Review Paper: Perceived Drivers and Outcomes of the Adoption of G-cloud in the Saudi Arabian Public Sector

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ABSTRACT
This review article will focus on demonstrating perceived drivers and outcomes that could be used to construct a unique framework for the adoption of G-cloud in the Saudi Arabian public sector. Despite the growing importance of cloud computing, not much academic research has been undertaken on cloud computing and its adoption especially in the context of a nation’s public sector.

Keywords: E-government, Cloud-computing, Adoption, G-cloud, cloud-based e-government.

1. INTRODUCTION
Organisations need to keep pace with technological developments in order to function better in an increasingly changing technological landscape. E-government is a rapidly growing strategy paying increasing emphasis on integrating technology into government operations in order to keep pace with the information technology revolution [3]. E-Government is at the core of innovation and modernisation in government because most governmental services are now available to citizens through the Internet [10]. Governments are reshaping and restructuring their services to be accessed, delivered and transferred through the web. It is expected that all governments will make the transition to e-government as it is considered to be an important element of modernisation. E-governance does not only change governments, it also changes citizens in terms of using innovative technologies to do things differently [25].

There have been many discussions about cloud-based systems and services being the next technological revolution [18]. Many countries including the UK, USA and Australia are seriously considering cloud computing technology as the means of enhancing the effectiveness of government services by conjoining cloud computing systems into e-government mechanisms for citizens and businesses [54].

2. INNOVATION ADOPTION
Innovation is about introducing something new that causes positive change, whether it is an idea or a product. In business terms innovation means creating new ideas that make the workplace more productive and efficient. It also means improving existing services. Innovation could be initiated by changing business models or by adopting new technologies to enhance the environment of business and to improve services [9]. The perceived drivers and outcomes that could affect the adoption of G-cloud in the Saudi Arabian public sector are going to be discussed in details in this review article. Table 1, demonstrates each perceived driver and outcome proposed to be included while constructing a G-cloud adoption framework. This table represents each driver and shows the source and description of each driver and outcome.
Table 1: Perceived driver and outcomes proposed to be included while constructing a G-cloud adoption framework.

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Author</th>
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<tr>
<td>Technological knowledge</td>
<td>[53]</td>
<td>The level of understanding technologies.</td>
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<td>Cloud Security</td>
<td>[47] [53]</td>
<td>[32] [35] [19] Security in the cloud is considered to be one of the main concerns.</td>
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<td>Required IT infrastructure availability</td>
<td>[39]</td>
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<td>Service-level agreement</td>
<td>[47]</td>
<td>SLA is the contract between organisations and cloud computing providers.</td>
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<td>Business scalability</td>
<td>[36] [53]</td>
<td>[35] Business scalability is when you accomplish the work satisfactorily even if the workload increases [52].</td>
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<td>Integration with current enterprise systems</td>
<td>[6]</td>
<td>Integration is important to move data from the current system to the new cloud system without interrupting services.</td>
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<td>Employees’ learning capability</td>
<td>[53]</td>
<td>Employees who require many skills and have the ability of learning new ones.</td>
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<td>Government providers declare to obey all government policies and regulations.</td>
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<td>Delivery of on-demand services</td>
<td>[6]</td>
<td>What you pay is what you get. Customers will pay only for what they want.</td>
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<td>Reduced maintenance</td>
<td>[6]</td>
<td>Organisations can reduce the need for maintenance.</td>
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<td>Enhanced collaboration with other organisations</td>
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<td>Collaboration could be improved because organisations can share information.</td>
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<td>Cost reduction</td>
<td>[47] [32]</td>
<td>[35] [19] [6] One of the main benefits of adopting cloud computing.</td>
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<tr>
<td>Improved performance</td>
<td>[43] [31]</td>
<td>[51] The performance of organisations and employees may be improved when adopting G-cloud.</td>
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</tbody>
</table>

Technological Knowledge

Technological knowledge refers to the level of understanding about various technologies that are relevant to a particular field. Knowledge may vary from simple to sophisticated or complex technology such as the Internet [48]. The technological factor has been noted in a previous study by [53].

Cloud Security

Security is a critical issue in the adoption of cloud computing [30]. The International Data Corporation’s (IDC) survey on cloud computing revealed that 75% of IT executives and chief information officers were concerned about security in the cloud [30]. Another joint survey conducted by IEEE and Cloud Security Alliance (CSA) finds that security concerns are obstructing the adoption of cloud computing [34].

Required IT Infrastructure Availability

One of the most important factors that organisations should prioritise is the adequacy of their ICT infrastructure. Weak ICT infrastructure is one of the main obstacles to adopting new technologies such as e-government and cloud computing. Without ICT infrastructure, organisations will not be able to share or transmit their data with cloud computing providers [5].

Service-Level Agreement

Service-Level Agreement (SLA) is the contract between consumers and service providers. Computing resources such as data storage or application services delivered from the providers are all owned and controlled by service providers. Hence, SLA should be organised between parties to ensure the quality, availability, reliability, and performance of services [28]. SLA usually lists the quality of agreed and required services, availability level of these services, performance of delivery of services and response times, types of security measures, disaster recovery plans, data portability and
Business Scalability

Scalability is an advantage of cloud computing. [52] defined scalability as “the ability to continue to function with acceptable performance when the workload has been significantly increased”. However, [1] stated that there is no definition for scalability as a universal term because different vendors provide cloud computing services with various measures of scalability. It is argued that scalability is one of the most important features that cloud computing service providers offer to their customers. Scalability denotes how cloud computing service providers offer a solution to a certain problem regardless of the intensity of the problem [1].

Integration with Current Enterprise Systems

Organisations are increasingly practicing cloud computing and being made aware of its benefits. Most companies are rapidly switching their systems to run on a cloud-based architecture [8]. However, one important question is: “how to move the data in legacy systems to the cloud environment without interrupting business operations?” This was one of the questions that was answered in [38] White Paper report. Oracle’s report on how data would be synchronised between on-premises and cloud databases, has offered many types of data integration. Each offer has its own qualification such as high-performance bulk data movement, real-time data integration and data profiling, cleansing, matching and monitoring capabilities. This shows the importance of integration. On the other hand, data integration for cloud applications is considered to be a barrier to the adoption of cloud computing because the integration of data from organisations to cloud applications is a hard process to achieve. This is because thousands of gigabytes are required to go through firewalls in order to be delivered to the cloud computing data centres in a unified format [38].

Employees’ learning capability

Employees are the people who make an organisation. With their culture and experience, each organisation will differ from all others. It is very important for organisations to select the best employees who acquired certain skills and talents. Organisations and companies need to hire people who could learn about new technologies faster and use assessments to predict the quality of employees before employing them. On the other hand, people should also work on their innovative thinking by improving their learning capability, provide better decisions and challenge themselves to provide easier, smarter and better solutions to build a better workforce [24].

Government Policy

[50] has addressed the two main classes of policy. These include substantive policy containing legislations for a specific program and administrative policy, which is considered as an evaluation of information. Both types can be applied vertically or horizontally. A vertical policy is set for a single organization or a special government department with a general framework. On the other hand, a horizontal or integrated policy is implemented in a number of organisations or departments.

Compliance Policy

The compliance policy is a statement provided by a cloud service provider to ensure that it is committed to fulfilling all regulations, policies, legal requirements and organisational standards [13]. Cloud computing providers should comply with audits and regulations in the SLA agreement by explaining their security policies and implementation of security measures. The Right of Audit Clause should be completed by both cloud providers and consumers, in order to ensure compliance with regulations. The technology of cloud computing is still developing; hence some service providers fail to provide an adequate compliance policy, which mitigates against the adoption of cloud computing [53] [40].

Delivery of On-Demand Services

On-demand service is considered as one of the factors that can affect the adoption of cloud computing [6]. The definition of on-demand self-service was acknowledged by the NIST. The NIST has identified on-demand services as one of cloud computing’s characteristics. Also, it is considered a benefit of cloud computing because it provides a flexible and scalable solution for customers’ IT problems when they cannot handle excess demands [22]. Cloud computing providers have many services and large systems that can be tailored to suit the needs of cloud computing services. That way, cloud computing providers can provide elastic cloud services for everyone, with suitable prices and high quality being offered [42].

Reduced Maintenance

There are many definitions for maintenance. The Collins English Dictionary defines maintenance as the work of keeping something in proper condition [12]. This definition implies that in order to maintain a certain thing in a good condition, a set of actions should be completed, otherwise that certain thing will experience degradation or failure [49]. [37] has defined software maintenance as:
“the process of modifying existing operational software by correcting errors, migration of the software to new technologies and platforms, and adapting it to deal with new environmental requirements”. With reference to cloud computing services for customers, for example, an infrastructure as a service, cloud computing service providers will offer provisioning, expenditure control and maintenance, which will reduce unnecessary costs [17].

Enhanced Collaboration with Other Organisations

Collaboration is a large field of research with many classifications and different definitions. In our study we focus on organisational collaboration. Some organisations and especially those in the public sector team together to work efficiently and effectively utilising different tools. Such collaboration will introduce different benefits such as better productivity and communication. Organisational collaboration also drives digital transformation [23]. Cloud computing allows users to communicate with each other and access data from anywhere and at any time when connected to the Internet. Various means of accessing data on the cloud is considered a benefit of cloud computing and this encourages sharing and collaboration amongst employees and interaction with stakeholders and customers [2].

Cost Reduction

Cost is considered to be a critically important benefit of cloud computing. When we look closely at cloud computing cost reduction, we find that cost reduction occurs in terms of two major aspects. The first one is purchasing cost and the second one is long-term usage costs [6] [7]. Reduction of cost has resulted after the implementation of cloud computing in many SMEs around the world. Amazon Web Services (AWS) has assisted its clients in reducing expenses by 70% [33]. Cost reduction is being observed not only in IT and computing assets but also in reducing the cost of maintenance of IT assets [16].

Improved Performance

The goal of cloud computing is to better utilise the IT resources in order to achieve better outcomes and to deal with various computational issues [46]. Organisations which implement cloud computing do not have to worry about building a data centre and providing all of the necessary supplies that are required for a data centre, such as buying the hardware and software, maintaining and housing data. Data centre problems and downtime are minimised and dealt with by highly professional cloud providers. This means that employees are spending less time worrying about the data centre operations [27].

Improved System Quality

Quality is a broad topic that can be understood from different points of view [45]. However, this study is focusing on the quality of systems as a perceived outcome of the adoption of G-cloud in the Saudi Arabian public sector. The term system and service quality was initiated by [15] they defined system and service quality as the perceived level of performance of a system and its service.

Enhanced Accessibility

Accessibility or broad network access is one of the characteristics of cloud computing. Its users can access their information or access cloud infrastructure services any time using different devices, such as laptops, smartphones and tablets. Instead of being at the same location where the data is stored, cloud computing enables users to access their data anywhere in the world, for example by opening a standard web browser or device-specific apps [4] [21] [29].

Better Availability

Availability is considered to be a major concern of cloud computing because services cannot be delivered if the Internet is disconnected or a power outage occurs [11]. Availability differs according to the type of cloud computing being offered. In public clouds, service delivery depends highly on the Internet because the infrastructure and software are located remotely. Thus, availability is considered a risk, while in private clouds the infrastructure and software are located within the premises. Therefore, availability of data is relatively high. Finally, in hybrid clouds people usually store their valuable data in private clouds and use public clouds for their less valuable data [14]. Availability of data is not just the availability of service delivery but also refers to one’s ability to access data and services remotely [14].

2. CONCLUSION

This review article has presented the perceived drivers and outcomes that may affect the adoption of G-cloud in the Saudi public sector. These perceived drivers and outcomes are the potential selected items that could be used in constructing a unique G-cloud adoption framework to test their impact on G-cloud adoption. This article has presented each drive and outcome and has shown the source and description of each driver and outcome. Future researches will focus on the use of these perceived drivers and outcomes to construct a framework for G-cloud adoption and test the results of this framework when applying it on a Saudi Arabian context to see the significance of each one.
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