The Impact of Cloud Computing on ITIL Service Strategy Processes

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***Abstract*—Cloud computing has become an increasingly popular means of delivering precious IT enabled business services. Customers and end users access the IT services catalog through self-service portals, using and paying for only those services they need, when and where they need them. When an organization adopts cloud computing it quickly becomes apparent that the traditional approach to IT service management frameworks such as Information Technology Infrastructure Library (ITIL) needs to be reviewed. This paper is focusing on the ITIL Service Strategy process and the impact of cloud computing on its sub processes implementation. Four case studies from organizations who either partially implemented or are planning to implement cloud computing have been consulted to propose enrichment to ITIL when cloud computing is adopted.**

***Index Terms*—Cloud computing, ITIL, IT service strategy, IT service management.**

I. Introduction

Cloud computing is relatively new model of enabling convenient and on demand network access to a pool of configurable computing resources and services. Cloud services deliver compute, storage, software, applications, etc. via Internet to customers on a self-serve basic. Customers can subscribe to these services based on their requirements. These services are flexible, adaptable, and utility based where customers pay for their subscription as they use it. Despite the growing recognition and importance of cloud computing however, little effort has been made towards incorporating it into established IT Service Management (ITSM) frameworks like Information Technology Infrastructure Library (ITIL). Cloud computing is an entirely new form of infrastructure with its own unique components, process and users. There is a need to accelerate the design and implementation of ITSM processes and capabilities to manage the cloud and consequently help reduce operational expenses and increase efficiency of cloud-based infrastructure [1].

ITIL is a widely accepted approach to ITSM in the world. ITIL provides a cohesive set of best practice, drawn from the public and private sectors internationally. It is supported by a comprehensive qualifications scheme, accredited training organizations, and implementation and assessment tools. The best practice processes promoted in ITIL support and are supported by the British Standards Institution's standard for IT service Management (BS15000).

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The ITIL originated as a collection of books, each covering a specific practice within IT service management. After the initial publication in 1989–96, the number of books quickly grew within ITIL V1 to more than 30 volumes. In 2000/2001, to make ITIL more accessible (and affordable), ITIL V2 consolidated the publications into 8 logical "sets" that grouped related process-guidelines to match different aspects of IT management, applications, and services.

In July 2011, the 2011 edition of ITIL V3 was published. It provides a more holistic perspective on the full life cycle of services, covering the entire IT organization and all supporting components needed to deliver services to the customer. Furthermore, ITIL V3 enables organizations to deliver appropriate services and continually ensure they are meeting business goals and delivering benefits. The ITIL V3 best practices are currently detailed within five core publications that introduce five Service Lifecycle stages: Service Strategy, Service Design, Service Transition, Service Operation, and Continual Service Improvement Fig. 1.

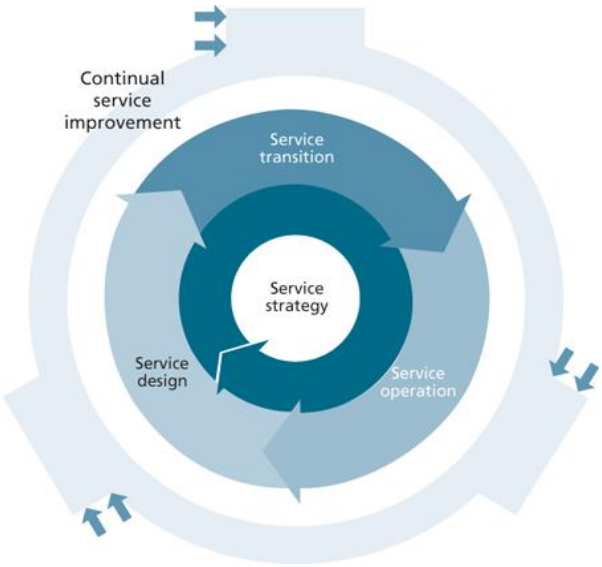

Fig. 1. Service life cycle.

II. Motivation and the Goal of This Research

As organizations move toward cloud services, many IT leaders find their existing ITIL structures do not support cloud well, resulting in frustration and limiting the value of cloud promises. This will expose the business to unnecessary complexities with no accountability for the end services being delivered and poses serious risks for any IT organization migrating to cloud solutions. The most significant ITIL 2011 edition was published at the end of July, 2011. The review of the new five published books reveal limited considerations about ITIL and the new industry trend

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of cloud computing. The majority of cloud-related content can be found in the ITIL Service Strategy book [2]. The book introduces the characteristics and attributes of cloud services and the various types of service delivery and deployment models.

Generally, empirical research in the IT service management domain is in its infancy [3], lacks scientific discussions [4] and has only just emerged [5]. Most of the research in this area is still focusing on ITIL implementation and best practices [6]-[8]. Interest in deploying IT service management tools in the cloud is great, and ITIL framework is applicable to manage cloud computing when adopted but there are elements that need to be approached differently [9], [10]. This research argues that in order for ITIL to support Cloud computing, ITIL phases and associated processes must be carefully revamped and extend its capability so it can incorporate the cloud computing in the process of IT service management. For example, the cloud computing charging model is based on consumption (pay as you go). The financial management processes should be enhanced to consider this new model.

Four different organizations that have either partially implemented or about to implement cloud computing have been consulted. Successful adoption to cloud computing starts with careful strategy processes planning followed by the design, transition and operation. Because the scope of this research is too big this paper only focuses on the impact of cloud computing in the ITIL service strategy processes and what factors that must be considered when implementing ITIL service process. Section III briefly explains the cloud computing, it's service layers, and deployment model. Section IV defines ITIL service strategy and its main processes. Section V represents the research methodology. Section VI discusses the findings of this research. Section VII, provides the conclusion of this research.

III. What is Cloud Computing?

Cloud computing is 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 [11].

Cloud computing represents a major shift in information technology (IT) architecture, altering the way IT services are sourced and delivered. Software and information are provided to computers and other devices on-demand, like a public utility. Consumption is billed on a utility or subscription basis with little or no upfront cost, creating a low barrier to entry. This new approach reduces upfront capital expenditures but there may be extra cost for operating expenses.

A. Cloud Computing Service Layers

Cloud computing providers provide different kinds of services to cloud computing consumers. The cloud computing service model has three different service layers (See Fig. 2) or categories also known as the cloud stack [12]. The cloud computing service layers are briefly explained in the following:

Fig. 2. Cloud computing layers.

- Software as a Service (SaaS): is cloud computing layer where users simply make use of a web-browser to access software that others have developed, maintain and offer as a service over the web. At the SaaS level, users do not have control or access to the underlying platform and infrastructure that is being used to host the software. Google Gmail is popular example that uses the SaaS model of cloud computing [13].
- Platform as a Service (PaaS) providers offer computing middleware. The consumers develop their applications and software using a set of programming languages and tools that are supported and provided by the PaaS provider. PaaS provides developers with a high level of abstraction that allows them to focus on developing their applications. Developers can provide their customers with a custom developed application without the hassle of defining and maintaining the infrastructure. Just like the SaaS model, users do not have control or access to the underlying infrastructure being used to host their applications at the PaaS level. Google App Engine and Microsoft Azure are popular PaaS examples [14].
- Infrastructure as a Service (IaaS) providers allow their customers access to different kinds of infrastructure (e.g. CPU power, memory and storage) and use the resources to deploy and run their applications through the use of virtual machines which automatically can scale up and down. IaaS gives users flexibility to deploy any software stack on top of the operating system. However, flexibility comes with a cost and users are responsible for updating and patching the operating system at the IaaS level. Amazon Web Services' EC2 and S3 are popular IaaS examples [15] Cloud computing deployment models

Cloud computing has a number of different implementation models. An implementation model is a specific method of providing a service. In the case of cloud computing these are unique methods of implementing a cloud computing service. Implementation models often have particular characteristics that suit them to appropriate workloads. The most commonly used three-cloud implementation models are:

- Private cloud: Created and run internally by an organization or purchased and stored within the organization and run by a third party
- Hybrid cloud: Outsources some but not all elements either internally or externally
- Public cloud: No physical infrastructure locally, all access to data and applications is external

The concerns for revamping ITIL service processes mainly exist when the public or private cloud is hosted with third

party. When services of private cloud are hosted internally there will be no substantial alteration in the way of using ITIL framework.

IV. ITIL Service Strategy Process

Service strategy is the central origin point of the ITIL service life cycle Fig. 1. The objective of ITIL service strategy is to provide guidance on how to design, develop and implement service management [2]. It decides the strategy on how to serve customers. Starting from an assessment of customer needs and the market place, the Service Strategy process determines which services the IT organization is to offer and what capabilities need to be developed. Its ultimate goal is to make the IT organization think and act in a strategic manner. Simply the Service Strategy is a plane created by the IT Service Organization to reach its objectives. The following processes achieve ITIL service strategy:

1) IT service management
2) Service Portfolio Management
3) Financial management for IT services
4) Demand Management
5) Business relationship management

The cloud computing will not change ITIL service strategy objectives, the above ITIL service strategy processes should be revamped so it can adopt the new era of the cloud computing.

V. Research Methodology

A qualitative research using case studies is used to identify the impact of Cloud computing on the ITIL service strategy process. We adopted qualitative method, as this research is exploratory in nature. The case study method provides the opportunity to ask penetrating questions and to capture the participant rich experiences and thoughts. A total of four case studies reflecting four different organizations are carefully selected and case semi-structured interviews with ITIL personnel were conducted. The selected organizations from United Arab Emirates (UAE) have either partly adopted cloud computing or thinking to adopt it. Due to commercial sensitivity of the information and comments, the actual names of the organizations can't be disclosed. The four cases are referred to throughout the case discussion as case A-D. Table I introduces each organization in terms of size, nature, ITIL version, cloud computing adoption, stage of cloud computing implementation and reason of cloud computing implementation. ITIL experts in these organizations were interviewed and questioned.

Based on the main service strategy processes objectives and literature review, we formulated some questions, which are open in nature. The questionnaire contains three main parts: Part A contains questions about the organization (i.e. size, nature, number of IT staff, etc.). Part B, contains questions about the impact of the cloud computing on ITIL service strategy process. Part C gathers feedback about the consideration of the service strategy processes when adopting cloud computing. The questions are used as a guide through the interviews. However, we did not rely on these questions only, other emerged questions and ideas during the interview were also considered.

TABLE 1 Organization Case Studies

Organizations	Case A	Case B	Case C	Case D
No of Staff	700+	1000	2500	500
No of IT staff	600+	45	100	20
Government (G)/Semi-government (S)	S	G	G	G
ITIL Version	V3	V3	V3	V2
Cloud Computing adoption (Largely (L), Partially (P), Planning (PL), None (N))	P	P	PL	PL
Stage of Cloud Implementation (if adopted)	Done	Partially Done	-	-
Reason for Cloud adoption (if any) Internal/External/Both/Other	Internal	Both	Both	Both

VI. Discussion and Finding

The interview's questionnaire outcome of the four case studies were analyzed to identify patterns and summarize the main characteristics of approach and to select quotations that are supportive of the patterns and themes identified across all cases[16]. The cross case analysis of the four organizations has generated important cloud computing impacts that must be considered when implementing ITIL service strategy processes. The impacts of every process are detailed and illustrated with quotations from the ITIL personnel who has been interviewed and questioned.

A. IT Service Management

This process is introduced in ITIL 2011 edition. Also, the new ITIL role Service Strategy Manager has been introduced to support the IT Steering Group. When adopting cloud computing the strategy management should assess the service provider's offerings, capabilities, competitors as well as current and potential market spaces in order to develop a strategy to serve customer needs.

The IT service management must thoroughly research the cloud computing environment in order to address the following concerns:

Does the organization need to build its own infrastructure? IT Service Management must determine if the computing infrastructure is expensive and too inflexible thus a highly virtualized cloud computing saves money.

Which parts of the business will be moved to the cloud? IT Service Management should consider the cloud for new applications or business processes as requirements evolve. The cloud can significantly reduce time to market when rolling out new functionality and processes.

What type of cloud deployment should be used? Public, Private or Hybrid Clouds.

How will information and data be secured? New measures will be required to help ensure that while data can be accessed anywhere and anytime, businesses do not breach data protection laws.

Once the strategy has been defined, the strategy management for IT services is also responsible for ensuring the implementation of the strategy.

B. Service Portfolio Management

The purpose of a service portfolio is to describe a service provider's services in terms of the business value and needs. In order to assess the needs and requirements of the diverse departments who wish to utilize and use certain cloud computing, the portfolio management should contain all necessary information that are required to assess which cloud model is efficient to deploy and compare service competitiveness & effectiveness across different providers. It is essential that a portfolio be created for all potential external cloud deployment models. Service Portfolio Management process gathers as and analyzes the cloud service provider services in the market and ensures that the service provider has the right mix of services to meet the required business outcomes at an appropriate level of investment. The service catalogue must be regularly updated to reflect all live cloud computing services available.

C. Financial Management for IT Services

The main objective of the financial management process is to provide a cost effective administration of the assets and resources used in providing IT services. It manages the service's budgeting, accounting and charging requirements.

The aim of the financial management is to assist management decision on IT investment by providing detailed cost analysis regarding changes to IT services.

One of the key features of cloud computing is based on the fact that its charging is based on consumption (pay as you go). Financial management process must be changed to incorporate this fact when it peruses cost analysis calculation. The financial management process needs to provide the necessary cost information in order to decide whether a certain service in the cloud can be deployed more efficiently and able to save the costs over more traditional areas of IT. Consumer financial manager with the help of the service user must collaborate to calculate the potential costs of a new cloud service to ensure they will indeed provide measurable cost saving. Since the cloud computing model charges on pay as you go bases the financial management budgeting activity must be changed to incorporate this model of charging.

IT accounting and customers need information related to the consumption bill and details about what and how the cloud service provider has billed them for. The IT accounting is fully responsible about explaining how is the money is spent by customer, service, etc. The cloud service provider needs to have a well-defined and implemented billing process to satisfy the IT accounting and customer needs.

D. Demand Management

The main objective of the demand management process is to understand, anticipate and influence business demand for services. It does that by analyzing patterns of activities and user profiles and provisioning capacity in line with strategic business objectives Demand Management works with Capacity Management process in the Service Design service to ensure that services have sufficient capacity to meet the required demand. One key promise of the cloud computing is that any request for modification or deletion of the existing capacity or resources has to be done in real time. Also, the cloud service provider must fulfill any sudden surge in the service demand without compromising the agreed performance. This is an excellent feature from the demand management's point of view but the cloud consumers must be very careful as the cloud service provider normally charges any usage over the agreed levels at a premium rate. The demand management must carefully calculate demand to allocate the agreed budget within the financial management process.

When using the cloud, the performance requirements for a cloud service must be accurately defined, especially within the peak period (low or high) and must be clearly articulated in the Service Level Agreement (SLA). Failing to calculate and define the required performance is a source of risk and could lead to obstruction or complete damage the consumer business.

E. Business Relationship Management

In the traditional ITSM the Business Relationship Management process identifies the needs of existing and potential customers and ensures that appropriate services are developed to meet those needs.

In the cloud environments, the purpose of the Business Relationship Management process is extended to form and uphold the cloud service provider and the customer business relationship. The Business Relationship Manager (BRM) identifies customer requirements and makes sure that the cloud service provider meets the requirements before agreeing to deliver the service. If business requirements changes over time the BRM ensures that the service provider is aware of changing business needs and help the business in expressing the value of a service. The objectives of the BRM include:

- Ensure that the cloud service provider understands the customer's perspective of service, and is therefore able to prioritize its services assets appropriately
- Guarantee that the cloud service provider is meeting the customer's requirements and business needs otherwise establish formal complains and escalation process for the customer
- Establish and maintain a constructive relationship between the cloud service provider and the customer based on understanding the customer and its business drivers
- Identify changes to the customer needs that could potentially impact the type, level, or utilization of the cloud services provided
- Establish and articulate business requirements for new services or charges to existing Services

VII. Conclusion

Adopting cloud computing is a serious business decision. IT service management frameworks such as ITIL is essential and plays a critical role to manage the cloud computing. Although ITIL has been around for almost 20 years it must be reframed and consider the context of the cloud computing. The cloud computing will not change ITIL service strategy objectives, the ITIL service strategy processes should be revamped on the light of the above discussion. Performing careful service strategy will reduce the possibility of exposing the business to unnecessary complexities with no accountability for the end services being delivered and poses

serious risks for any IT organization migrating to cloud solutions.

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