EXPLORING CLOUD COMPUTING PREVALENCE FOR COMPETITIVE ADVANTAGE IN ONLINE PUBLICATION PLATFORMS

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ABSTRACT

The use of Online Publication Platforms (OPPs) by individuals and organizations has overtaken reliance on print media. The paper investigated the prevalent cloud computing themes towards competitive advantage. A cross-sectional study using a content analysis approach was followed with data collected from selected OPPs between the years 2015 and 2020. Seven hundred and ninety-three OPPs articles were purposefully selected, then thematically analysed. OPPs used for establishing prevalence and current issues pertaining to disruptive technologies. Six prevalent cloud computing themes are proposed that can be used as guidelines were uncovered and conceptualized for practitioners and the research community.

KEYWORDS

Cloud Computing, Competitive Advantage, Online Publication Platforms (OPPs)

1. INTRODUCTION

(Sharma & Husain, 2017) indicates that the concept of cloud computing is becoming popular, this supporting that it has become a technology that cannot be ignored for individuals and enterprises. Cloud technologies are highlighted as a technology to aid in the digital disruption (Prevost et al., 2018). Studying and exploring cloud computing prevalence is important for organisations to maintain or gain competitive advantage in the markets. Cloud computing as an emerging technology that attracts attention towards business benefit (Truong, 2010). While studying Universities in Jordanian, (Moh et al., 2015) asserted that cloud computing adoption is essential as part of a strategy and to achieve competitive goals. In support of costs, a South African study (Mvelase et al., 2016) asserts that the pricing model for public cloud services offered by providers is not affordable and economical for Small, Medium and Micro Enterprises (SMME). The use of Websites by organisations is also noted as a source for competitive intelligence (Pellissier & Kruger, 2010). Subsequent sections feature: problem outline; literature; methods; results; conclusion and recommendations.

2. THE PROBLEM OUTLINE AND RESEARCH QUESTIONS

Print media publications have provided data, content, information and knowledge to multiple users, readers, and contributors over the years. The use of OPPs by individuals and organisations has overtaken their reliance on print media. In a study on organisational strategic alliances, (Pellissier & Kruger, 2010) list Websites as one of the most important sources for the collection of competitive intelligence. Other sources are competitor's products, annual reports, and research reports. The stories and notes contained in the OPPs can also impact markets trends. Various stakeholders such as service providers, managers, administrators, developers, and users rely on this content on a regular basis. (Suo, 2013) identified recurrent themes in a study on cloud implementations in organisations. The objective of the article was to investigate cloud computing prevalent themes as presented on the SA OPPs towards competitive advantage for individuals and enterprises between 2015-2020. The gap and novelty for this article is in looking at sourcing data from OPPs using content analysis.

3. CLOUD COMPUTING AND OPPs

The literature presented a foundations for the cloud computing, SA, collection from OPPs and theory.

3.1 Computing, Cloud Computing Defined and Previous Studies

While analysing the difference in computing concepts, (Sharma & Husain, 2017) lists: Cluster, Grid, Utility and Cloud. They further state that cloud computing will become the main technology in our information life. The National Institute of Standards and Technology (NIST) definition of cloud computing (Mell & Grance, 2011) identified three focus areas in defining cloud computing: ***Essential Characteristics, Service Models and Deployment Models***. In a study on cloud implementation in organizations, (Suo, 2013) identified '*full migration program of infrastructure and applications*' as one of the themes and '*Data migration*' as a challenge confirming for cloud computing. Various cloud computing studies conducted within SA context for the period investigated by the study of 2015 to 2020.

Goldstuck (2017) reported SA's Internet penetration growth reaching 40% in 2017. This is important since cloud computing is dependent on Internet infrastructure. Statista (2021) further supported this in a recent report indicating Internet user penetration in South Africa having reached 57.8% in 2021 and a projection of 62.3% in 2025. An early study by (Mohlameane & Ruxwana, 2014) indicate a lack of cloud computing awareness leading to limited knowledge on the benefits and services. It is important to understand and address this challenge for SA organisations to realise the opportunities presented by cloud computing. While that study used interviews, expert reviews, literature, and questionnaires this current study unobstructively collected its data from media publications. The levels of cloud computing adoption are noted from a different data sources.

While focusing on healthcare providers, (Sadoughi et al., 2020) highlighted security towards the cloud as an important concern. A cloud computing study by (Mosweu et al., 2019) focused on '*records management in Africa*', this supports the feasibility for OPPs in SA. The study indicated that there are good tools that can bring business efficiency and improvement. Identifying cloud computing as an '*achilles heel of the digital era*' also presented an opportunity for this study to investigate further while focusing on the SA context.

3.2 Cloud Computing Evolution

An early investigation comparing and contrasting Cloud and Grid computing, (Foster et al., 2008) indicate the intricate connection between cloud computing and the Grid computing paradigm which is linked to utility and cluster computing technologies. (Voas & Zhang, 2009) further outline 6 computing paradigms as mainframe computing, PC computing, network computing, Internet computing, grid computing, and cloud computing.

In discussing modern computing paradigms, (De Donno et al., 2019) identified Cloud, Internet-of-Things (IoT), Edge, and Fog. The rapid deployment of smart devices and IoT systems and the need for real time services has led to the emergence of Fog Computing (Choudhari et al., 2018). (Yi et al., 2015), terms Fog Computing the same as Edge Computing towards providing elastic resources and services to end users at the edge of network. (Syed et al., 2016) asserts that Fog Computing brings virtualized cloud services to the edge of the network to control the IoT devices. Malik et al (2018) outlines various technologies functioning behind the platform of cloud computing technologies: virtualization, Service-Oriented Architecture (SOA), grid computing and utility computing.

3.3 The South Africa Cloud Computing Context

This context was selected because SA is one of the front runners in the technology industry on the African continent. The Industrial Development Corporation (Industrial Development Corporation, 2020) demonstrated interest in cloud computing by conducting research under the following title: "*An overview of the global cloud computing industry and the SA perspective for the formulation for IDC Strategies as a funder and a user' [2013/4]"*. This project is a motivation for further work on the mission of bringing benefits for SA and Africa on industrial development and innovation.

(Foster et al., 2008) list cloud industries: Amazon, Google, Yahoo, Microsoft, and IBM. The top cloud providers in SA on a 2019 publication were (MyBroadBand, 2019) were: Google Cloud (39.19%); Microsoft

Azure (32.16%); AWS (12.97%); VMWare Cloud (5.41%); IBM Cloud (3.51%); Oracle Cloud (2.70%) and Others (12.43%). In 2020 (ZDNet, 2020) lists the top three service providers in the world as AWS, Azure and GCP. The sources presented have common service providers indicating shared results across the two years 2019 and 2020. None of these cloud service providers are based in SA or the African continent that propelled this study to investigate and understand what is happening in this part of the world. (Mvelase et al., 2014) proposed a Virtual Enterprise Model for cloud computing to assist SMME in acquiring or subscribing to Public Cloud infrastructure. (Mohlameane & Ruxwana, 2014) found the use of Websites as part of the Internet as a business enabler for entering new local and international markets.

3.4 OPPs as a Source of Information

The use of Websites as a source was motivated by reflecting on (Crossland & Chigona, 2010) when investigating the functionality and delivery of Websites of political parties in SA. Earlier studies investigating media and democracy cited the weakness of African Websites highlighting poor search and archive capabilities and the journalists not being independent (Kreutzer & Berger, 2002). The Websites selected for this study addressed all these by introducing new functionality. Organisation's content is generated by users based on their projects which is converted into interactive Website for dissemination and public use (Jessee et al., 2011).

3.5 Theoretical Perspectives in Support of the Study

Diffusion of Innovation (DOI) theory as defined by (Rogers, 1983) focusing on the five categories of individual innovativeness was used as a guide. (Sadoughi et al., 2020) notes the use of DOI and adopted constructs for cloud technology. The prevalence of cloud computing in OPPs is an indicator of technology adoption.

4. MATERIALS AND METHODS

This study followed a content analysis approach motivated by its use in an investigation on the implications of cloud computing services in archives and records management (Mosweu et al., 2019). Studies have cited the interest in qualitative research increase during the latter half of the 20th century investigating issues while iterative and flexible (Physiopedia contributors, 2020). OPPs articles were published between 2015 and 2020.

NIST (Mell & Grance, 2011) defines cloud computing as a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources. The preliminary focus areas from the definition are as follows (number of items in bracket): *cloud computing characteristics (5), cloud computing service models (3) and cloud computing deployment models (4)*. The first phase being deductive, twelve codes were loaded from the preliminary focus areas into Atlas.Ti; Qualitative Data Analysis Software (QDAS). Secondly, the inductive phase featured reading the articles, using coding to identify emerging codes. (Physiopedia contributors, 2020) indicated that thematic analysis reviews all of the data to identify common ideas which reoccur. (Krippendorff, 2004) introduced the five step research design of content analysis. (Herring, 2004) further describes these steps as the traditional approach while discussing Content Analysis for New Media. The adapted content analysis stages were in four stages. a) Research Question development; b) Define complete texts to for the articles from the OPPs as data sources; a sample was purposively selected; c) Identification and loading of preliminary codes from literature; d) Coding and analysis using a QDAS.

5. CONTENT ANALYSIS: PURPOSIVE SAMPLING FROM TEXTS

In addressing stage two of the content analysis process, the data collection were conducted by searching for studies that investigated ICT OPPs in SA. Websites were visited, the search function was located and used to extract the data using keywords "*cloud computing*".

Firstly, (King, 2020) produced the "*Top South African news publications revealed*" as indicated with the Website name and their unique browser records in brackets: MyBroadband (2,588,359), Techcentral (217,090), ITWeb (202,301), Engineering News (97,698) and Memeburn (73,180). Secondly, the above list was also

supported by (Du, 2020) when they published "*10 best South African technology websites*", listing: *My BroadBand, TechCentral, Bandwidth Blog, Memeburn, Mail & Guardian, News24 Technology, Gearburn, ITWeb, Stuff, and ITNewsAfrica*. Further, (CommunikaySA, 2020) published a list of "*Technology publications in South Africa*", these are: ITWeb, TechCentral, MyBroadband, Brainstorm Magazine, Futurewave BusinessIT, IT-Online, BusinessTech.co.za, Gadget, Channelwise, Bandwidth Blog, EngineerIT, The Margin, Stuff and htxt.africa. All three publications MyBroadband (King, 2020), WebAfrica (Du, 2020) and CommunikaySA CommunikaySA (CommunikaySA, 2020) featured these Websites amongst the top in SA. The top three selected for data collection Websites were*: ITWeb, MyBroadband* and *Techcentral*. The '*Brainstorm Magazine*' is a business technology magazine, this was also included since it presented an overlap between printed and digital publications. The printed version is sold at retail stores and featured at ICT events and conferences. This article only considered the online version of the magazine. (Zhang, 2005) concluded that random sampling is widely applied with a Websites as a data source after studying thirty-nine cases. The adapted steps used with purposive sampling incorporated:

Population: All ICT OPPs Websites in SA; **Sample Frame**: All ICT OPPs Websites represented in the four OPPs; **Sampling Method:** "*cloud computing*" was used for searching then a document was generated with all results. Next, three articles were purposively selected per OPPs; **Sample Size**: twelve articles; plus, four documents for the period. Sixteen sources (documents); **Unit of analysis**: Websites of the selected OPPs.

6. RESULTS, OUTPUT AND ANALYSIS

This section starts by outlining OPPs where the data collected followed by theme development for analysis.

6.1 Participants' Websites and OPPs Context

OPPs were inspected to provide a context for this study. (Qi et al., 2010) proposed a Website evaluation framework featuring three main dimensions: Usefulness, Service Quality and Website Physical Accessibility. The 'Usefulness' dimension was applied which addresses the *Functionality* and *Usability*. The OPPs consulted for data collection was inspected and met all seven requirements, indicated as **functionality**: Context of Website, Flexibility and Accessibility. **Usability**: Navigability, Layout and design, Ease of use and Playfulness.

6.2 Data Extracted from OPPs (Documents and Articles) Overview

The overview of data extracted from OPPs (Articles) as indicated in Table 1 below:

Table 1. Data extracted from OPPs

OPPs	***Articles sampled***	***Number of pages extracted***	***Number of articles***
Brainstorm	86	22	221
Techcentral	84	28	120
ITWeb	108	82	164
MyBroadband	35	47	288
Totals	**313**	**179**	**793**

The *number of pages extracted* differ since some of the returned results were primarily text based while others included images which take up space hence the higher numbers. Word clouds were used as a familiarization tactic to visualize frequent words. Highlighted at the centre were phrases: "*cloud*" and "*computing*".

6.3 Presenting Prevalent Cloud Computing Themes

Twelve codes were identified from literature and twenty-eight codes from data, consolidated into six themes:

a) **People – human capital:** Leadership, people and skills, cloud user and growth and maturity. Various people are part of the cloud computing community. This is from leaders in organizations to the end users. They

all require various skills to develop in order to benefit from this technology. Growth and maturity for all is essential for the future of cloud computing.

b) **Economic and finance:** Finance represented by the need for funding is central to the discussion cloud. The human resources, hardware and software infrastructure must be funded for the cloud projects to be successful. These funds are sourced from various locations and structures.

c) **Technical and technologies:** Deployment, power - electricity challenges, big data, Edge Computing, cloud challenges-concerns, digitally transform. Big data and edge computing are underlying technologies. 'Fog Computing' was not identified in the data. This may indicate that there may be delays in evolution on themes within the SA context. There is an on-going transformation leading to environmental concerns noted through the data centres needing to adapt to new requirements of energy saving and electricity savings.

d) **Cloud Service Provider - products and services:** These needs to be understood for wide usage.

e) **Geographical location:** Cloud computing bypasses geographical boundaries. This promotes opportunities and changes that need to be understood and addressed. Business and operating models must be updated with services located in other parts of the world. Accessibility and regulations may be a challenge with the physical location of data and services not known to the end consumer.

f) **Information access and platforms:** These are presented by publications, news and media. OPPs have become an important source of information for cloud computing in a rapidly changing operating environment.

The themes demonstrate opportunities and challenges for competitive advantage as supported by (Truong, 2010). Each theme can be a contribution towards the prevalence and understanding of cloud computing.

7. CONCLUSION AND RECOMMENDATIONS

Studying cloud computing using OPPs can present a competitive advantage for individuals and enterprises with the range of discourse that can be generated and analysed in short period. Organisations can benefit from assessing themselves on the adopter category that they belong to as indicated by (Rogers, 1983). The '*Late Majority*' and '*Laggards*' needs to work harder not to miss the benefits of cloud computing. OPPs can be used for establishing prevalence and current issues pertaining to disruptive technologies such as cloud computing, artificial intelligence and data mining. Second, the cloud computing focus areas must be considered as a lens when studying an organisation's adoption and use of cloud computing. While '*Fog Computing*' did not return data entries alongside the theme on '*Edge Computing*', these needs further investigation.

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