



**British Journal of Economics, Management & Trade**  
4(11): 1644-1654, 2014

SCIECEDOMAIN *international*  
[www.sciencedomain.org](http://www.sciencedomain.org)



---

# Embracing Continuous Auditing: A Case for Public Sector in Kenya

Christopher A. Moturi<sup>1\*</sup> and Peter N. Gaitho<sup>1</sup>

<sup>1</sup>*School of Computing and Informatics, University of Nairobi, Nairobi, Kenya.*

## **Authors' contributions**

*This work was carried out in collaboration between both authors. Author CAM designed and managed the study. Author PNG managed the literature search, performed the statistical analysis and wrote the first draft of the manuscript. Both authors read and approved the final manuscript.*

**Original Research Article**

**Received 15<sup>th</sup> March 2014**  
**Accepted 31<sup>st</sup> May 2014**  
**Published 25<sup>th</sup> June 2014**

---

## ABSTRACT

**Aims:** The objective of this study was to assess the current state of continuous auditing in the state departments in Kenya and to adapt a framework to implement continuous auditing by the Public Sector Audit Organization.

**Study Design:** Adoption of existing model and survey using questionnaires.

**Place and Duration of Study:** Kenya, 2013.

**Methodology:** Existing continuous auditing models were studied and the Integrated Continuous Auditing, Monitoring and Assurance Conceptual Model was adopted for use. The model was tested using data collected using questionnaires. Data was collected from 76 auditors in the Public Sector Audit Organization. A database system of a government Ministry was used to demonstrate how data can be obtained directly from a client system.

**Results:** The study found the need for training in the skills required for continuous auditing and the acquisition of IT resources and infrastructure were necessary in realizing continuous auditing.

**Conclusion:** The paper shows that Public Sector Audit Organization in Kenya, like institutions in other countries such as USA [8] and Australia [11], are preparing to advance from traditional audit to continuous auditing. The Integrated Continuous Auditing, Monitoring and Assurance Conceptual Model would offer a good starting point.

---

\*Corresponding author: Email: [moturi@uonbi.ac.ke](mailto:moturi@uonbi.ac.ke);

*Keywords: Auditing; continuous auditing; continuous monitoring; continuous assurance; continuous auditing model.*

## **1. INTRODUCTION**

The Kenya government financial system has undergone changes with the traditional paper-based manual systems being replaced with automated systems. The traditional source documents such as purchase orders, invoices, and cheques, previously used for audit evidence, are now in electronic form. The change in business processes that removes the paper-based sources of information requires the creation of new audit procedures. In addition, business transactions have become complex and thus increased risk exposure such as possibility of fraud and misappropriation of funds. This calls for a more effective audit to mitigate these risks. Automation of the audit process would result in greater efficiency, timeliness, and high quality audits. The deployment of a continuous auditing system would be an effective audit method of modern business processes.

This research sought to explore the necessary requirements for implementation of continuous auditing by the Public Sector Audit Organization to perform audit work electronically with the aim of improving quality, reliability and efficiency of the audit. The Public Sector Audit Organization (KENAO), established by an Act of Parliament, is an independent office mandated to audit all Government Ministries, Local Authorities and State Corporations in Kenya ([www.kenao.go.ke](http://www.kenao.go.ke)) [1]. The objectives of the study included assessing the level of automation of the business systems used in processing transactions, investigating technologies, and automated audit tools for continuous auditing.

Our research questions therefore included: Are the business systems and processes being audited automated?; Are the business systems and processes monitored on a continuous basis to ensure reliability of information generated?; Does KENAO have automated audit tools and technologies required for continuous auditing to be implemented?; What is the perceived impact of continuous auditing in terms of audit quality, efficiency and timeliness by KENAO auditors?

Four existing models of continuous auditing were studied and a comparison done in order to identify the key common elements of continuous auditing for adoption by KENAO.

## **2. LITERATURE REVIEW**

### **2.1 Continuous Auditing**

Continuous auditing has been defined as a methodology that enables independent auditors (internal and external) to provide written assurance on a subject matter using a series of reports issued simultaneously with, or a short period of time after, the occurrence of events [2,3]. Vasarhelyi [4] describes how continuous auditing is emerging and how it attempts to match auditing practices to the modern IT-dominated environment with the aim of providing timely and meaningful assurance to stakeholders. This paper identifies continuous auditing as the way to address delays in performing processes, decision making, and implementation of the decisions. We recognize this as being applicable to Public Sector Audit Organizations not only in Kenya but the African region as a whole. This will provide continuous data assurance, continuous controls monitoring, and continuous risk management and assessment. Chan and Vasarhelyi [5] agree that traditional audit paradigm is outdated in the

present day real-time economy. There is therefore need to explore continuous auditing as a potential successor to the traditional audit by both practitioners and academics. The authors have explained how continuous auditing introduces innovation to practice. They have further proposed a methodology for the future of assurance for practitioners and academic researchers. Mainardi [6] provides step-by-step instructions on how to build, market, implement, and manage a successful continuous auditing program. This will help auditors to prepare their organization for continuous control monitoring and sharing capabilities. Aquino et al. [7] have identified the following six key steps when implementing continuous auditing: Establish priority areas to continuously audit; Identify rules for monitoring the continuous audit; Determine the frequency of processes; Configure parameters for continuous audit; Follow up alarms and errors; and Communicate results to auditees.

## **2.2 Acceptance of Continuous Auditing**

Vasarhelyia et al. [8] conducted a survey to assess the use of continuous control monitoring in the USA and found that several companies were involved in some form of continuous auditing or control monitoring while others are attempting to adopt more advanced audit technologies. They reported observations on issues of managerial, technology training and absorption. Their observations show that companies in USA have not yet reached continuous audit stage. Byrnes et al. [9] provide an insight into what companies in USA are doing with respect to continuous auditing and continuous monitoring. This includes products and services provided, role of professional organizations to facilitate adoption of continuous audit and continuous monitoring, and the required expertise. This is not only of interest to American Institute of Certified Public Accountants (AICPA) but the whole accounting profession including the Public Sector Audit Organization in Africa. In their experiment, [10] found that auditors are ready to rely more on internal audit work in a continuous audit environment than in a traditional environment. This has implications for efficiency and effectiveness of the overall audit. Hardy [11] have investigated the adoption and implementation of continuous assurance in an Australian company and reported diverse nature of continuous assurance, system dependencies and audit independence, and the unexpected usages and politics of information. We believe Public Sector Audit Organization in Kenya can learn from the Australian experience. Hunt and Jackson [12] have put a case for continuous auditing as a means of curbing the increased risk of employee fraud. Alghananeem et al. [13] have analyzed the goals of information security to ensure information security through a case study of the income tax department and sales in Jordan. Shields et al. [14] show that continuous auditing can be an environment for proactive collection of forensic evidence. Chelimo and Kariuki [15] investigated the internal audit function in financial reporting in a municipality in Kenya and recommended on how monitoring and evaluation should be enhanced. In their study [16] provide reasons why there is low compliance with quality assurance standards among most internal audit units in state owned corporations in Kenya. Among the reasons is lack of awareness of standards and lack of professional practice framework. Chou and Chang [17] proposed a conceptual and technical framework for continuous auditing to address the problems of web-released financial information. This will assist practitioner and researchers to implement solutions for online, real-time business reporting.

## **2.3 Review of Continuous Auditing Models**

Four models of continuous auditing were examined as described below:

### **2.3.1 Continuous audit approach [18]**

This is a conceptual model which describes continuous auditing methodology. An optimal continuous auditing uses client/server architecture and web-enabled data for delivery to audit work stations. The approach for collection and storage of data include use of an audit data warehouse and audit data marts. A repository for storing transaction data produced by different business systems (data warehouse) is designed. This data warehouse should be scalable to allow for more data as audit continues. This approach is appropriate for dispersed systems with varied data formats. Audit data marts can also be used to automate the capture of relevant data, and the auditing and reporting processes.

### **2.3.2 Model for secure continuous auditing [19]**

This model is concerned with three basic data examination areas of auditing systems: keystrokes, transactions and transaction patterns. It suggests that in order to guarantee the integrity of accounting information captured in ledgers, it is necessary to monitor all keystrokes and transactions within the system, and then search for patterns in groups of transactions. The keystroke level data examination involves monitoring database utilities and applications for commands which could cause fraud or error. These utilities give users ability to modify and update a master file, bypassing the normal safeguards present in the accounting system itself. Transaction level data examination involves auditing and reporting on each transaction at the time of entry, each being treated as an isolated entity. This is meant to ascertain whether each transaction meets the set business rules. Transaction pattern level examination involves examining the effects of transactions as a whole over a longer time period.

### **2.3.3 Continuous audit model [20]**

The model was developed and implemented within a debt agreement compliance domain. It therefore relates to a particular business domain and aims to create a working model of continuous auditing. The authors were responding to CICA/AICPA [2] that challenged researchers to investigate the concept of continuous auditing and its implementation in various audit domains.

### **2.3.4 Integrated continuous auditing, monitoring, and assurance conceptual model [21]**

This Global Technology Audit Guide provides a guide to auditors on how to implement a strategy that combines continuous auditing and continuous monitoring in order to meet demands compliance in regulatory environments. This is the environment the Public Sector Audit Organization in Kenya operates in. The challenges this guide aims to address include regulatory compliance and control, internal audit value and independence, fraud, availability of skilled resources, and use of technology. This therefore provides a new approach that is sustainable, productive and cost-effective to address these challenges [21]. This can be an opportunity for the internal audit profession and its leaders to provide value to an organization and assist in improving the effectiveness and efficiency of business processes. The coverage for the application of the model includes continuous control assessment, continuous risk assessment, development of an audit plan, support to individual auditing, and follow up on audit recommendations.

### **2.3.5 Models comparison**

A comparison of three models: [18-20] that was done by [22] was adopted. In addition, we considered [21]. In their comparison [22] examined the accuracy in terms of fraud and errors within transactions, reliability of internal control systems, whether the model runs real time, and the reporting method. Coderre [21] provides for real-time review of transactions and the analysis of trends over time, uses CAATs to determine reliability of internal controls, frequency of analysis will depend on the level of risk and the degree to which management is monitoring the controls, and results are prioritized in order to determine the frequency of the continuous auditing. The comparison indicated that the Integrated Continuous Auditing, Monitoring and Assurance Conceptual Model is more inclusive as it encompasses a wider scope of continuous auditing which include technical, professional and governance aspects. Hence the model was proposed for adoption by the Public Sector Audit Organization. The other models are biased towards the technical architecture.

## **3. METHODOLOGY**

### **3.1 Research Design**

Based on the key elements of the Integrated Continuous Auditing, Monitoring and Assurance Conceptual Model [21], a questionnaire was developed. The six elements are: Business Systems and Processes; Continuous Monitoring; Audit Testing; Continuous Assurance; Continuous Auditing; Results. The key questions posed to the respondents included: Extent to which business systems and processes are automated; Amount of data in business systems that was in auditable format; Extent of the availability of data extraction and analysis tools; Skills and knowledge possessed by the auditors; Existence of adequate information technology infrastructure for continuous auditing. The objective was to test if the elements of the adopted model were existent in the Public Sector Audit Organization [1].

### **3.2 Data Source**

The target population was the 400 auditors in KENAO who perform the financial audits of the Kenya's central government, local authorities and state corporations.

### **3.3 Data Collection and Analysis**

The questionnaires were administered through hand delivery to the respondents. A total of 100 questionnaires were distributed, out of which 76 valid responses were received. A five-point Likert-type scale was adopted. Most of the respondents (92.1%) were graduates and post graduates, indicative of highly trained staff in the audit field. 63.2% of the respondents had worked in KENAO for 6 to 15 years while 27.6% have worked for more than 15 years, suggesting adequate experience. Data collected was analyzed using Ms Excel.

## **4. RESULTS AND DISCUSSION**

### **4.1 Data Validity and Reliability**

To establish validity, the questionnaire was given to experienced auditors and managers to assess if the questions were adequately addressing the framework elements. Based on

reviewers' comments, changes were made. A pilot study involving 9 respondents was conducted and a Cronbach's Alpha coefficient of 0.816 was achieved.

## **4.2 Results**

### **4.2.1 Business systems and processes**

The study sought to find the level of automation of the business system. 39.5% of the respondents agreed that the clients' (auditees') systems they audit are computerized; 42.1% disagreed. On how well the existing information systems used by the clients are documented, 35.5 % agreed the systems are well documented while 29.5% disagreed. As to how well the business processes are described, 35.6% attested that the processes are properly described. This outcome is similar with that of the level of documentation of the information systems. The auditors were asked whether they were able to easily understand the computerized accounting systems and processes; 36.8% agreed while 32.9 disagreed.

### **4.2.2 Activities, transactions and events**

We sought to find about the activities, transactions and events carried out by the clients' computerized accounting systems. They include: data format, availability of data extraction tools, real time data analysis readiness, and reliability of the data generated by the automated systems. The results indicate that 64.4% of the respondents agreed that data obtained from the clients with automated systems was auditable while 23.4% disagreed indicating data may not be in a format that is auditable. The majority of the respondents (52.7%) indicated that data extraction tools were not available to the auditors, while 32.9% showed that the tools are available. Regarding the parameter readiness on real time data analysis, 38.1% affirmed the ability to perform real time analysis of the transactions while 43.5% did not agree. On the reliability of the transaction generated by automated systems, 50% of respondents agreed that the transactions generated by system could be relied on in giving an audit opinion. Only 23.7% had a contrary opinion. This is indicative of reliable systems with adequate data integrity which the auditors can rely to give an opinion. Finally 37.8% of the respondents showed they did not have the skills for data analysis while 28.9% were neutral. 34.2% however indicated that they possessed the data analysis skills.

### **4.2.3 Continuous control and risk assessment**

Six parameters were considered i.e. adequacy of system control measures, management role in these controls, use of the controls by auditees, efficiency of the internal controls and processes, risk assessment framework, and categories of risk. The results show that 50% of the respondents indicated controls exist within the clients' systems. Those who did not agree formed only 13.1%. There is therefore a strong indication that the systems in place have adequate controls. Majority of the respondents (56.6%) indicated that management plays a key role to ensure adherence to the controls. The results also present a divided view on the efficiency of internal controls with 30.3% disagreeing that the controls are efficient while 30.2% affirmed that controls are efficient. A further 39.5 % were neutral to this factor of continuous control. Majority of the respondents (54%) indicated that there was no existing risk assessment framework in the client's organization. The results further showed that there are no categorized risk areas within the organization systems (52.7%).

#### **4.2.4 Continuous auditing requirements**

We sought to find out the requirements of continuous auditing. The requirements involved four major components: IT resources to implement continuous auditing, skills and knowledge to use continuous auditing technologies, IT infrastructure for continuous auditing, and management support for continuous auditing. The respondents view on whether the required IT resources and the IT infrastructure for continuous auditing exist indicated that 46% and 57.9% respectively said they do not exist. However 32.8% and 23.7% respectively affirmed that resources and infrastructure are in place. Results concerning continuous auditing skills and knowledge revealed that most respondents (47.4%) seemed to share the view that the auditors do not have the required continuous auditing skills and knowledge. In addition to the above factors, 46.1% of the respondents agreed that there is management support for implementation of continuous auditing.

#### **4.2.5 Framework testing**

The adapted framework was tested with a view of establishing its viability for implementation of continuous auditing in KENAO. The analysis results discussed above and a demonstration of continuous auditing by use of a CAAT known as Audit Command Language software were used in testing the adapted framework. The outcome supported the adapted framework for implementation of continuous auditing. However, the results showed inadequate investment in the required IT resources and infrastructure as well as the lack of required knowledge and skills needed for continuous auditing. The adapted framework was confirmed to be appropriate for implementation of continuous auditing KENAO.

#### **4.5.6 Summary responses on continuous auditing**

The results are summarized in five categories: Business systems and processes; Auditable data format; Data extraction and analysis tools; Data analysis knowledge and skills; and IT technology Infrastructure (Table 1).

**Table 1. Summary of responses on continuous auditing**

<b>To what extent do you agree with the following statements regarding continuous auditing in the organization</b>	<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Agree</b>	<b>Strongly Agree</b>
Automation of Business Systems and Processes	2.6	39.5	18.4	32.9	6.6
Auditable Data Format	6.6	15.8	13.2	52.6	11.8
Availability of Data Extraction and Analysis Tools	21.1	31.6	14.5	26.3	6.6
Auditor Data Analysis Knowledge and Skills	11.8	25	28.9	30.3	3.9
IT Infrastructure for Continuous Auditing	11.8	46.1	18.4	23.7	0

Business systems and processes automation is a key consideration necessary for implementation of continuous auditing. The 64.4% who agreed that the data obtained from these systems was in auditable format suggests that auditors would be able to perform audit

procedures soon after obtaining the data without having to perform data cleaning and conversion. With 52.7% respondents disagreeing on the extent of the availability of data extraction and analysis tools, means access to the tools was very low. On the question on whether the auditors possessed skills and knowledge in use of these tools in which 36.8% disagreed, this indicates that there is need for more training in use of Computer Aided Tools for the auditors. Finally, 57.6% of the respondents disagreed on the existence of adequate Information Technology infrastructure for continuous auditing suggesting the need for Public Sector Audit Organization to invest in IT resources in order to realize continuous auditing.

Control measures and risk management models put in place by the management is an important condition for implementation of continuous auditing. Table 2 summarizes three key components: Adequate System Control Measures; Efficient Internal Controls and Processes; Risk Assessment Model.

**Table 2. Summary of responses on continuous controls and risk assessment**

<b>To what extent do you agree on the existence of the following</b>	<b>Strongly disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Agree</b>	<b>Strongly agree</b>
Adequate System Control Measures	1.3	11.8	36.8	46.1	3.9
Efficient Internal Controls and Processes	5.3	25	39.5	26.3	3.9
Risk Assessment Model	5.3	48.7	23.7	22.4	0

The results indicate that 50% of the respondents indicated that there exist controls within the clients' systems. There is a strong indication that the systems in place have adequate controls. The result for existence of risk assessment models in the client's organization suggests that the role of identifying the risk areas within the organization has not been prioritized.

### **4.3 Discussion**

In their paper, [9] offer insight into what companies in USA are currently doing with respect to continuous auditing and continuous monitoring. They report that organizations are not yet reaping the full benefits of continuous auditing and continuous monitoring. Our study similarly shows that the Public Sector Audit Organization in Kenya [1] is not reaping from continuous auditing and monitoring but the organizations are preparing to advance from traditional audit to continuous auditing. Auditors would be able to perform audits from existing business systems. However, there is need for diversified skill set for effective implementation and management of continuous auditing, and greater investment in adequate IT resources and infrastructure. Adoption of the Integrated Continuous Auditing, Monitoring and Assurance Model would offer a good basis for full potential of continuous auditing and continuous monitoring.

Deloitte [23] recognizes that relatively few enterprises all over the world have realized the full potential of continuous monitoring and continuous auditing. Executives have not seen strong cases for establishing continuous monitoring or continuous auditing neither have do they have a clear picture how continuous monitoring or continuous auditing would be implemented. This model would offer a good starting point.



Adoption of continuous approach would provide the solution to compliance with quality assurance standards to address the issues identified in [16]. The model will provide a professional practice framework that will assist the internal auditors in continuously improving the quality of their work as required by Institute of Internal Auditors.

## **5. CONCLUSION**

The study found out that time is ripe for continuous auditing to be implemented in the Public Sector Audit Organization in Kenya since most of the requirements for it are already in existence. With the advancement being made in technology and the changes in the Kenya government financial management system, the use of continuous auditing is an important paradigm shift which will enable the auditors to remain relevant and cope with these changes. With the increasing automation of business processes, the use of continuous auditing can increase efficiency in the Public Sector Audit Organization. All the respondents affirmed that continuous auditing would yield benefits with majority strongly agreeing to the following as its probable outcomes: Improved quality and reliability of audit evidence; increased efficiency in audit process; Fraud prevention and detection; usefulness in decision making; improved quality of audit reports; and timely reports.

The findings indicated that there was a low level of training in the skills necessary for continuous auditing among the respondents. It is therefore recommended that training needs in future should incorporate these skills and knowledge. In addition, the study revealed that there was no adequate investment in IT resources and infrastructure. It is therefore important to consider improvement in these resources in future in order to realize continuous auditing.

The contribution of this paper includes identification of how continuous auditing can innovate the practice of traditional audit in public sector audit organizations in the region by using the case of Kenya. We shows that Public Sector Audit Organization in Kenya, like companies in the USA [8], are prepared to advance from traditional audit to continuous auditing.

Further research work needs to explore the use of intelligent agents in conducting audit. The use of these agents to detect unusual activities or unexplained activity patterns and alert the auditor would play a great role in changing the way audit is done. There is need for the development and implementation of tailor made continuous auditing software tools that would encompass all the required functions of continuous auditing.

## **ACKNOWLEDGMENTS**

We acknowledge the Kenya National Audit Office (KENAO) for allowing us to conduct the survey.

## **COMPETING INTERESTS**

Authors have declared that no competing interests exist.

## **REFERENCES**

1. KENAO. Kenya National Audit Organization. Accessed 29 March; 2014. Available: [www.kenao.go.ke](http://www.kenao.go.ke).

2. CICA/AICPA. Continuous Auditing: Research Report. Canadian Institute of Chartered Accountants and American Institute of Certified Public Accountants; 1999.
3. ISACA. Continuous Auditing: Is it fantasy or reality. *Information Systems Control Journal*. 2002;5.
4. Vasarhelyi MA. The coming age of continuous assurance. *Insights, Melbourne Business and Economics*. 2011;23-29.
5. Chan DY, Vasarhelyi MA. Innovation and practice of continuous auditing. *International Journal of Accounting Information Systems*. 2011;12(2):152–160.
6. Mainardi RL. *Harnessing the Power of continuous auditing: Developing and implementing a practical methodology*. John Wiley & Sons; 2011.
7. Aquino CE, Sigolo N, Vasarhelyi MA. Six steps to an effective continuous audit process. *Internal Auditor*; 2008.
8. Vasarhelyi MA, Allesia M, Kuenkaikaewa S, Little J. The acceptance and adoption of continuous auditing by internal auditors: A micro analysis. *International Journal of Accounting Information Systems*. 2012;13(3):267–281.
9. Byrnes PE, Ames B, Vasarhelyi MA, Warren JD. The current state of continuous auditing and continuous monitoring. *AICPA White Paper*; 2012.
10. Malaescu I, Sutton SG. *The Reliance of External Auditors on Internal Audit's Use of Continuous Audit*. Dixon School of Accounting, University of Central Florida; 2013.
11. Hardy CA. Exploring continuous assurance in practice: Preliminary insights. *Proceedings of the Pacific Asia Conference on Information Systems (PACIS)*. 2011;74.
12. Hunt R, Jackson M. An introduction to continuous controls monitoring. *Computer Fraud & Security*. 2010;6:16–19.
13. Alghananeem KM, Altaee MA, Jida BK. The impact of the goals of information security standards to ensure information security. *Journal of Management Research*. 2004;6(2):74-101.
14. Shields C, Frieder O, Maloof M. A system for the proactive, continuous, and efficient collection of digital forensic evidence. *Digital Investigation*. 2011;8:S3-S13.
15. Chelimo AK, Kariuki BM. An evaluation of internal audit function in financial reporting in local authorities in Kenya: A case of municipal council of Eldoret. *Journal of Emerging Trends in Economics and Management Sciences*. 2013;4(1):114-119.
16. Okibo WB, Kamau CG. A study to explore internal auditors' compliance with quality assurance standards: A case of state owned corporations in Kenya. *International Journal of Research Studies in Management*. 2012;1(1):109-126.
17. Chou C, Chang CJ. Continuous auditing for web-released financial information. *Review of Accounting and Finance*. 2010;9(1):4–32.
18. Rezaee Z, Sharbatoghlie A, Elam R, McMickle P. Continuous Auditing: Building automated auditing capacity. *Auditing: A Journal of Practice and Theory*. 2002;21(1):147.
19. Onions RL. *Toward a paradigm for continuous auditing*. The University of Salford, Salford, UK; 2003.
20. Woodroof J, Searcy D. Continuous Audit: Model development and implementation within a debt covenant compliance domain. *International Journal of Accounting Information Systems*. 2001;2(3):169-19.

21. Coderre D. Continuous Auditing: Implications for assurance, monitoring, and risk assessment. Global Technology Audit Guide; 2005.
22. Flowerday S, Blundell A and Solms R. Continuous auditing technologies and models: a discussion. Computers and Security Journal. 2006;25(5).
23. Deloitte. Continuous monitoring and continuous auditing from idea to implementation; 2010.

---

© 2014 Moturi and Gaitho; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/3.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

*Peer-review history:*

*The peer review history for this paper can be accessed here:*  
<http://www.sciencedomain.org/review-history.php?iid=568&id=20&aid=5056>