters of sex for subsistence have been difficult to locate in past literature, but general goods of subsistence or "needs" have been defined as food, essential clothing, and school fees in past studies (Leclerc Madlala, 2004).

School fees, food, and employment were commonly cited as the needs of young women coming from poor families. Alternative Motives for Transactional Sex: Fun, Love, Preference, and the Silence of Sexual Pleasure: Fun was the most commonly cited alternative motivator for young women to engage in intergenerational, transactional sex. Nearly half of the interviewees considered it a significant reason for their peers to pursue sugar daddies. The pursuit of love and marriage was vehemently denied as a component of transactional sex by some young women; others believed that it could occasionally become a factor.

Critical reflection

There was no unanimity on important definitions such as girlhood, adolescence and adulthood/womanhood and related issues such as age of sexual consent and marriage. As such, cross-generational easily becomes normalised, as adolescent girls who are seen as 'sexually mature' are perceived as being available for sex, even if legally the age of consent is 18. In fact, most relationships including cohabitation and marriage in the community involve girls or women with much older male partners.

Cross-generational sex is thus not perceived as a child protection violation, but as a normal and socially acceptable phenomenon, not attracting punitive social sanctions. A girl or boy's physiological maturity, characterised by distinct bodily changes, takes precedence over numerical age in the definition of adulthood.

Discussions with adults and adolescents alike indicated that, although girls' and boys' involvement with old men and women, respectively, was attributed largely to naivety coupled with poverty, some of the boys and girls were actually not materially needy but only psychosocially vulnerable.

Peer pressure is expressed more in terms of the social acceptability of cross-generational sex and the pressure to form relationships from a young age, as discussed earlier, particularly for girls. However, adolescent girls interviewed in small group discussions also noted that it was not uncommon for adolescent girls attending school (who are thus not among the poorest) to desire things their parents cannot afford. This drives them into going with older men who have money, particularly as they see friends with 'nice things' and want to have them too.

The relationship between intergenerational sex and higher risk of HIV infection has recently been called into question. As suggested above, previous cross-sectional studies of HIV prevalence have indicated that younger women in cross generational relationships are placed at a higher risk of HIV infection.

Drivers of transactional sex are varied and complex; alternative motives for young women include the pursuit of fun, potential love, and partner preference. Sexual pleasure was utterly absent from discussions regarding transactional sex by the young women in this study, reflecting the country's roots of patriarchal society and dominant discourses surrounding gender and sexuality. Young women are often active agents in transactional sexual relationships, and cannot be regarded as passive, exploited victims. This study cites several cases of young women purposefully pursuing, initiating relationships, and exploiting their older male partners. Females challenge gendered economic inequalities by utilizing their sexuality for access to economic power and resources traditionally held by men. Both men and women maintain multiple concurrent partnerships amongst practices of transactional sex.

Female agency in transactional sex serves to both disrupt and reproduce patriarchal norms. The power dynamics between older men and young women in transactional sexual relationships have crucial implications for high risk sexual behaviors.

This study found that socioeconomic status likely exacerbated gender inequalities within a transactional relationship, leading to gender-based violence. While transactional sex can prove to be socially, psychologically, and financially beneficial and meaningful for both parties involved, it seems to be deemed as a scorned, immoral pathway to success in the eyes of young women who do not partake in such relationships.

The young women of this study are well aware of the health risks of transactional, intergenerational sexual relationships, such as HIV infection and pregnancy. This knowledge, however, does not drive their decision to abstain from sugar daddy relationships.

Overall, what remains unclear is the extent to which the boys and girls who get involved in cross-generational sex with older partners see the damaging negatives before engaging in these relationships, or whether they realise the damage only once they have experienced it.

Given the social acceptance or frequency of these relationships, it can be hypothesised that many young adolescents think only of the very limited positive consequences of these relationships, without actually weighing the long-term negative costs. For others, given their limited options, they might still see it is as the only alternative, even when they are aware of the risks.

Conclusion

This study provides evidence on the high incidence of cross-generational sexual relationships in the research sites visited. Acute income poverty and its stultifying effects, subjecting both boys and girls to a myriad of vulnerabilities, are identified as a key push factor for cross-generational sexual relationships. Sociocultural and other challenges, such as peer pressure, discriminatory social norms, lack of and poor-quality services and dysfunctional families also emerge as significant drivers.

Drivers of transactional sex are varied and complex; alternative motives for young women include the pursuit of fun, potential love, and partner preference. Sexual pleasure was utterly absent from discussions regarding transactional sex by the young women in this study, reflecting the country's roots of patriarchal society and dominant discourses surrounding gender and sexuality.

This study found that socioeconomic status likely exacerbated gender inequalities within a transactional relationship, leading to gender - based violence. Furthermore, the consequences adolescents experience as a result of engaging in cross-generational relationships are common across rural and urban contexts. Some of the adverse effects include sexual abuse and exploitation, physical abuse, early marriage, unwanted pregnancy, single motherhood, exposure to HIV/AIDS and other STDs and psycho-emotional trauma. These consequences usually overlap, resulting in adolescents being unable to access their rights.

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Recommendations

A number of factors were found to play a critical role in pushing of trans generational sex which policy makers would do well to look at and are citied as follows:

1. Poverty is a major factor given as the reason why adolescents both male and female would get involved into this act. It is important therefore that the people are equipped with necessary tools that will enable them to find alternatives to replace the use of engaging into sex with older men and women as a means of survival.
2. Education and awareness must be enhanced in communities similar to the settings in which this study was conducted in especially on issues pertaining to the implications of trans generation sex so that the young people are made aware of the long-term effects than simply focusing on the short lived economic value harvested in the short term.
3. Trans-generation Sex in the case of this study was a result of the economic boom coupled with cultural and social beliefs/practices of the local people, it is important therefore that policy be generated to the effect that whenever such situations are foreseen mandatory sensitization should be undertaken by investing companies to avert the social backlash that would arise.
4. More studies need to be conducted to have a thorough understanding of underlying factors and motivating reasons for young people to focus more on short term benefits even in the face of knowing the serious results of such activities. This is so that the social ramification of the practice has downturn effects on the overall development of a nation.

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"Prevalence of Pterygium and Visual Impairment in Patients at a Tertiary Care Centre of Etawah District: A Hospital Based Study"

Article by Gaurav Dubey[1]; Nandani Pandey[2]
[1, 2]*Optometry Resident (Faculty of Paramedical Sciences; Uttar Pradesh University of Medical Sciences, Saifai, Etawah, Uttar Pradesh India)*
E-mail: address gauravopto25@gmail.com[1]

Abstract

Introduction*: Pterygium is a non-malignant, slow growing, wing shaped proliferation of the fibro vascular tissue, which is arising from the sub-Conjunctival tissue, which may extend over the cornea and thus disturbing the vision.*

Background and Purpose: *To assess the prevalence of Pterygium and Visual impairment in patients at a tertiary care centre of Etawah district.*

Methods: *A cross-sectional study was done over a period of 3 months on both genders with the categorised age group and into grades according to the size of the Pterygium in the Department of Ophthalmology at UP University of Medical Sciences hospital Saifai, Etawah. After taking an informed consent a total of 2100 patient were examined by eye screening and diagnosed with the help of ophthalmologist in which 130 patients were found with Pterygium problem. Out of these 94 patients (135 eyes) was found purely with Pterygium in one or both eyes and the rest 36 were excluded because of other associated morbidities. The selected participants underwent assessment by eye examination sheet and the subject undergone specific test. The data were recorded on the basis of set predesigned, pretested, semi structured questionnaires and the grading was done with the help of slit lamp examination. The data was collected and analyzed using chi square test.*

Result and conclusion: *A high prevalence of Pterygium was found in patients working in outdoor (76.29%) in comparison to indoor (23.70%) because of exposure to sunlight.*

Introduction

Pterygium is a non-malignant, slow growing, wing shaped proliferation of the fibro vascular tissue, which is arising from the sub-Conjunctival tissue, which may extend over the cornea and thus disturbing the vision (Garg 2009).

Pterygium is a common condition of the eye, the existence of which was well recognized at the time of Hippocrates (460-375 BC) and Celsus who described it as Urigus in his manuscripts. The earliest description of Pterygium is available in the texts of the great surgeon of ancient India, Sushruta (3000 BC) who called it as 'Armans'. In India, it is called 'Nakoona' in Hindi, due to its resemblance to a nail, in its shape (Sanjeev 2013).

Pterygium is associated with a wide spectrum of factors like sun and UV light, which is the reason why Pterygium is more prevalent in tropical regions (Luthra 2001).

Moreover; Pterygium is associated with factors like age, sex, ethnicity (Chen S 2012). It most commonly found in the population exposed to dry, dusty, windy, and warm weather. It affects the people exposed to U.V. radiations & Infrared radiation.E.g.-farmers, welders etc.

Its prevalence ranging between 0.7% and 33% globally. For management of this condition, surgery is done like bare Scleral technique with or without mitomycin C, Conjunctival auto graft, amniotic membrane graft etc. (Droutsas 2010). The recurrence rate after the surgery is between 30% and 90% (K Zheng 2012).

(Taylor and colleagues 1992) found a statistically significant association between the ultraviolet light exposure (both UV-A and UV-B) and a development of Pterygium in a large group Chesapeake Bay Fishermen.

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Methods

This study was cross-sectional in nature where the objective is to determine the prevalence of Pterygium in at least one eye in patients attending ophthalmology OPD of a tertiary eye care centre in the district Etawah and also to assess the visual impairment in patients with Pterygium. The study was done in the Department of Ophthalmology at UP University of medical Sciences hospital, Saifai, Etawah.

After taking an informed consent from the patient a total of 2100 of routine patients were examined by eye screening using torch light examination, slit lamp examination and vision screening using snellen's chart. A diagnosis of Pterygium was made by the ophthalmologist in whom 130 patients were found with pterigium. The data was collected over a period of 3 months in both genders. Out of these 94 patients (135 eyes) was found purely with Pterygium in one or both eyes and the rest 36 were excluded because of other associated morbidities.

The selected participants underwent assessment by eye examination sheet which includes subjective examination and the subject undergone specific tests (Uncorrected Visual acuity (UCVA), best corrected visual acuity (BCVA), Visual acuity with present glasses, refraction, and slit lamp examination for grading of Pterygium).

An interview was conducted with each participant to collect data on the basis of set predesigned ,pretested ,semi structured questionnaires which includes socio demographic profiles and descriptive factors like Age, sex, locality, (rural/urban), history of sun exposure, occupation, use of protective glasses , behavioral lifestyles (alcohol consumption and cigarette smoking), family history of eye disease.

The patients who were attending OPD of Ophthalmology department during the study period was included in the study while those who exhibit absence of Pterygium, Cataract, history of trauma in eye, any opacity or scar, Pseudophakia were excluded from the study. The selected patients were divided into 4 groups A, B, C & D on the basis of ages of the patients for assessing most commonly affected group (Group A – 0-20 years; Group B -21-40 Years; Group C – 42- 60 years and Group D - >60 years) and into grades I to IV on the basis of the size of Pterygium (Grade I - Just touching the cornea ,Grade II - Encroaching the cornea, Grade III - Touching the pupil ,Grade IV - Covering the pupil.To determine the prevalence of Pterygium the group is divided into gender (Male and Female) and exposure to work (Indoor and outdoor) as shown in Table-2.

These selected patients were further categorized and assessed by determining the sides of Pterygium, position of Pterygium and other examination as shown in Table -2 The table shows that Pterygium is most commonly seen in smokers, Uniocular, bilateral.

Table 1. Positions, sides of pterygium and other examinations

SIDES	
Uniocular	68.88%
Binocular	31.11%
POSITION	
Nasal	17.03%
Temporal	2.22%
Bilateral	80.74%
OTHER EXAMINATION	
Smokers	11.11%
Non-smokers	88.88%

Statistical analysis: The prevalence of Pterygium in at least one eye or both eyes was considered therefore a person whose right or left eye has a Pterygium is considered as a case of Pterygium. The percentage Pterygium along with 95% confidence intervals (CI) was considered in the design effect. Changes were considered significant based on a significance level of 5%. The data was analyzed using chi square test and by using the software statistical package for social sciences (SPSS).

Result

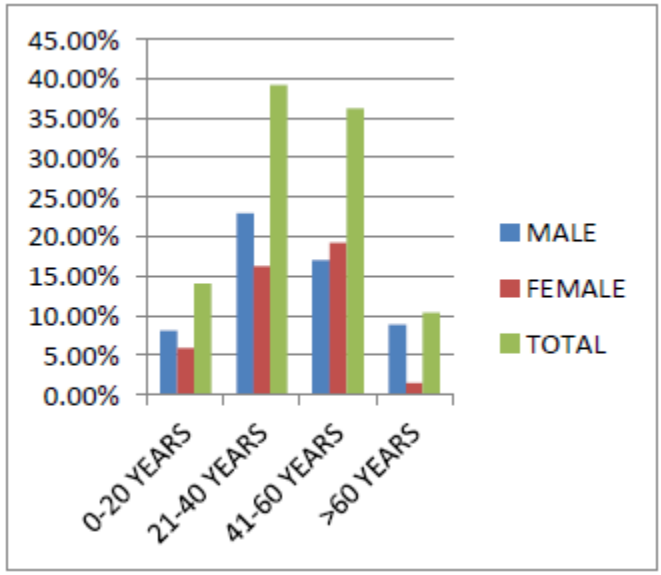
A total of 2100 patients were examined through sampling, out of which 130 patients (prevalence rate = 6.6) were found with Pterygium. Out of 130, 36 of them had other morbidities hence only 94 (135 eyes) were evaluated for study. The mean age of the study participants was 39.25%. The prevalence of Pterygium by gender and exposure is presented in Table2.

Table2. The Prevalence of Pterygium by gender and exposure

GENDER WORK	MALE	FEMALE	TOTAL
OUTDOOR	75(55.55%)	28(20.74%0	103(76.29%)
INDOOR	1(0.74%)	31(22.96%)	32(23.70%)

The prevalence of Pterygium was 76.29% in outdoor Male and Female while 23.70% in Indoor Male and Female (95%CI: Chisquare value =48.19: df=1: P=0.00001**).** According to Table 1, the prevalence of Pterygium was higher in outdoor males (55.55%) than outdoor females (20.74%) as compared to indoor males (0.74%) and indoor females (22.96%), but the difference was not significant. The indoor male and female ratio were comparatively low.

A multiple model was used to evaluate the relationship of the prevalence of Pterygium with age groups, Position of Pterygium and Side of Pterygium. The results are presented in the form of bar graphs (a & b) and in the tabulation forms in Table 3 and 4.



a) Prevalence of pterygium with age group

The Maximum percentage of Pterygium was noticed in the age group 21-40years. This is in close age concordance with findings of Sanjeev Rohati et al. (31-40 years), A Fotouhi (20-39years). The higher percentage of Pterygium is also found in the age group 0-20years (14.07%) which was high in comparison to other studies of a frotouhi et al, Veena Bhardwaj et al. (1.33%). This may show an early onset of Pterygium in this area.

The percentage of Pterygium was high in smokers (89%) then in non smokers (11%) and the Pterygium was found high binocularly (69%) then uniocularly (31%). The Pterygium was high in nasal side (81%) then in temporal (2%) and bilateral (17%).

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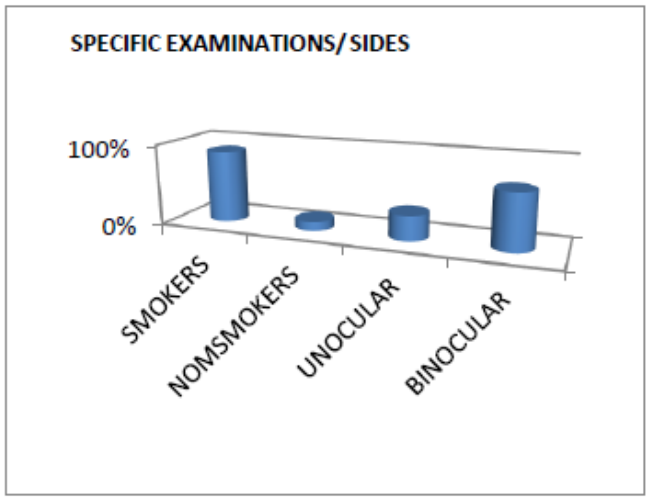

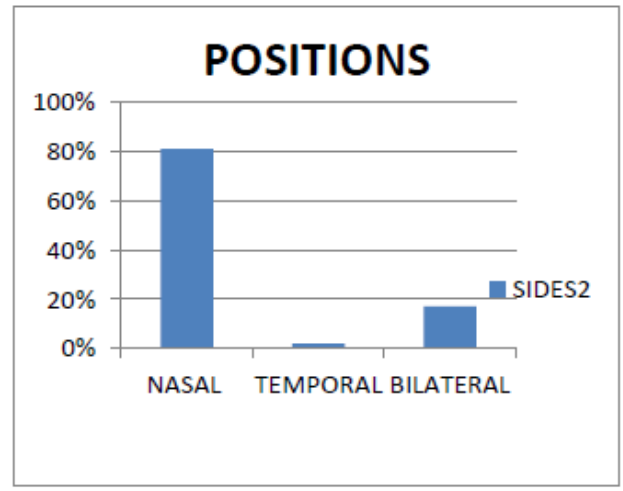

b) Prevalence of Pterygium with Position and sides of Pterygium.

This study shows that the prevalence increases with the age till 60 years of age and then declines as compare to study of Hasemi et al. The size of Pterygium is greater in the age group of 21-40 years Males (Grade 1 =12.59%); female (11.85%).

Table 3. Description of patients according to age group and grades of Pteryium

AGE GROUP	GENDER	GRADE I	GRADE II	GRADE III	GRADE IV
0-20 (A)	M	6 (4.44%)	5 (3.70%)	-	-
	F	5 (3.70%)	3 (2.22%)	-	-
21-40(B)	M	17(12.59%)	12(8.88%)	2(1.48%)	-
	F	16(11.85%)	5 (3.70%)	2(1.48%)	-
41-60(C)	M	12 (8.88%)	10(7.40%)	-	1 (0.74 %)
	F	16(11.85%)	7 (5.18%)	-	2 (1.48 %)
>60 (D)	M	5 (3.70%)	3 (2.22%)	2(1.48%)	2 (1.48 %)
	F	-	2 (1.48%)	-	-

Best corrected visual acuity (BCVA) was found in Grade I of Pterygium as given in Table -3. Grade IV affects vision more in comparison to grade III, grade II & grade I (chi square value =27.26: df = 6: P <0.05:CI = 95%). The negative effect of grades of Pterygium over visual acuity is given in Table: - 4 and is as follows (Grade IV> Grade III > Grade II > Grade I).

Table 4. Effects of Pterygium grades on visual acuity.

GRADES	6/6	6/9	6/12	6/18 & more
Gr. I	55(40.74%)	19(14.07%)	2(1.48%)	1(0.74%)
Gr. II	31(22.96%)	8(5.92%)	5(3.70%)	3(2.22%)
Gr. III		-	1(0.74%)	-
Gr. IV	-	1(0.74%)	-	4(2.96%)

Discussion

In this study, we evaluated the prevalence of Pterygium and visual acuity in tertiary eye care center in the district of Etawah. The prevalence of Pterygium was found higher in the age group of 21-40 years (39.25) in our study.

(Ma.K and colleagues 2007) explained that Pterygium is an ocular disease that is very much associated with the environment, occupation, climate, dust, and lifestyle all of which may contribute to its higher prevalence in the rural population

(Panchapakesan. J 1998) and (MC Carty CA 2000) found in their study, the prevalence of Pterygium was higher in men than women. Different studies have confirmed this finding. one of the reasons could be more outdoor activities of men as compared to women and their related occupational conditions are also a triggering factor to it.

(Karai. L 1984) and (Shiroma. H 2009) concluded that the general men more often do jobs like welding, farming, ranching, and fishing than women which is associated with higher prevalence of Pterygium.

(Lu. P and clooeagues 2007) prove in their study that women were at a higher risk than men which seems to be associated with their lifestyle and outdoor activities. In our study, the prevalence of Pterygium increases with age.

Conclusion

From this study we may conclude that most of the cases were seen in young and middle-aged people in between age group of 21-60 years (75.55%) because most of them used to work in outdoor, heat and dusty environment. Diminition of vision occurs with the increase in the size of Pterygium.

The present study had some strengths and weaknesses. The strengths of this study are its clinical information collected about Visual Acuity, Severity of Pterygium and the eye affected. The weaknesses of this study are that we could access data only on sun exposure, heat and dusty environment not on smoking and dry eye, which are also important risk factors for Pterygium.

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Primary-Resource Dependence: An Examen of Economic Diversification Policy and Poverty Eradication strategy in Botswana

Article by Feddious Mutenheri
Tutor in Development Studies at Livingstone Kolobeng College and a PhD Student in Public Administration at Texila American University
E-mail: feddious@gmail.com

Abstract

Dating back to its independence from British 'protection' in 1966, Botswana's economy has been largely based on beef production and in the 1980s, the mining and export of diamonds. Whereas the country remains one of the few brawny economies in Africa, the twin challenges of overreliance on primary economic activities and a sparse population base have become a real development bane. While the former has by now shown calamitous economic consequences as a result of foot and mouth disease and the drop-in world diamond prices, the latter is difficult to contemplate in development outlay. Faced with these reality checks the successive governments of Botswana have, with varied successes (or lack of), embarked on economic diversification overdrive and robust population policies. This paper reconnoiters the importance of economic diversification in primary-resource dependent Third World economies such as Botswana. It further explores the historical background to economic diversification in Botswana and the major challenges that Botswana faces in its diversification drive. The paper also draws attention to the challenges posed by a small and dwindling population and other fundamental issues to the vision of economic diversification. The paper concludes by pointing out opportunities available for a long-term expansion of the economy of Botswana. An intensive qualitative analysis of available literature will be used to gather information on Botswana's diversification policy. Secondary quantitative methods of data collection will largely be relied upon which involves the collection of secondary data from existing data sources like the internet, government resources, libraries and research reports. Secondary quantitative research will help to corroborate the information that is collected from primary quantitative research as well as support the strengthening or proving or disproving previously collected data. It is a major finding of this research that Botswana's diversification policy has not been pursued with the competence it deserves and therefore has so far been a failure. It is also the finding of this paper that unless robust population policies are put in place to support diversification, this policy will remain a pipe dream.

Introduction

Background to diversification in botswana

The talk about the necessity for diversification in Botswana is a progeny of a stark reality of an unsophisticated economy heavily dependent on a few primary economic activities. Botswana, from times of yore, provides itself a lot of avenues and opportunities for expansion of its economic options due to its array of endowments. Surprisingly, the economy has tended to depend primarily on diamond, copper/nickel and gold mining and beef export and to a lesser extent on the tourism sector, to its own disadvantage with little attention to diversification. While it was easy to maintain this situation at independence, it has proved unsustainable in recent years as a result of changing global economic and political realities which will be discussed later in this installment.

As a general policy objective, diversification in Botswana has been attempted since the attainment of independence in the 1960s, but as a specific and vigorous policy, diversification became a phenomenon in the 1990s. (Shillington: 2005). Diversification then was centered on mineral production. This was the time when the mineral industry was booming. Botswana tried to avoid the problems of mineral boom economies. It dealt then with its government expenditure and the result was economic growth and economic diversification (shillington: 2005).

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Even then, diversification did not have an impact on gross domestic growth. At the time of its independence, Botswana was among the world's poorest countries. Tax revenues proved insufficient to cover the costs of government, forcing Botswana into heavy debt with Britain.

Seretse Khama set out on a vigorous economic program intended to transform Botswana into an export-based economy, built around beef, copper, and diamonds. (http://en.wikipedia.org/wiki/Seretse_Khama). The 1967 discovery of Orapa's enormous diamond deposits particularly aided this program, and between 1966 and 1980 Botswana had the fastest growing economy in the world. Much of this money was reinvested into infrastructure, health, and education costs, resulting in further economic development. (http://en.wikipedia.org/wiki/Seretse_Khama).

The source of this fortune has been the exploitation of deposits of diamonds and other minerals, a beef export industry that has preferred status with Europe, and a tourism policy that has courted the top-end of the market. But it is diamonds that have been the engine of growth. The domestic cost of production is low compared to their overseas sales value (priced in American dollars) and as a result, diamond sales for Botswana are extremely profitable (Jefferis, 1998). By the early 1980s, diamonds had replaced beef as Botswana's leading foreign exchange earner: in 1981, diamond exports accounted for 40% of total exports—in the first quarter of 2001 it was 87% (Republic of Botswana, 2002b). (Taylor: 2002).

Despite decades of rapid GDP growth and export (i.e. minerals and beef) success, the economy has failed to diversify and remains under-developed. (Taylor: 2002). Coupled with the world economic recession of 2008-2009, the economic outlook faced a gleamer future. All this has partly been a result of unclear government policies.

A key element in the government's model of economic development consists of private sector development policies grouped under the broad goal of economic diversification, and aimed at reducing the country's dependence on diamond mining. Botswana's successful management of its macro-economy and the persistent stagnation of private sector development present a perplexing paradox. (Conteh: 2008)

Diversification has thus become a policy objective for successive governments to that led by Lft Gen. Seretse Khama Ian Khama but with limited to no success. As Kapunda (2003) points out:

…One should not quickly conclude that significant diversification has been achieved. Firstly, the manufacturing sector, which is expected to play the central role in the diversification process, is still contributing only about 4 percent to GDP compared to 10percent in Sub-Saharan Africa. Furthermore, its contribution to total employment is only II percent. Even the industrial sector, defined broadly to include manufacturing, public utilities and construction, contributes only 12percent, 23 percent and 13percent to GDP, total employment and exports respectively.

From the above submissions, there is need to exhume the problems and the opportunities available for diversification of the Botswana economy in order to achieve porverty alleviation.

Natural resource endowment: The diversity

In order to comprehend the case for diversification in Botswana one needs an understanding of the geography and resource structure of the country. Botswana is a landlocked nation-state located in Southern Africa and shares its borders with Zimbabwe to the north-east, South Africa to the south and eastern side, Zambia to the north and Namibia to the west. This has meant that Botswana is heavily dependent on South Africa and Mozambique for her exports and imports. This profound reliance on other sovereign entities has palpable political, economic and even social costs.

582 000km^2 in area, the country is flat and up to 70% of it is covered by the Kalahari Desert. The tropic of Capricorn passes through this country and as such produce's differences in seasons especially between winter and summer. The other area though is suitable for arable agriculture. Because of the semi-arid climate, it is livestock farming, particularly ranching, which dominates agriculture in Botswana. According to Silitshena (1993: 115) ranching contributes 80% of the agricultural gross domestic product and is a major contributor of exports.

Apart from agriculture, Botswana is endowed with a rich mineral wealth that has contributed immensely to its GDP. A variety of minerals are found in Botswana and these include diamond,

silver, lead, zinc, antimony, tungsten, chromium, iron, manganese, copper, nickel and coal (Silitshena: 1993: 125). Of these however, the most important ones are diamonds, copper, nickel and coal as some of the minerals exist only in smaller quantities.

Botswana boasts of a landscape and natural endowments which make the country suitable for tourism. The wildlife in Botswana is one of the best in Africa in the league of Kenya, Tanzania, and Zimbabwe. Whereas wildlife in those other countries has been affected by human activities due to their high densities, Botswana enjoys a smaller population and its wildlife has remained relatively flourishing.

The endowments which also include fish, resourceful forest and tourist features are a pointer of the potential that Botswana possesses in its endeavor to diversify its economy.

Research problem

According to Sekwati (2011) international experience has shown that diversification is a challenging task, and structural changes are usually slow to implement. Sekwati further notes that, for countries which are resource dependent, such as Botswana, the challenges are compounded by the fact that the dominant resource sector is poorly linked with the rest of the economy. The Ministry of Trade and Industry (2011) noted: in spite of four decades of rapid economic growth, the Botswana economy continues to be less diversified and driven by primary products of diamonds, copper/nickel and beef. In addition, the country's import bill averages P20 billion per annum over the last five years, further illustrating the symptoms of a less diversified economy. (Ministry of Trade and Industry: July 2011). Notwithstanding the flurry of policies, stratagems and incentive arrangements implemented by government to promote economic diversification over the years, the economy of Botswana remains heavily dependent on diamond mining, with a narrow and shallow private sector. (Lesego Sekwati: 2011). From the foregoing, it is clear that it is difficult for a country to depend on one commodity primarily because of the risk that if sector falls, the whole economy crumbles. According to Ramsay (2018), mining in Botswana is capital intensive and therefore there are not many jobs there and therefore that sector cannot be depended on to alleviate poverty in Botswana. It is therefore the objective of this research to examine the effectiveness, and the success of the diversification policies and attended strategies that the government has put in place to achieve economic diversification and eradicate poverty in Botswana.

Existing solutions to the problem

The government of Botswana has long realised the importance and the need to diversify its economy. These efforts can be traced through the various National Development Plans (NDPs) 14 that have been implemented since independence (Sekwati, 2010). However, in recent years, direct policy has been designed to focus on economic diversification including the Botswana Excellence Strategy rolled out in 2008. In view of the problems mentioned above, recently in 2010, The Government of Botswana engaged Ministries and their Stakeholders to step up efforts to expand the economy via the Economic Diversification Drive (EDD) Short-Term Strategy and the EDD Medium to Long-Term Strategy.

The EDD Short-Term Strategy is grounded on Government interventionist strategies such as administrative interventions to promote domestic production and consumption; The use of citizen economic empowerment strategies; The use of Government local procurement, The use of Government reservations, The use of Government preference schemes, The use of Government large import bill to promote the development of local companies and the use of preference margins. According to the Ministry of Trade and Industry strategy paper, it is aimed at achieving quick wins and early harvest of low hanging fruits in targeted sectors of the economy where private sector efficiency and competitiveness may be achieved quickly. (Ministry of Trade and Industry: 2011). The major aim of the Strategy is to diversify the economy and reduce the large import bill cited above.

On the other hand, it is realized that the EDD short term strategy is not viable in a free-market economy. Therefore, the EDD Medium to Long-Term Strategy envisages diversification of the economy through the development of globally competitive enterprises that need little or no Government protection and support. (Ministry of Trade and Industry: 2011). Its major aim is to

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diversify the economy into sectors that will continue to grow long after minerals have run out. Its specific objectives are to develop globally competitive sectors; diversify exports and export markets through a vibrant and globally competitive private sector; develop goods and services that comply with local and international standards; and develop an entrepreneurship culture for business growth and enhanced citizen participation in the economy. (Ministry of Trade and Industry:2011)

But these are not the only solutions that the Government of Botswana have implemented to diversify the economy. According to Ramsay (2018) the first two Batswana Presidents, Sir Seretse Khama and Quit Masire did what was necessary to keep the economy oiled-up and the well-being of the people well looked after. Under Quit Masire, educating Batswana became a basis for skills development. Diamond money was used to improve the infrastructure. Under President Mogae, the country had an opportunity for FDI. President Mogae had the right ideas to attract FDI. However, during his time HIV/AIDS didn't help matters as resources had to be channeled to this epidemic, which also brought a bad reputation on the country. The country's leaders then had to focus attention on the combating of the pandemic and little attention to diversification.

The best solution

The EDD Medium to Long Term Strategy is the best approach do diversification in Botswana. It is an ambitious programme that envisages a vibrant and globally competitive private sector, which has been weaned-off from government support and protection. According to the Ministry of Trade and Industry it is to be achieved through: The development of a modern technology and skills driven knowledge economy in which Botswana firms will compete on the basis of quality of the labour force and productivity; quality of goods and services; technological innovation and adaptation; quality of business environment and infrastructure; and the extent and diversity of business linkages. (Ministry of Trade and Industry: 2011).

Limitations

The failure of diversification in Botswana thus far points to a variety of challenges that the country faces in its bid to diversify its economy. While there are myriad of factors that are responsible for failure of diversification, the momentous challenge to this process is to a larger extent posed by the twin phenomena of: its infernally small and dwindling population plus heavy dependence on a very few primary resources. The two challenges are dissected hereunder. Since independence, the population of Botswana was expected to grow at very fast rate because of a number of factors such as improvements in the economy, food aid and imports and better distribution, which have eliminated deaths caused by drought and also the provision of health facilities. However, in recent times, this trend was drastically altered by a number of factors.

Firstly, the HIV/AIDS pandemic has had very serious repercussions on Botswana's population structure. Ranked second in HIV prevalence in Africa after Swaziland, Botswana has experienced a drastic decline in its life expectancy. This has resulted in population projections being reduced from an estimated 2, 6 million by 2011 to a very humble number of only 2, 0 million by 2030. Such projections are a revelation of how the Botswana population is expected to grow at a very decreasing rate.

The Botswana pyramid has a much narrower base, since many sexually active HIV-infected young people die prematurely, while women may become infertile well before the end of their child-bearing years, leading to fewer babies being born. (Potter et al: 2008). Furthermore, as Barnett suggests, 'Up to a third of the infants born to HIV-positive women become infected themselves before or during birth, or through breast milk. Hence fewer babies survive to childhood and adolesence'. (Barnett, 2002b: 393). The smaller number of females under under 50 years old in the 2025 Botswana pyramid indicates the higher infection rate among young women than men.

According to the 2001 Botswana population census, Botswana's de facto population is 1.8 million people and This number masks the real population and slightly above 1million people are Batswana and the rest are foreigners.

There are a number of other factors that inhibit the achievement of the government's ambitious diversification strategies such as climate which limits diversification in agriculture, lack of other viable manufacturing options, financial resources and requisite skills base.

Exports have not risen as expected since diversification has largely been experienced in the services sector which does not produce goods which can be traded across the borders.

Unemployment has remained largely high because mining is largely a capital-intensive sector and does not create jobs. It is the government which is largely the employer and it does so by using revenues from mining in the public sector. This therefore means, there is still high unemployment and by extension means inequality still exists in the Botswana economy.

Achievements

There are a number of indicators of achievement in the area of diversification in Botswana. Firstly, GDP has become more diversified over the past 25 years. Since the 1980s the share of mining has progressively fallen, to 22.4% in 2013. (Jefferis: 2014) (See Figure 1- Figures and Tables).

Although the economy has become more diversified since the late 1980s, and the share of mining has fallen, the non-mining sector is quite different now to what it was 40 years ago. In 1974/5, the agriculture and manufacturing sectors accounted for 45% of non-mining value added, but by 2013 this had fallen to 10%. The counterpart to this was that the share of services has risen sharply. (Jefferis, 2014) (See Fig. 2 – Figures and Tables).

Secondly, Botswana has experienced growth in the services sector. So instead of mining alone contributing to growth, there has been an increase in the sources of growth of the economy thereby showing a decrease in the dependence on mining. However, it has to be noted that though services experienced growth, overall the growth rates have gone down since there has been lack of export diversification as most services are non-tradables. (See Fig. 3 – Figures and Tables).

Thirdly, there has been an expansion on government revenues from other non-mining sectors. Back in mid-1980s, fiscal mineral revenues accounted for 60% of total revenues and 30% of GDP. These figures have now at least halved, and non-mineral revenues make the majority (around 70%) of government revenues. (Jefferis: 2014) (See also Figure 4 – Figures and Tables).

Research methods

An intensive qualitative analysis of available literature was used to gather information on Botswana's diversification policy. Secondary quantitative methods of data collection were largely relied upon which involved the collection of secondary data from existing data sources like the internet, government resources, libraries and research reports. Secondary quantitative research helped to corroborate the information that is collected from primary quantitative research as well as support the strengthening or proving or disproving previously collected data.

The qualitative analysis reviews topics to do with the diversification policies in Botswana, the implementation of the policies, the extent to which the policies have been successful and the gaps in the policy-making strategy by the government of Botswana. An evaluation of the literature was extensively done to determine whether as a strategy, economic diversification in Botswana has managed to eradicate poverty in the country where poverty is said to be at 46% in rural areas and unemployment levels at 20% (Borjen Project 2017). Key respondents in government and the private sector were also consulted in order to get the view of the real participants in the policy making and implementation domains.

Results/Findings

It is the major finding of this Paper that there has been a large spate of policies, strategies and interventions that were aimed at diversifying the economy and averting the dangers associated with diamond led economies or basically economies dependent on one major economic activity.

According to Dr. Ramsay, the successive governments of Botswana since independence have made considerable progress in making policies that would set Botswana on a path to diversification and with-it poverty eradication. Especially under President Ian Khama, Tourism has been developed since he had passion for tourism. He contends that tourism is labour extensive and more jobs have been

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created in that field since Botswana has unique tourist resources such as wildlife and one of the only world inland deltas, the Okavango Delta. However, the continued lack of a strong private sector means that government alone has to push for the diversification of the economy. According to Ramsay, bureaucrats by their very nature are the wrong people to push for diversification.

Thirdly, Botswana's education policy has not necessarily complemented the diversification drive pursued by the government. There is need to develop a skill based that is based on the country needs for diversification, creating graduates who know what exactly the economy needs. This has been a failure.

The population threshold in Botswana

According to Ramsay the Botswana economy still falls far behind in technology. The Asian Tigers have managed their growth through implementation of the 4th Industrial Revolution and Botswana still lags behind. The Fourth Industrial Revolution builds on the Digital Revolution, representing new ways in which technology becomes embedded within societies and even the human body. The Fourth Industrial Revolution is marked by emerging technology breakthroughs in a number of fields, including robotics, artificial intelligence, nanotechnology, quantum computing, biotechnology, the Internet of Things (IoT), 3D printing and autonomous vehicles. (Klaus Schwab: 2016). Ramsay contends that the starting point is the digitization of government itself then manufacturing and services for the country to set the right tone for diversification.

Botswana's vision maintains that by 2016 Botswana will have diversified its economy, with mining, industry, manufacturing, services and tourism all making a sustainable contribution (RB: 6). However, the diversification is still not satisfactory as illustrated hereunder: Although the contribution of the mining sector to GDP has been declining from over 50 percent when the diversification industrial development strategy was adopted in 1984/85 to only 37 percent in 2000/01, one should not quickly conclude that significant diversification has been achieved. Firstly, the manufacturing sector, which is expected to play the central role in the diversification process, is still contributing only about 4 percent to GDP compared to 10percent in Sub-Saharan Africa. Furthermore, its contribution to total employment is only II percent. Even the industrial sector, defined broadly to include manufacturing, public utilities and construction, contributes only 12percent, 23 percent and 13percent to GDP, total employment and exports respectively. (Kapunda: 2003) (Botswana Journal of African Studies: Vol. 17 (2003) no.2).

Discussion

The EDD Short term strategy is basically not sustainable in a supposedly free market economy as it is based on government interventions and other policies that are command in nature such as preference margins, local empowerment strategies, local procurement and government reservations to mention a few. Botswana in reality falls far short from being described a free market economy because government is too involved what Ramsay described as a neo-soviet economy. Examples are the ways in which government was heavily involved with such big investments such as Corning and Heinz, Hyundai, Palapye Glass. The apt Adam Smith's concept of the "invisible hand" applies because generally government is ineffective and wasteful. Botswana needs to open its market rather than being protective if it is to achieve a diversified economy that caters to the development needs of the country.

The government needs to take on board the Fourth Industrial revolution starting the digitization of government, manufacturing sector and services sector. The advanced economies have progressed on this basis. Being a landlocked country however, manufacturing is a difficult task for Botswana but the services sector. However much of these services are not tradable and would not be expected to push the export revenues up for Botswana.

Government needs to create an enabling environment and there should be political commitment to the objectives of diversification. For 25 years the government has talked about The One-Stop-Shop for investors but till to date it has not materialized. On the other hand, while it is important to open borders and ease immigration laws, care should also be taken as there is need to protect the social and economic interests of the local people. So, doors need to be opened for investors but with rules.

Education in Botswana also needs radical change. It needs to be autotomized and let education centers infuse a curriculum that suits the needs of the economy.

Conclusion

From the foregoing, diversification in Botswana has been a buzzword in government circles however with little progress made on the ground. Government has been preoccupied with making a flurry of policies on paper well-meaning for diversification but with little implementation on the ground. The EDD short term strategy cannot be the panacea to the development needs and poverty alleviation strategy. It is a command economy strategy in what is basically a free market economy and therefore does not address the long-term needs of the economy. On the other hand, the EDD Medium to Long Term Strategy is a very ambitious programmed, which envisages a globally competitive private sector which is able to compete at the international stage, producing goods that have international standards. This is a hard sell as the private sector in Botswana has relatively remained small shallow and generally ineffective. The population dynamics, immigration policies and commitment by government bureaucracy in the country inhibit FDI since it is difficult to support viable business and therefore unlikely to lure much needed foreign investment. In as much as there has been diversification in the services sector, and an increase in the revenue base of non-mining activities, this has not translated to real growth in GDP, and rather there has been a decline as the export side of the economy has not experienced any growth.

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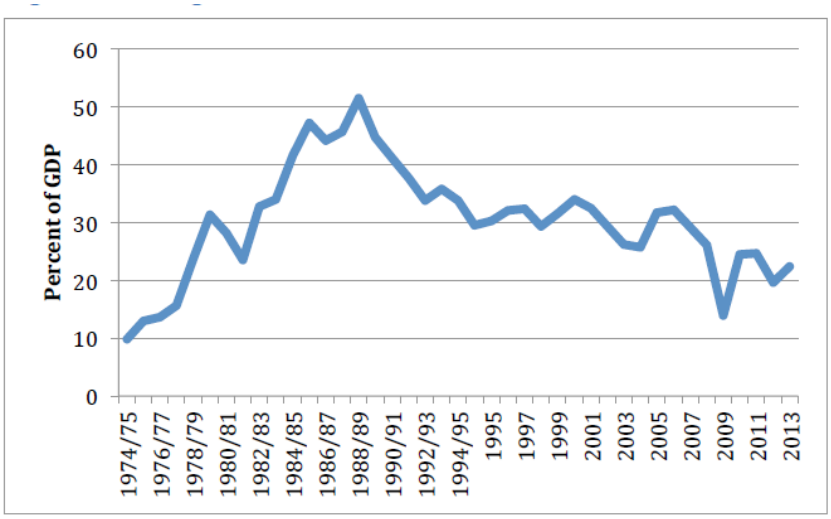


Figure 1. Mining as share of GDP

Source: Statistics Botswana.

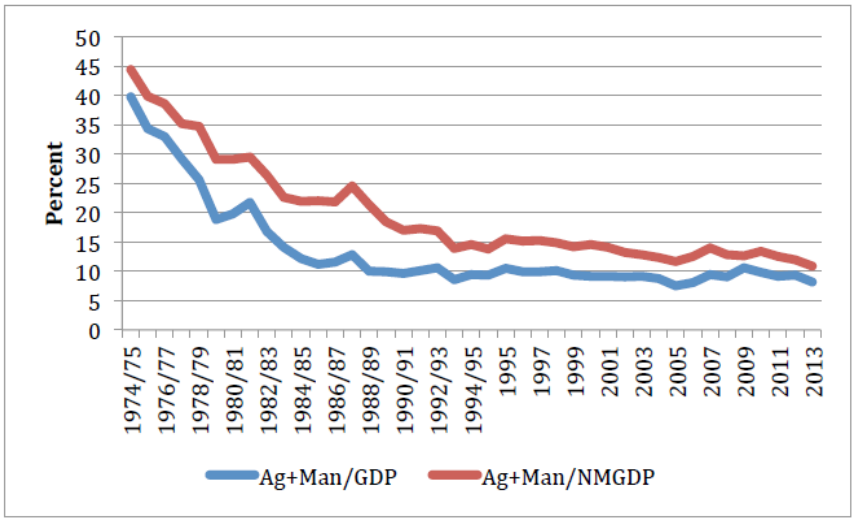


Figure. 2. Share of Agriculture and Manufacturing in GDP and Non-Mining VA

Source: Statistics Botswana.

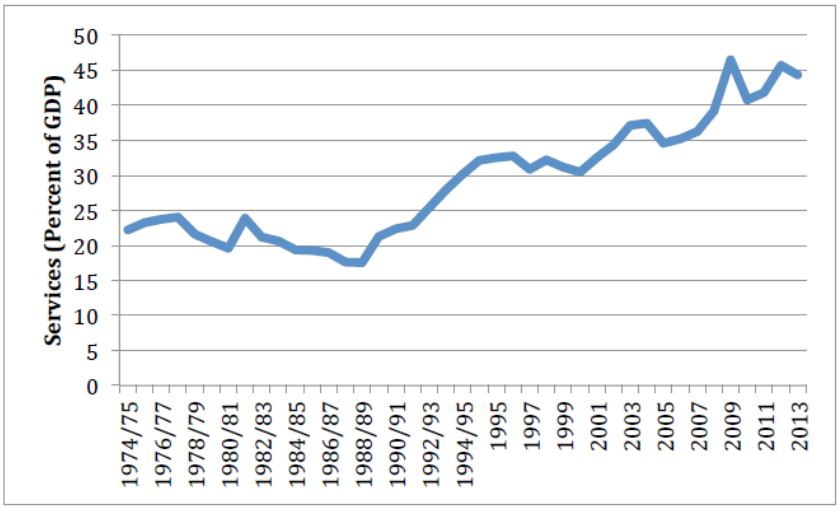
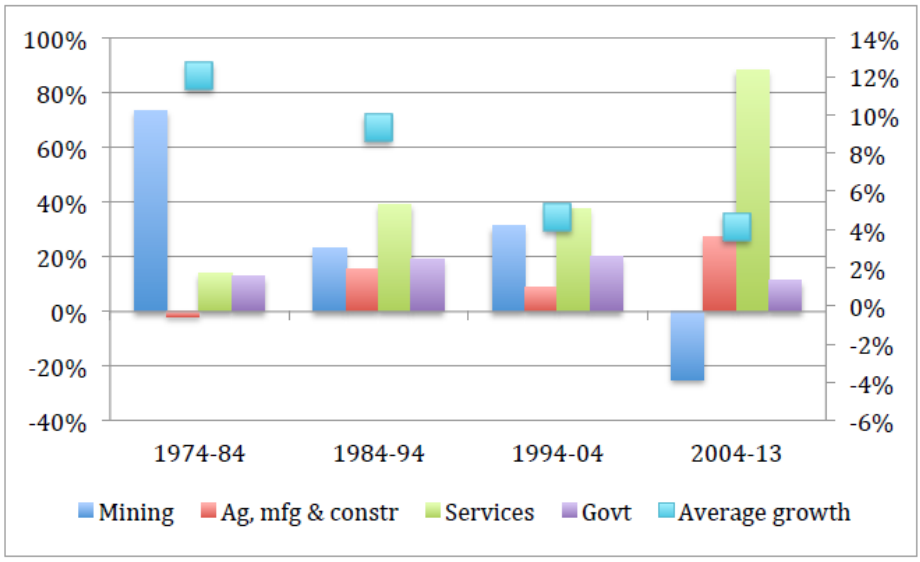


Figure 3. Share of Services in GDP

Source: Statistics Botswana



Source: calculations based on data from Statistics Botswana

Figure 4. Drivers of Growth

World Population Ageing 1950-2050

Botswana

Indicator	Age	1950	1975	2000	2025	2050
Population (thousands)						
Total	Total	389.4	759.0	1 541.3	1 826.4	2 109.3
	0 - 14	179.6	379.9	648.9	594.9	518.9
	15 - 59	185.9	354.0	822.5	1 119.0	1 338.7
	60 - 64	8.4	8.8	26.2	32.4	90.1
	65 - 69	6.7	6.2	17.7	26.6	65.9
	70 - 74	4.6	5.0	12.2	20.3	40.5
	75 - 79	2.7	2.8	8.3	15.6	23.9
	80 - 84			3.9	10.1	16.2
	85 - 89			1.2	5.4	9.9
	90 - 94	1.5	2.3	0.3	1.6	4.0
	95 - 99			0.0	0.3	1.0
	100+			0.0	0.0	0.2
Female	Total	207.4	400.7	786.5	901.5	1 027.5
	0 - 14	94.5	189.4	322.2	294.6	256.2
	15 - 59	97.6	196.2	420.7	537.1	646.9
	60 - 64	5.3	5.4	15.7	17.5	42.8
	65 - 69	4.2	3.3	11.1	15.6	31.4
	70 - 74	2.9	3.0	7.7	12.9	19.2
	75 - 79	1.8	1.8	5.6	11.2	11.8
	80 - 84			2.5	7.3	9.0
	85 - 89			0.8	3.8	6.3
	90 - 94	1.0	1.6	0.2	1.2	2.9
	95 - 99			0.0	0.2	0.8
	100+			0.0	0.0	0.2
Male	Total	182.0	358.3	754.7	924.9	1 081.9
	0 - 14	85.1	190.5	326.7	300.3	262.6
	15 - 59	88.3	157.8	401.8	581.9	691.8
	60 - 64	3.1	3.4	10.4	14.9	47.3
	65 - 69	2.4	2.9	6.6	11.0	34.6
	70 - 74	1.6	2.0	4.6	7.4	21.3
	75 - 79	0.9	1.0	2.7	4.4	12.1
	80 - 84			1.4	2.9	7.2
	85 - 89			0.4	1.6	3.6
	90 - 94	0.5	0.7	0.1	0.4	1.1
	95 - 99			0.0	0.1	0.2
	100+			0.0	0.0	0.0

Figure 5. Botswana's Population Statistics
Extracted from: Population Division, DESA, United Nations

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Mobile phone technology for collection of monthly service statistics in Family Planning Clinics: Experience from NURHI High Volume sites in Oyo and Kaduna States

Article by Ayankola John Oluseun
E-mail: jayankola@nurhi.org

Abstract

Background: *As the NURHI 2 project goes to scale, it became more expensive and inefficient to routinely collect service statistics on family planning (FP) from its high-Volume sites (HVS) through in person visits. Based on this, the NURHI team piloted and implemented the use of mobile technology to transmit data from its HVS to a central server.*

To assess the effectiveness of the approach, the RM&E team carried out an evaluation of the pilot. The results from our qualitative and quantitative analysis showed that the use of mobile phone technology using DHIS2 data collection application for android phones with cloud storage system is a potentially viable means of collecting routine monitoring data from service delivery points in Oyo and Kaduna states.

Objectives/Main research question/Hypothesis and program area: *The objective of this pilot is to explore the feasibility of, identify possible challenges that can affect the delivery of a proposed technology-based solutions aimed at improving the routine data monitoring flow in a timely and accurate manner from NURHI supported HVS.*

Methodology (location, study design, data source, time frame, sample size, analysis approach): *Participants were trained for two days on the newly designed data collection system. After reviewing the existing routine data collection system, participants were familiarized with the system to be piloted. The training included basic but important trouble shooting technics that may be required during the course of using the application. These included how to set up and download the DHIS2 apps on the device, how to collect data and how to upload data into the server. Trouble shooting tips were provided to the participants so that they can solve problems that may arise on their own.*

Two months after the pilot of the phone based routine data collection system, the RM&E team evaluated the pilot system in order to know whether the approach is viable or not and if viable, learn how the approach can be improved upon based on lessons learnt.

Same set of participants that were trained and piloted the model were interviewed after twelve sessions of experience with the use of the device including two months of actual routine data collection. The RM&E team assessed the experiences of the participants during the data collection period as well as the different segments of the data collection process including use of android phone, enabling the data option of the device, entering data into DHIS2 and uploading of same into the cloud storage. We also asked questions on their experience about the use of the model and the challenges they had, it also included capturing their overall though on the model.

Over the phone, Key informant interviews (KII) using KII guide (Appendix A) were conducted with the study participants in the two states

Results/key findings: *The results from our qualitative and quantitative analysis showed that the use of mobile phone technology using DHIS2 data collection application for android phones with cloud storage using the "ona.io" is a potentially viable means of collecting routine monitoring data from service delivery points in Oyo and Kaduna states.*

Conclusion: *The participants in the two states generally agree with most of the positive statements on the operations and use of the technology, although Kaduna participants generally have a lower ranking when compared with participants from Oyo states. While our findings showed promising potentials for this approach for the collection of routine monitoring data from the family planning service delivery points, it is also necessary to carry out minor tweaks in the design of the system especially in the type of phones to procure and use for scale up as well as the type of internet provider*

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to subscribe to. The pilot showed that the internet network cannot be a "one size fit all", but rather should be determined by geography and by what works best in the different locations.

Summary

As the NURHI project goes to scale, it became more expensive and inefficient to routinely collect service statistics on FP from its High-Volume sites (HVS) through in person visits. Based on this, the NURHI team piloted the use of mobile technology to transmit data from its HVS over a period of two months. To assess the effectiveness of the approach, the RM&E team carried out an evaluation of the pilot. The results from our qualitative and quantitative analysis showed that the use of mobile phone technology using Open Data Kit (ODK) data collection application for android phones with cloud storage system is a potentially viable means of collecting routine monitoring data from service delivery points in Oyo and Kaduna states.

Introduction

Availability of routine monitoring data from service delivery points in a timely manner is very important for planning the delivery quality FP services. In the phase one of NURHI, there were less 66 High Volume Sites (HVS) in Kaduna and Oyo states. In this scale up phase, the number of HVS has far more than doubled (147) in these two states, as this number increased, it has become more expensive and inefficient to continue to conduct monthly in-person visits to these health facilities to review and retrieve the NURHI monthly summary sheet where all service statistics are summarized, from the family planning register. The RM&E team therefore is exploring other cost-effective options of getting routine data from its HVS on an on-going basis and in a cost effective and efficient manner. Based on this the team developed a mobile-phone based approach for collecting routine monitoring data and piloted the approach in Kaduna and Oyo states.

Description of the phone – based system

The mobile phone based routine data collection approach makes use of Open data kit (ODK) platform for data collection and transfer. This platform offers ways of collecting health data through mobile phones. Data were transmitted from all pilot sites and aggregated into a web-based cloud storage platform known as **ona.io** and downloaded for onward analysis and use by the NURHI RM&E staff at the NURHI state levels. This model was piloted in Kaduna and Oyo states from May to June 2016.

The objective of this pilot was to assess the feasibility of using a mobile phone–based technology and to identify possible challenges that can affect the delivery of the proposed technology-based solutions aimed at improving the routine data monitoring flow in a timely, accurate and cost-effective manner from NURHI supported HVS. In Oyo state twenty providers were invited from 14 HVS facilities while in Kaduna state, 19 health care providers were invited from fourteen HVS.

Training of participants for the pilot

Participants were trained for two days on the newly designed data collection system. After reviewing the existing routine data collection system, participants were familiarized with the system to be piloted. After this was done, the group had a detailed discussion to explore their perceptions and views about the phone-based approach. After the group expressed a strong view about the usefulness of the system, they were then trained on how to use an android phone to collect data from the NURHI monthly summary form (that they normally complete) using the ODK, and how to transmit this data through a dedicated cloud storage server known as "ona.io". The training included basic but important trouble shooting technics that may be required during the course of using the application. These included how to set up and download the XLS forms in the device, how to collect data and how to upload data into the server. Trouble shooting tips were provided to the participants so that they can solve problems that may arise on their own. Below is the list of key topics covered in the two days training:

- Overview of NURHI routine monitoring and data collection system

- Overview of the use of mobile phone technology for routine monitoring and data collection at NURHI HVS
- Introduction to Basic Functions of Android OS Phones
- Application of the Android phone on the NURHI routine data collection
- Focus group discussions – Perceptions of participants on mobile data collection approach
- Hands on practice on the ODK application
- Trouble shooting problems with the ODK – downloading application (ODK), downloading form, checking connections, uploading data
- Application of the Android phone on the NURHI routine data collection

Evaluation of the pilot phase

Two months after the pilot of the phone based routine data collection system, the RM&E team has evaluated the pilot system in order to know whether the approach is viable or not and if viable, learn how the approach can be improved upon based on lessons learnt.

Specific objectives of this evaluation are:

- Gather feedback information from the experience of FP providers that piloted the use of mobile phone for monthly routine monitoring and collection of FP statistics and to;
- Document the challenges of the providers with the implementation of the tools and the device.

Same set of participants that were trained and that piloted the model were interviewed after twelve sessions of experience with the use of the device including two months of actual routine data collection and transmission to the NURHI ona.io server. The RM&E team assessed the experiences of the participants during the data collection period as well as the different segments of the data collection process including use of android phone, enabling the data option of the device, entering data into ODK and uploading of same into the cloud storage. We also asked questions on their experience about the use of the model and the challenges they had, it also included capturing their overall though on the model.

Over the phone, Key informant interviews (KII) using KII guide (Appendix A) were conducted with the study participants in the two states. In Oyo thirteen participants and 14 in Kaduna who piloted the technology were interviewed. All KII sessions were audio recorded and transcribed verbatim in English language to ensure that no part of the discussion session was left out during the analysis of findings. Also, participants were asked to rank their level of agreement with some statements about the use of the technology. Results for these sections are presented in the results section below.

Main findings

In this section, we present the main findings of this pilot phase. The results from the KII's and the ranking of statements about the pilot system are presented in this section under different sub-sections.

Ability to operate the phone

Almost of the participants across the two states reported that they found the operation of the phone easy and smooth. Demonstrated ability to navigate through the phone is consistent across participants in the two states and across the rural and urban geographies. They attributed their navigation skills to the training received on using the phone – organized by the RM&E team. A few of them with no prior experience with smart phones explained the training opened them up to use of smart phones.

Some of these findings are captured in what some of the participants says as shown below:

It is good. That is what am using and working with now to send the report of June and July to the NURHI M&E officer. ***(URBAN KII Participant, Ibadan)***

As for me, I'm successful to use it because I have practicalize all we were asked to do and I noticed that I got it all, even when they trained us then I got it all, and all the data given to us to input and send I did it all. But for it to send is what is difficult at times. I feel it's the phone or network ***(RURAL KII Participant, Iseyin)***

Except for MTN that use to debit my line. But there is nothing wrong with the phone, the other problem is the battery drains quickly ***(RURAL KII Participant, Okeho)***

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This platform is very good, the training was also very useful. When I lost the ODK form, I was able to retrieve it back on my own ***(Urban-Kaduna KII, Badarawa)***

Apart from the MTN sim network problem, the use of phone for sending data is very easy to operate. This is very convenient for me ***(Urban-Kaduna KII, Zakari Isa)***

Using the phone was very easy for me because of the training instructions we received from NURHI. Other NURHI training videos on the phone was useful. ***(Rural-Kaduna KII, Gangara)***

Ability to use the features of the phone – internet, ODK application, entry section (key pads)

Across all states, participants reported high level of access to the phone features while majority reported the phone run smoothly and they find it very easy to use.

*… No issues, it runs smoothly but sometimes when we want to send messages it could say the phone is out of 3G coverage and once we get to another location it sends (****RURAL KI Participant, Akinyele)***

… *No I didn't have trouble accessing any of the phone features. It's all good. It runs smoothly, it is okay* ***(URBAN KI Participant, Ibadan)***

... I think you have done well. The only thing is that if you can improve us in the area of training, but pertaining to data, there is no problem. ***(URBAN KI Participant, Ibadan)***

I did not have any trouble accessing the features of the phone ***(Urban-Kaduna KII, 44 Military Hospital)***

I did not have any trouble accessing the features of the phone, the only issue is it sometimes takes time for the data to send ***(Rural-Kaduna KII, Kudan)***

Ability to use the sending features completed data

Significant number of the informants at rural and urban settings could use the phone internet without major challenge(s). Providers will like to see an improved internet connection which should be faster because it takes time for the phone to open applications. Opportunity for training directed on the subject will also be welcome.

…*It does well when data connection is on, only if you forget to put it on then it won't work. But once it is on, before typing the message it goes through* ***(URBAN KI Participant, Ibadan)***

*No problem with the internet connection. (****Urban-Kaduna KII, Barnawa)***

I sometimes have challenge with the network because of the MTN sim ***(Rural-Kaduna KII, Giwa)***

Participants rating of the phone-based routine data collection system - design, process and implementation

All pilot participants were asked to rank their experience with the design, process and implementation of the pilot exercise. Overall, thirteen statements were read to all the participants and they were asked to rate how they agree or disagree with the statements. Strongly agree was ranked 5 while strongly disagree was ranked 1. Responses were computed and average score for each of the statements were computed.

In Oyo state, the phone-based technology was well rated across all the statements. For example, participants ranked the statement "I like each step of sending data through the via mobile phone" 4.54 on a 5.0 scale, which is between agreeing and strongly agreeing. Also, the statement "After hands on practice, I feel comfortable sending data via the phone-based technology" was ranked 4.46 on a scale of 5.0.

When participants were asked to rank the statements that relates to interference of the phone-based technology with their day to day work, an average of 1.46 was obtained, which lies between disagreeing or strongly disagreeing – which means that participants did not believe that us application can interfere negatively on their time.

The participants generally agreed that the application will improve the quality of data and that every provider can you the technology if trained.

The pattern of these results is similar for participants in Kaduna, although slightly lower when compared with that of Oyo.

Table 1. Average rating of participants on the design and implementation of the phone-base technology in Kaduna and Oyo states on a scale of 5

	Ibadan Means	**Kaduna Means**
I like each step of sending the monthly data via mobile phone	4.54	4.36
After weeks of hands on, I feel comfortable sending data via the phone	4.46	4.14
The phone technology is easy to use for data transmission	4.62	3.93
The phone technology will disturb the services we provide to FP clients	1.46	1.64
This technology will fit into my regular work day	4.31	3.86
Providers would benefit the most from this technology	4.77	4.29
I find the mobile phone helpful to my work	4.69	4.07
This technology will improve data quality	4.85	3.79
This technology will improve timeliness of reporting	4.69	4.14
Some important/useful fields are missing on the phone application	1.62	2.64
The use of this approach should be adopted for all health facilities	4.77	4.0
I believe every provider can use the device if trained	4.69	3.64
Something needs to be changed before it is put to full use in facilities	3.15	3.21
The phone can be maintained by the hospital	3.46	3.21

Scale up plan

To ensure a hitch free scale up of this technology based on the success of the pilot, the NURHI team needs to do this in a phased manner. In each of NURHI states, the scale-up should be carried out in five LGAs and rolled on to other LGAs until all intervention HVS are covered.

Conclusions and recommendations

The results from our qualitative and quantitative analysis showed that the use of mobile phone technology using Open Data Kit (ODK) data collection application for android phones with cloud storage using the "ona.io" is a potentially viable means of collecting routine monitoring data from service delivery points in Oyo and Kaduna states.

The participants in the two states generally agree with most of the positive statements on the operations and use of the technology, although Kaduna participants generally have a lower ranking when compared with participants from Oyo states. On the statement about whether every provider can use the technology if trained, participants in Oyo ranked the statement 4.69 while those in Kaduna rated it 3.64 on a scale of 5.0. The ranking for Kaduna though relatively high as well will require some attention in the area of training to ensure that participants leave the trainings feeling very capable.

While our findings showed promising potentials for this approach for the collection of routine monitoring data from the family planning service delivery points, it is also necessary to carry out minor tweaks in the design of the system especially in the type of phones to procure and use for scale up as well as the type of internet provider to subscribe to. The pilot showed that the internet network cannot be a "one size fit all", but rather should be determined by geography and by what works best in the different locations.

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The Effect of Social Media on Church Management

Article by Ludwig Neils Hesse
PhD Information Technology
E-mail: lnhesse@hotmail.com

Abstract

This paper surveys the implication of the use of the social media in contemporary times on the church and items. The way of doing mission work in the time past cannot be applied in this ever-changing world. The world becoming a global village calls for shit in the way and methods of communicating and managing people. All organizations need to employ new methods of reaching out to people in a more smart and quick way.

The church as a spiritual entity needs to employ key means of reaching out to its people as well as others who might come into contact with them. Social media is undoubtedly an effective means of reaching out to church members as well as managing them and the world in its entirety. The social media can be used to do many things ranging from winning souls to fundraising. It is against this background that this paper looks the implications of social media on church management.

The effect of social media on church management

There is no doubt that social media has gained wider acceptability and usability and it is also becoming probably the most important communication tools among people across all levels of life. The Church can be simply explained as a particular Christian denomination or group of Christian believers.

The great commission of spreading the gospel in Jesus' time was carried out through word of mouth. This was achieved through the gathering of people who were desperately in need of the salvation and the delivery of sermons by Jesus himself or the disciples. Years after the departure of Jesus management of such churches were done through the writing of letters by the disciples and the apostles. Some of this letter could not get to their intended destination as well as some being delayed. In recent times a lot of methods have been tried and tested in reaching out to new souls and well as effectively managed those save already.

The social media is one of such key tools employed in this modern world. The proliferation of different social media tools has their rippling effect on religion especially the church. Different schools of thought had considered the pros and cons of social media on the Church.

Social media is a term used to describe a variety of web-based platforms, applications and technologies that enable people to socially interact with each other online. Some examples of Social Media Websites (SMW) and applications include Facebook, Twitter, YouTube, Del.icio.us, Google+, Digg, Blogs, 2go, Watsapp and other sites that have content based on user participation and User-Generated Content (UGC).

One key thing that keeps the various yarns of societal fabric together is communication. It is therefore important that all institutions including the church management identifies various means within which the church can be kept closer to its members. This is the reason why the effect of social media and church management would have to be looked at critically.

In other to know the effect of social media on the church, it is necessary to make certain the level of church awareness of social media websites, computer literacy of members, and policy on social media, primary purpose of each member on the social media website, time spent on social media websites and so on. These are performance indices to evaluate the effect of social media on the church. It is not sufficient to conclude whether the effect on the church is positive or negative.

Some key effects of social media include but not limited to the under discussed. Churches use social media as a tool for communicating with existing members. Churches are no longer restricted to a street address or a couple of service times each week. Instead, members or potential members can access sermons, listen to podcasts, connect with other church members, view photos from the most

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recent church event, regardless of where they are or the time of day. This helps to limit the gap between the chapel and the members.

In addition, churches can use the social media to plan and deliver service geared towards the aged and all those who unable to leave the house. This keeps them active and the specially created messages targeted towards them revives the hope that they have not been neglected in the 'evening of their life'.

Currently, most churches have devised ways to keeping in constant contact with members. One of such means adopted by most of the churches in the publishing and distribution of weekly, monthly or yearly bulletins among others. In recent times one can easily asked how effective this method is. Some of the information intended to be communicated may get to the targeted audience. The most effective way of pushing prayer meetings, request, upcoming programmes among other important information intended for a particular audience is the use of the social media. That is the use of social media makes the availability of information more quickly and prompt than any other means. This also helps to cut down cost since printing of the bulletins is expensive as well as time consuming.

Another point underlying and compelling churches to use social media is accomplishing more with fewer resources. Above and beyond communicating event-oriented content, churches can also use social media to get their message out and, in some cases, encourage open dialog. This is accomplished through a variety of methods including tweeting a daily message, Bible verse, broadcasting regularly scheduled podcasts, uploading videos of sermons or other spiritual teachings, sharing blogs written by the minister or other church leaders, updates on conferences, fundraising for projects in addition all important activities.

Churches, like other nonprofits institutions are finding social media a doable tool for raising funds to finance projects. This is achieved through providing easy ways to donate, repurposing presentations and many other more. Churches are able to put across their projects and use social media as a tool to seek financial support to help accomplish such projects. Members and nonmembers alike are able to make their financial contribution in the form of donations, tithes, offerings and other forms. This helps to raise more than enough funds to help sustain the life and activities of the church.

An additional viable arm of social media for churches is the potential of reaching new members. Salvation messages among other things can lead to wining more people into their fold. Churches use the social media to reach out the unsaved and those who need to rededicate their lives. People who access such messages and are touched by them are followed up on with pastoral letters, daily devotional messages, inspirational messages to reassure them of God's continual presence and guidance. All these through the social media such as Facebook, tweeter, YouTube help to win more souls and thereby adding up to the membership.

Blogs can also be a great source of information for a Christian and can give them access to some of the great thinkers of the church in current times. Christians can easily feed themselves on another pastor's blog at any period and on regular basis.

Social media can bring ministry groups, study groups, and those with like interests together for discussion, debate and events. Sometimes a group can't meet face-to-face but could connect via a social networking site.

Notwithstanding the above benefits that churches stand to profit if social media is looked at well as an improvement and growth tool in church management, there some negative effects as well on church management.

One of the major problems of social media is that face to face connections are endangered. They reduce or eliminate face-to-face socialization. Because of the autonomy afforded by the virtual world, individuals are free to create a fantasy persona and can pretend to be someone else. Such pretense is against the rule of the church. It is hard to say no, be rude, or ignore someone when you are looking at them in the eye. It is incredibly easy and quick to 'unfriend' or 'unfollow' someone or simply block their efforts to make a connection. Unfortunately, this feature of online socialization cheats people of the opportunity to learn how to resolve conflicts in the world outside the Internet and it could retard or cripple one's social skills developments.

Use of social networks can expose the church members to harassment or inappropriate

contact from others. Unless the church leaders are diligent to filter the Internet content to which the members are exposed, they could be exposed to pornography or other inappropriate content. High usage of social media increases the risk of their being victims of cybercrimes.

Conclusion

The issue of social media and its effect on the church management and growth cannot be swept under the carpet. The magnitude of social can be used to reach out to the entire world. It is interesting to know that some years ago Facebook had over 900million users, 500million users of Twitter, over 200million blog sites, over 5 million images uploaded daily, among other important social media handles.

All these lead to the very understandable deduction that there has been a seismic shift in the way we interconnect and that we are now very much wired connected community. Social media if well embraced will not only help reach out the masses but also help build the spiritually sound people as we as manage them. This is made possible through people contributing to their understanding of God by asking questions and having satisfactory answers promptly, communicate effectively about events, provision of pastoral care and accountability, provision of leadership modelling on how to do life in Christ well, communicating the salvation plan of |God to all, helping connecting people to churches, giving a sense of belonging to a community of believers among many other key importance of social media and how it can impact on the management of a church.

Churches that employ the various advantages of the use of social media should not be fascinated by the enormous benefit it brings but care must be taken as any negligence on its disadvantages can undermine the mission and vision purpose of such churches.

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GLOBAL OFFICE
Texila Educational & Management Services (P) Ltd
Module 310, Iii Floor, Tidel Park
Aerodrome Post, Coimbatore-641014
E-mail : Iseconference@tau.edu.gy



TEXILA
INTERNATIONAL
e-CONFERENCE

Texila American University,
Lot 2442, Plantation Providence,
East Bank Demerara(Ebd),
Gayana, South America.