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## A Conceptual Framework for Designing Data Governance for Cloud Computing

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### Abstract

Data complexity and volume continue to explode; businesses have grown more sophisticated in their use of data which drives new demands that require different ways to combine, manipulate, store, and present information. Forward thinking companies have recognised that data management solutions on their own are becoming very expensive and not able to cope with business reality, and that they need to solve the data problem in a different way through the implementation of effective data governance. Attempts in governing data failed before, as they were driven by IT, and affected by rigid processes and fragmented activities carried out on system-by-system basis. Up to very recently governance is mostly informal, in siloes around specific enterprise repositories, lacking in structure and the in wider support by the organisation. With the emergence of cloud computing and the increased adoption, data governance is receiving an increasing interest amongst specialist, but still under researched. This paper presents initial research towards developing an effective data governance programmes for the cloud paradigm. The paper discusses why it is essential to do so from both the cloud consumer and provider perspectives and proposes a conceptual framework and a five-step procedure for designing data governance for cloud computing.

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## 1. Introduction

A recent development in technology is the emergence of Cloud Computing. The National Institute of Standards and Technology (NIST) defined Cloud Computing as “*a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction*”<sup>1</sup>. Cloud Computing model enhances availability and is composed of five essential characteristics, four deployment models and three service models<sup>2</sup>. The essential characteristics of Cloud Computing include on-demand self-service, broad network access, resource pooling, rapid elasticity and measured service<sup>3</sup>. The Cloud deployment models are private, public, hybrid, and community model<sup>7,8</sup>. In addition, Cloud Computing includes three service delivery models which are: Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS)<sup>7</sup>. Cloud Computing offers potential benefits to public and private organisations<sup>4,5</sup> by making information technology (IT) services available as a commodity<sup>9</sup>. The general claimed benefits of Cloud Computing include<sup>6</sup>: cost efficiency, almost unlimited storage, backup and recovery, automatic software integration, easy access to information, quick deployment, easier scale of services and delivery of new services<sup>10</sup>. In addition, cloud computing enhances operational capabilities through increased storage and automation<sup>5</sup>. Furthermore, other benefits include: optimised server utilization, dynamic scalability and minimised life cycle development of new applications<sup>7</sup>. Though, Cloud Computing is still not quite widely adopted because of many factors, but mostly concerned with moving business data to be handled by third party<sup>8</sup>, including loss of control on data, security and privacy of data, data quality and assurance, and data stewardship etc. Data lock-In is a potential risk whereupon cloud customers who can face difficulties in extracting their data from the Cloud<sup>9</sup>. Cloud consumers can also suffer from operational and regulatory challenges, as organisations transfer their data to third parties for storage and processing<sup>5</sup>. It may be difficult for the consumers to check the data handling practices of the cloud provider.

Cloud computing models are expected to be a highly disruptive technology and the adoption of its services will require an even more rigorous data governance strategies and programmes which can be more complex but necessary. There is very little research reported in literature on data governance for cloud computing and what is reported is still very superficial. This paper presents an important contribution in this, so far neglected field. The next section reemphasises on the importance of implementing effective data governance for cloud computing. Section 3 proposes a conceptual framework for data governance design for cloud computing and Section 4 provides a step-by-step procedure in realising this design. Section 5 presents the conclusion and future work.

## 2. Importance of implementing Effective Data Governance for Cloud Computing

The most significant issues that are facing cloud consumers when adoption cloud computing is loss of control on their data since their data is stored on a computer belonging to the cloud provider<sup>10,3</sup>. Arguably, this loss of governance and control could have a potentially severe impact on the organisation’s strategy, and therefore on the capacity to meet its mission and goals. The loss of control and governance can also lead to the impossibility of complying with the security requirements, a lack of confidentiality, integrity and availability of data, and a deterioration of performance and quality of service, not to mention the introduction of compliance challenges. Therefore, organisations need to be aware of the best practices for safeguarding, governing, and operating data in the cloud environment.

<sup>6</sup> NIST offers many recommendations to the cloud consumers, one being that organisations have to consider data governance strategy before they adopt cloud computing. This recommendation cements the argument that data governance is important for organizations who intend to move their data and services to cloud computing environment because it will set policies and rules, and distribution of responsibilities between cloud actors. Developed policies and data governance processes will help organisations to monitor compliance with approved standards, and technical and business guidance in cloud environments. Effective data governance may solve some of the challenges of cloud computing especially those issues related to data-ultimately offering many benefits to cloud consumers.

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