



Case study

Cloud computing procurement and implementation: Lessons learnt from a United Kingdom case study



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ABSTRACT

The United Kingdom Public Sector delivers a wide range of public services to the citizen. These complex service delivery functions are underpinned by sophisticated information technology and information system solutions. The information technology and systems field is rapidly changing, developing and emerging. A recent evolution is Cloud Computing, where information technology and systems are hosted outside the host organisation, on the internet by third parties. There is a need for the Public Sector to review these solutions to determine whether they are feasible and advantageous. This case study investigates the rationale for the implementation of Cloud Computing in a practical setting and from a user perspective in a United Kingdom Public Sector organisation. The analysis demonstrates how the Cloud Computing solution was deployed and these findings are then mapped against the current research. The case also identifies a set of practical lessons for future Cloud Computing implementation. The findings and lessons learned will benefit other analysts implementing Cloud Computing and undertaking Cloud Computing research.

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1. Introduction

Cloud Computing (CC) is one of the newest developments of the Internet. CC allows information technology and systems to be delivered and used externally over the Internet (Tassabehji and Hackney, 2014). This technology includes servers, personal computers, laptops, tablets, applications, telephones, smart phones, email and file storage (Pillay, 2014). Historically, these systems have been hosted, managed and supported locally, in house and internally by the host organisation. Usually by the organisations internal IT department. CC elements have been around for a number of years. Some companies such as Google have implemented CC solutions such as CC email (Guardian, 2011) and Apple has implemented CC data storage solutions (Accenture, 2010). However, in more recent years CC has developed and matured to offer the full range of IT services, systems, applications and mobile computing services (Pillay, 2014). UK Public Sector organisations have traditionally delivered and hosted IT systems locally and in-house. There have been a few exceptions where the internal IT service, in part or whole, has been outsourced to a third party. With outsourcing, the internal IT delivery and hosting can be either locally, remotely or a combination (Simpson, 2011).

UK Public Sector organisations have been strongly encouraged by the UK National Government to embrace and adopt CC, in particular, the Government Cloud (G-Cloud). It has been both predicted and reported by UK National Government IT strategy architects that by switching to these initiatives, significant savings can be achieved (Accenture, 2010; Cabinet Office, 2011b). The reason being cited is that as G-Cloud is recognised as a shared and common service, costs would be shared amongst each organisation (Sultan, 2013). There is also increasing recognition that efficiencies will come from common information technology systems, common business processes and 24/7 service delivery in the Public Sector (Simpson, 2011). CC therefore would appear to fit well in assisting to achieve this Public Sector vision (Pillay, 2014). It has also been argued that CC will deliver more agile IT responses to evolving Public Sector business requirements and business processes (Xu, 2012). It has also been reported that CC facilitates mobile working and enables organisations to become more transformational and innovative (Sivarajah et al., 2014). Furthermore, Sultan (2013) contends that CC will improve IT resilience and security.

Against this positive and optimistic backdrop however, there is concern about the potential risks of CC. These risks could include for example governance issues, integration with legacy systems, data security and ownership, vendor immaturity and the inability to back up and restore data (Jansen, 2011). Many authors (Gartner, 2010; Shin, 2013) contend that IT and CC is critical to modern organ-

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isations and therefore it is vital that any implementation considers both the advantages and risks that CC presents, especially when considering or implementing CC (Xu, 2012). This case therefore investigates a United Kingdom Local Authority (UKLA), which has recently procured and implemented CC. CC was introduced with the aim of primarily reducing costs and to comply with the UK political mandate to investigate Cloud opportunities. The concern is how CC was initiated and deployed and draws upon the literature and case study findings to extrapolate lessons to help understand its implementation aspects in a Public Sector organisational setting and from an organisational perspective. The research therefore is concerned with the high level, key strategic issues and lessons that have emerged from the case study.

This case is structured as follows: Section 1 above contains a brief introduction to the UK Public Sector and CC. In Section 2, a literature review of CC is undertaken, including the advantages and risks of CC. This is followed by Section 3, in which the research methodology, Grounded Theory, is presented. In Section 4, the case study findings are analysed and discussed. Section 5 contains a discussion and lessons learnt for CC and Section 6 provides the conclusion, wherein the summary of the case study is presented.

2. Cloud computing

The deployment of CC has been heralded as the solution to a host of IT and organisational problems (Xu, 2012). Proponents of CC argue that the implementation can reduce costs and improve current IT deployment. There have been case studies in the UK Public Sector where CC deployment has delivered proven benefits to the organisation in question (Gartner, 2010; Cabinet Office, 2011b; Shin, 2013). (Sivarajah et al., 2014) note that significant operational efficiency and organisational transformation can be achieved through the deployment of CC. This is achieved by 24/7CC operations and allowing staff to access CC anywhere worldwide where there is an internet connection. This has resulted in CC access from internet cafes, mobile wi-fi and hot-desking in back office locations. There is a growing demand for the public sector to embrace more emerging and newer technology (Pillay, 2014). Furthermore to be more innovative (Shin, 2013). Organisations are therefore increasingly implementing CC in an attempt to transform service delivery and provide 24/7 access to Public Sector services. This is both internally to the staff of the organisation and externally for the citizen.

According to Pillay (2014) the primary advantages of CC are summarised as follows:

- Faster implementation for small scale systems.
- Easier access from any appropriate Internet ready device.
- Increased resilience.
- Improved agility.
- Reduced costs.
- Improved security.
- Reduced maintenance and support.
- Release IT resources.
- Empowerment of end-users.
- Virtualisation technology.
- Sharing of resources and costs.
- Centralization of infrastructure.
- Peak-load capacity function.

The potential risks that have also been noted include:

- Increased costs.
- Data location.
- Poor performance.

- Service availability.
- Limited capacity.
- Security and privacy.
- Disaster recovery.
- Data ownership.
- Integration.
- Difficult to customise.
- Governance.
- Provider trust.
- Portability restrictions.

The advantages and risks as highlighted above from the normative literature are now investigated via an in depth case study and then mapped against the literature.

3. Case study research methodology

CC is both a technical and social phenomenon. To undertake a valid case study, it is necessary to choose a qualitative research methodology. The literature demonstrates the need for case studies where the main research areas are the CC concepts employed and where the researcher wishes to understand how different actors engage with the technology. The focus therefore is understanding human action in the case study to develop CC in an organisational setting. The research approach uses grounded theory (GT) (Glaser and Strauss, 1967). GT is a field based, discovery qualitative research methodology, which allows the researcher to develop an account of the organisation under study by empirically investigating the organisation from a user orientated and organisational perspective. The research methodology extrapolates findings that are grounded in the research data. GT is well suited to research situations that deal with “qualitative data gathered from participant observations, face to face interaction, semi-structured or unstructured interviews” (Glaser and Strauss, 1967).

Baskerville and Wood-Harper (1996) have demonstrated the value of interview based field research in the context of case study exploration. GT is interpretative research, wherein the researcher develops a rich account of the case organisation. GT is useful for exploratory research where rigid and well-controlled experimental design is not possible (Glaser and Strauss, 1967). The findings therefore become derived from knowledge that is grounded in the data (Glaser and Strauss, 1967).

The case study involved interviews with key staff associated with CC, which were identified in conjunction with the Chief Executive and the Authority's board of Directors. The interviews were semi-structured and interviewees were encouraged to comment and to raise, reveal and suggest issues and challenges that they regarded as important to the subject in question. These interviews were subsequently transcribed and analysed using the GT interpretative research methodology. The approach required the collection of empirical evidence from a variety of sources in the case study. The main aim was to understand CC in the case organisation via concept discovery and to extrapolate outcomes in the form of discussion and lessons learnt. The knowledge gathered was used to be informative rather than true or valid. A total of eight staff members, consisting of key stakeholders within the UKLA, were interviewed individually. The interviews gave good oral testimony. This enabled a broad and rich view of CC to emerge via the GT approach.

Data triangulation was undertaken by comparing and contrasting the interview findings with observation results and document reviews. This was required to validate and verify the findings of the primary research data with secondary information (Walsham, 1995). This also helped to ensure that no bias emerged from either the participants or the researcher, thus the findings and conclusion made from the cases are valid (Yin, 2009).

4. Case findings

In a bid to improve its current IT agility, infrastructure and resilience, whilst at the same time reducing costs and conforming to the UK National Government political mandate to consider CC, UKLA has recently procured and implemented CC. CC was introduced to deliver a comprehensive IT system on a single information technology platform, which is hosted outside the organisation by a third party organisation. Implementation and use of CC at UKLA has been similar to that of other Government Public Sector organisations. CC was introduced within the past year to avoid potential problems faced by early solution providers and early adopters. The CC deployed by the Authority was a leading industry product and one of the most highly regarded technology solutions. A well-planned and participative approach to its selection and implementation was undertaken, which aligns with [Sultan \(2013\)](#). The choice was also strategic in that CC was introduced through a positive commitment and endorsement by the whole Authority. The Chief Executive, Directors' Management Team, key IT users and future CC staff users were consulted. The CC procurement was also based on a formal cost feasibility study and initial pump priming finance was made available via a capital funding bid. These monies however, will have to be paid back via the known cost savings of the CC over the first five years. The CC Project Team had used a PRINCE2 project management approach that helped significantly, which resonates with ([Jones, 2008](#)). The CC project was regarded as successful by the case study interviewees and it was reported that the procurement and implementation was well managed, on time and in budget.

The new CC solution replaced the entire existing UKLA IT and IS infrastructure. The deployment was undertaken over a weekend. Subsequently, all UKLA staff were then able to access CC. There had been no major reported problems or issues to address. There are two minor issues that are reported later in the paper in relation to IT staff numbers and data security. CC deployment was therefore regarded as successful by the case study organisation. The CC implementation had reduced revenue costs. There is a need for a future payback of the original capital funding to ensure CC delivers the cost saving over the first five years. UKLA has seen significant and increasing demands for home, mobile, flexible and community working from UKLA staff. This aspect is reported by most organisations in the UK Government ([Cabinet Office, 2011a](#)). CC deployment has helped with the emerging business and service requirements, as staff can access the UKLA CC solution from any location anywhere there is Internet or wi-fi access. This is a substantial benefit to the Organisation as staff can now access UKLA IT systems 24 hours a day, seven days a week from any location worldwide. This scenario has led to many staff voluntarily working extra hours, choosing when to work and working more flexibly. For example, working in the local community, including residents homes and business premises. Prior to CC, staff had to attend work 9-5 to be able to access IT systems. Now CC is available 24/7 and also fully supports UKLA current and future business and operational plans. The main delivered benefits include reduced cost, reduced headcount of administrative staff, improved efficiency and effectiveness.

The corporate-wide CC solution has proven to be a critical element for operation of the UKLA. Other benefits from the implementation of mobile, flexible and home working include a virtually paperless office environment, as staff no longer require source paper and duplicate paper documents. This is due to the fact that staff are using mobile devices. Furthermore, for customer-facing staff, CC has enabled access to all relevant electronic information relating to all the customers and citizens of UKLA. Accordingly, the primary benefits of the CC implementation are summarised as follows:

Table 1

Advantages ([Pillay, 2014](#)) mapped against UKLA.

Advantage	Case study findings
Faster implementation for small scale systems	Yes
Easier access from any appropriate internet ready device	Yes
Increased resilience	Yes
Improved agility	Yes
Reduced costs	Yes
Improved security	Yes
Reduced maintenance and support	Yes
Release IT resources	No
Empowerment of end users	Yes
Virtualisation technology	Yes
Sharing of resources and costs	Yes
Centralisation of infrastructure	Yes
Peak-load capacity function	Yes

- Customer-facing staff have access to all the information they need to provide a complete service.
- Mobile, flexible and home working, staff can access information wherever they are 24/7, including access in the community and citizens homes.
- A great deal of paper is no longer required and therefore has been destroyed, significantly reducing the need for document filing space.
- 10% of office space has been freed up by holding information electronically in CC instead of on paper.
- 30% reduction in printing and printers, as documents are held electronically in CC and accessed by mobile devices.
- Efficiency savings have been achieved, resulting in reductions in staff numbers.

CC is first and foremost an enabling technology that has been embraced by the workforce to improve organisational efficiency and effectiveness as illustrated by [Tassabehji and Hackney \(2014\)](#). The implementation of CC has had a significant impact and has transformed the way the Organisation undertakes tasks and service delivery. CC had been made available to every staff member and there had been no requirement for any justification to use CC. The case study however, noted that this had resulted in some additional costs in terms of purchasing staff mobile devices, increased network traffic and more than anticipated disk storage space requirements. These factors had an impact on the overall budget saving scenario. There had also been a requirement to increase IT support staff as a direct result of implementation of the CC, as far more staff were using CC and associated equipment such as mobile devices and wi-fi. However, UKLA were still achieving a substantial saving. Some staff had agreed to use their own individual tablets and mobile devices, which had saved UKLA a substantial amount of funding.

The advantages noted by ([Pillay, 2014](#)) are now mapped in [Table 1](#), against the UKLA findings.

CC deployment had major and successful outcomes overall, when mapped to [Pillay \(2014\)](#) in [Table 1](#) above. The case study contends that CC was well implemented and was well functioning. These many positive advantages were hampered by just one aspect that was not evident at UKLA. This was the requirement to increase rather than reduce IT support staff. This was due to the increase in number of CC users and additional equipment supported, such as mobiles, tablets and wi-fi.

The risks noted by ([Pillay, 2014](#)) are now mapped in the [Table 2](#) against the UKLA findings.

CC deployment had very favourable outcomes when compared to the risks noted by [Pillay \(2014\)](#) in [Table 2](#). UKLA maintain that CC had only exhibited one risk. That risk was security and privacy, which was evident in UKLA. This was because some mobile devices were either lost or stolen. Subsequently, non UKLA staff members,

Table 2
Risks (Pillay, 2014) mapped against UKLA.

Risks	Case study findings
Increased costs	No
Data loss	No
Poor performance	No
Service availability	No
Limited capacity	No
Security and privacy	Yes
Disaster recovery	No
Data ownership	No
Integration	No
Difficult to customise	No
Governance	No
Provider trust	No
Portability restrictions	No

i.e. members of the public found these devices and hacked into the UKLA CC. Each device had extensive security controls, such as security markings, internal GPS location finders and multiple passwords. However, as discussed, a small number of devices were lost or stolen and the CC system was hacked a small number of times by external hackers. The fact that the data is in CC and not the UKLA owned IT internal location resulted in losing some security aspects. As soon as the mobile devices were reported lost or stolen, they were disabled by UKLA IT staff. However, on a small number of devices, reporting the loss or theft was not immediate, which resulted in a breach of security and privacy due to hacking.

5. Lessons learnt for successful CC implementation

The case study elicited a broad and rich picture that was extrapolated from the UKLA research. The paper now presents a discussion and elicits lessons learnt. This is undertaken by drawing on the literature and UKLA findings. Firstly, the properly conducted feasibility study that was undertaken, which identified cost, value, advantages and risks from the implementation of CC was of key importance to UKLA. It enabled UKLA to understand the full cost and accurate cost savings of CC. This financial analysis was undertaken jointly in collaboration by the UKLA Finance and IT staff. The findings were presented and subsequently approved by senior management. This cost feasibility approach resonates with Jones (2008) and Irani (2010). Secondly, Senior Management Team commitment to CC was highly evident. This gave substantial weight to the implementation and strengthened the CC project delivery. There was also a clear vision of CC articulated by the UKLA Senior Management Team via a visioning document. This helped motivate UKLA staff. These aspects resonate with Sultan (2013). Thirdly, strong project management was evident, which assisted with the CC implementation. CC had the support of all UKLA staff who recognised CC as a new service delivery mechanism that was embraced by UKLA staff to transform and innovate services. This resonates with Irani (2010). Fourthly, a workforce willing to become mobile and work flexibly to deliver service transformation via CC. This new approach to work by the workforce is orientated towards a successful CC implementation and innovative use within the UKLA service delivery. This resonates with Xu (2012). Fifthly, new innovative and transformational business processes were developed. These business processes are currently exploiting CC to the full and delivering further efficiencies. This resonates with Shin (2013). Sixthly, appropriate support for CC from the internal IT Team was evident. This had helped ensure that the CC technical implementation and subsequent CC support was successful. This resonates with Tassabehji and Hackney (2014). Finally, the CC company was performance monitored and evaluated. This ensured CC was operating successfully and helped identify any potential barriers to enable

Table 3
Lessons for successful Cloud Computing implementation.

Lesson	Reason	UKLA
Cost Benefit Analysis	Understand cost saving	Yes
Senior Management Team Commitment	Deliver project	Yes
Strong Project Management	Deliver project	Yes
Mobile Workforce	Improve efficiency	Yes
Exploit New Innovative Processes	Improve effectiveness	Yes
Appropriate CC Support	Ensure effectiveness	Yes
Monitor Performance	Ensure delivery	Yes

remedial action to be taken. This resonates with Jansen (2011) and Shin (2013).

Overall CC had a very successful deployment when mapped against the advantages and risks in the current literature (Pillay, 2014). CC was well deployed and well maintained by the CC third party company. Furthermore, although not part of the original benefit goals, there were also many unexpected, positive aspects of the CC implementation, including improved morale, improved staff recruitment and retention, improved information flow and more knowledgeable and experienced technology UKLA CC users.

The case research enabled a broad, high level picture to emerge from studying the UKLA scenario. It is useful to elicit the lessons learnt in Table 3, by drawing on the literature and case study findings. It is suggested this table and findings are tentative, not substantive. This is because the findings from UKLA are not generalisable (Walsham, 1995).

The above Table 3 elicits the lessons learnt from UKLA and from the literature. The lessons should help organisations with CC procurement and implementation. The lessons should also help researchers identify future research aspects for CC. UKLA have successfully implemented CC and staff can access the UKLA IT CC systems 24/7 and from any location in the world. This has been a substantial benefit and has resulted in the workforce being significantly more efficient and effective. CC in UKLA will help deliver the case study organisations future working and service requirements.

6. Conclusion

This case has reported on research undertaken on CC in a UK case study organisation. A clear CC vision from senior management, together with strong project management and CC cost benefit analysis helped ensure that CC was well implemented. CC resulted in improved information flow, improved efficiency and improved effectiveness for UKLA CC users and citizens. The research has illustrated that CC deployment can deliver advantages and that risks can be mitigated or minimised into UK Public Sector organisations. The advantages realised by UKLA as noted (Pillay, 2014), include:

- Faster implementation for small scale systems.
- Easier access from any appropriate Internet ready device.
- Increased resilience.
- Improved agility.
- Reduced costs.
- Improved security.
- Reduced maintenance and support.
- Release IT resources.
- Empowerment of end-users.
- Virtualisation technology.
- Sharing of resources and costs.
- Centralization of infrastructure.
- Peak-load capacity function.

However, one advantage was not evident in UKLA, namely:

- Release of IT resources.

In fact, UKLA had to increase IT resources to enable efficient and effective support to CC users who had increased substantially in numbers from the original number of UKLA IT service users. Furthermore, to support additional numbers of mobile devices, such as smartphones and tablets, including their own devices.

UKLA had mitigated the following risks:

- Information management.
- Increased costs.
- Data location.
- Poor performance.
- Service availability.
- Limited capacity.
- Disaster recovery.
- Data ownership.
- Integration.
- Difficult to customise.
- Governance.
- Provider trust.
- Portability restrictions.

However, UKLA had one key risk evident, namely:

- Security and privacy.

This was due to devices being lost or stolen. Before they were reported as such, a small number of hacking attempts had been successful. This case reports the findings of the implementation of CC in a UKLA and maps advantages and risks found in the literature against the empirical findings. It also extrapolates a number of lessons for CC procurement and deployment, which could have a role in CC practice.

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