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**An analysis about the relationship between the Cloud Computing model  
and ITIL v3 2011**

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Master in Computer Science and Business Management

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ISCTE-IUL

PhD. Isaías Scalabrin Bianchi, Assistant Professor,  
UAB - UFSC

November, 2021





TECNOLOGIAS  
E ARQUITETURA

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ISTA – Department of Information Science and Technology

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## Resumo

A computação em nuvem é amplamente reconhecida como um paradigma de computação recente da transformação digital, no qual recursos computacionais escaláveis e elásticos são fornecidos como um serviço através de tecnologias na Internet. As suas características fizeram com que esse modelo de negócio fosse cada vez mais adotado por organizações que na prossecução dos seus objetivos de negócio. Além dos benefícios, também existem os riscos podem impactar as organizações internamente e na forma como entregam os seus serviços aos clientes. Portanto, tornou-se importante entender os impactos do modelo de Cloud na forma como as empresas organizam seus próprios processos e práticas.

O objetivo deste trabalho é investigar quais são os principais impactos decorrentes do modelo de Cloud que impactam atualmente os processos da *Information Technology Infrastructure Library*. A metodologia selecionada será por meio de entrevistas semiestruturadas a profissionais capacitados para recolher informações decorrentes de experiências na prática que, de acordo com a Revisão Sistemática da Literatura realizada, não poderiam ser obtidas pela literatura tradicional.

Ao analisar os resultados da Revisão Sistemática da Literatura, diversos processos desta *framework* foram afetados, o que pode levar à necessidade de reformulá-la. As considerações empíricas recolhidas nas entrevistas semiestruturadas, sugerem que a *framework* não necessita de ser reformulada e que os processos do ITIL v3 2011 mais impactados no modelo *Cloud* são o de Gestão de Incidentes e de Gestão da Mudança.

**Palavras Chave:** *Information technology infrastructure library* (ITIL), Computação em Nuvem, Migração para Computação em Nuvem





## **Abstract**

Cloud Computing is widely recognized as a recent computing paradigm of digital transformation in which scalable and elastic computational resources are delivered as a service through Internet technologies. Its characteristics made this business model increasingly adopted by organizations reaching business goals. Besides its benefits, some risks may impact organizations internally and, in the way they deliver their services to their clients. Therefore, it became important to understand the impacts of the Cloud model on the way companies organize their processes.

The goal of this work is to investigate which are the main impacts arising from the Cloud Computing model currently impacting Information Technology Infrastructure Library framework processes. The methodology selected will be through semi-structured interviews with knowledgeable professionals to effectively collect practical information that, according to the Systematic Literature Review performed, could not be collected by the traditional literature.

By analyzing the Systematic Literature Review results, several processes of this framework were affected, which may lead to a need for reframing it. Although the organization's approach to this model must be enhanced and adapted to a new reality, the empirical insights collected from semi-structured interviews, suggest that the framework does not need to be reframed, and ITIL v3 2011 most impacted processes by the introduction of the Cloud-based model, are Change Management and Incident Management.

**Keywords:** Information technology infrastructure library (ITIL), Cloud Computing, Migration to Cloud Computing



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## **List of abbreviations and acronyms**

ACM – Association for Computing Machinery  
EBSCO - Elton B. Stephens Company  
CAPEX – Capital Expenditure  
CC – Cloud Computing  
CICD – Continuous Integration Continuous Development  
CSP – Cloud Service Provider  
IaaS – Infrastructure as a Service  
IT – Information Technology  
ITIL – Information Technology Infrastructure Library  
ITSM – Information Technology Service Management  
NIST – National Institute of Standards and Technology  
OLA – Operational Level Agreement  
OPEX – Operating Expenditure  
PaaS – Platform as a Service  
RQ – Research Question  
SaaS – Software as a Service  
SLA – Service Level Agreement  
SLR – Systematic Literature Review  
SOA – Service Oriented Architecture  
WOS - Web of Science



## Chapter 1 – Introduction

Digital transformation provided new opportunities for organizations and evident improvements in the way they structure the delivery of their services (Chou 2015, Karkošková 2018). Cloud Computing then appears as a new paradigm of computing (Jansen 2011), not as a technology *per se*, but as a business model supported by new technologies that optimize the way computational resources are made available (Karkošková 2018). This approach aims to facilitate the supply and use of IT infrastructure, platforms, and applications in the form of services available on the Internet by the IT Providers.

Cloud Computing is mainly characterized by scalability and elasticity (Mell and Grance 2011) that allow organizations to scale the amount of contracted computational resources or their acquisition/assignment to its infrastructure as well as the possibility of cost reduction (Chou 2015). Despite all these benefits, some challenges must be considered in the strategic design of organizations to keep the IT resources properly aligned with business objectives (Bailey and Becker 2014).

In this sense, it is important to understand if the ITIL, as a recognized framework (Jansen 2011, Heininger 2012, Beckers, et al. 2013, Karkošková 2018), is or should be prepared to accommodate the specific needs of this model to provide organizations with an effective response to the inherent risks and thus be able to ensure the quality imperatives expected.

### 1.1. Motivation and relevance of the theme

According to NIST, CC can be defined as a “model that allows ubiquitous, convenient, and on-demand access to the shared network, a set of configurable computing

resources (...) that can be quickly provisioned and delivered with minimal management or interaction effort. with your service provider” (Mell and Grance 2011). Stanley (2014) and Chou (2015) point out some risks in the adoption of the Cloud by organizations such as user authentication, information security and privacy,” integration with internal systems, business availability and content ownership”. In response to the risks of CC, Bounagui, Mezrioui, and Hafiddi (2018) propose the provision of “end-to-end security solutions” to ensure compliance with “regulations and standards of good practice”.

The existing IT frameworks do not fully address Cloud’s requirements (Karkošková 2018). The management of the IT resources in the Cloud must be performed differently from the traditional ones, the practical approach of ITSM in the Cloud context must be reviewed (Jansen 2011). ITIL, as a *de facto* standard (Bailey and Becker 2014, Cardoso, Moreira and Escudero 2018) needs to be reassessed to address Cloud’s challenges (Miller, et al. 2013, Al Mourad and Hussain 2014, Zhang 2016).

## **1.2. Questions and research goals**

The main objective of this research is to analyze ITIL as the most adopted IT framework worldwide to understand if the processes within cover CC model-specific characteristics. The previous objective is then translated into the following research question: Is ITIL still appropriate to be applied in CC model context organizations?

This central question is subdivided into the sub-questions below identified:

1. What are the processes within ITIL that could be impacted by the characteristics of the CC model?
2. Should ITIL be reframed to accommodate the characteristics of the CC model?

### **1.3. Methodological approach**

To pursue the defined objective and answer the formulated research questions an SLR is performed, whose steps are depicted in Chapter 3. Its results suggest that there may be unexplored information by the traditional academic literature (Heininger 2012, Karkošková 2018, Wang, Zhong and Li 2021). Therefore, Qualitative Research using Semi-Structured Interviews methodology was performed, which is the most used technique (Dicicco-Bloom and Crabtree 2006). Its goal is to collect subjective information from knowledgeable professionals. This methodology will provide the flexibility to collect research inputs and unexpected additional information that may enrich the current analysis and further contribute to a better framing of the theme (Rabionet 2011, McIntosh and Morse 2015, Kallio, et al. 2016).

### **1.4. Structure and organization of the dissertation**

This study is organized into five chapters that aim to reflect the different phases until its conclusion. The first chapter introduces the subject of the investigation and its objectives, as well as a brief description of the work structure.

The second chapter reflects the theoretical framework, called the Literature review. The third chapter is dedicated to the Methodology used in the data collection and treatment process as well as the methods of analysis used. The fourth chapter presents the analysis of the results obtained, according to the methodology that was considered appropriate. In the fifth and last chapter, the conclusions of this study are presented, as well as the recommendations, limitations, and future work.



## Chapter 2 Background Analysis

### 2.1. Cloud Computing

#### 2.1.1. Concept and Characteristics

According to several authors, the definition of CC is formally explained by NIST (Jansen 2011, Bounagui, Mezrioui and Hafiddi 2018, Chou 2015). NIST (Mell and Grance 2011), describes CC 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”. In a more practical view, CC can be defined as applications delivered in the form of services through the internet and the systems software hosted in data centers that allow those services to be provided (Armbrust, et al. 2010).

Additionally, NIST provides detailed information about CC characteristics (On-demand self-service, broad network access, resource pooling, rapid elasticity), service models (Software as a Service, Platform as a Service, Infrastructure as a Service), and deployment models (Private cloud, Community cloud, Public cloud, and Hybrid cloud).

#### 2.1.2. The Service and Deployment Models of Cloud

The Service and Deployment Models of the Cloud were also clearly defined by Mell and Grance (2011). Therefore, three main service models constitute this business model such as Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS). Using SaaS services, clients can operate on the applications of the Provider under a cloud infrastructure. but do not usually detain the management or “control of the underlying cloud infrastructure” (Mell and Grance 2011). Under PaaS services, the CSP allows its clients to have a development environment where they can manage, run or develop applications, under the CSP support. With exception to the applications, clients do not usually detain the management or “control of the underlying cloud infrastructure” (Mell and Grance 2011). In the IaaS services, the CSP offers computational resources such as storage, networks, processing, and the client can run and deploy software. Although the client manages the “operating systems, storage, and

deployed applications”, they do not usually detain the management or “control of the underlying cloud infrastructure” (Mell and Grance 2011).

There are four existing deployment models in this context: private cloud, community, public, and hybrid, which can be, among other factors, categorized by ownership and accessibility. In the Private cloud context, the infrastructure is exclusively used by a sole organization that may own and manage it (Mell and Grance 2011). In the Community Cloud, only a limited of organizations and/or users can use the infrastructure that may own and manage it (Mell and Grance 2011). In a Public Cloud, the public may use the infrastructure and is managed by “business, academic, or government organization” (Mell and Grance 2011). The combination of at least two of the infrastructures above mentioned is designated as Hybrid Cloud. Through this deployment model, data and application mobility is possible between them (Mell and Grance 2011).

### 2.1.3. Benefits and risks of the CC model

The cloud computing model introduces several benefits and risks (Chou 2015, Bounagui, Mezrioui and Hafiddi 2018). As benefits, accessibility, IT cost-saving, external security service handle, scalability, and flexibility, external IT management task handling, and mobility enhancement are the main advantages that CC offers (Chou 2015). The main risks on cloud computing are associated with “authentication, data security and privacy, interfacing with internal systems, system availability, business continuity, and ownership of content and other legal requirements” (Chou 2015). The main challenges that the cloud model brought are mainly caused by the lack of a proper CC governance approach regarding the control of cloud environments and risk mitigation (Bounagui, Mezrioui and Hafiddi 2018).

## 2.2. ITIL

Created by the British government in the late '80s, the ITIL framework provides a set of best practices that are widely accepted as the most popular approach for ITSM (Bailey and Becker 2014). These best practices have been collected both from global public and private sector entities (Ahmad and Shamsudin 2013). Being a de facto standard for IT management processes, this set of best practices is more evident in the operation and IT maintenance (Cardoso, Moreira and Escudero 2018). ITIL's objective is to help IT to



provide cost-effective services to align the Business requirements expressed in the form of a Service Level Agreement (Iden and Eikebrokk 2014). The most recent release of this framework was published by AXELOS in February 2019 – ITIL 4 – as an allusion to the ‘Fourth Industrial Revolution’.

In this work, the focus will be on the ITIL v3 2011 edition. In Table 1, the process groups and their elements (processes and functions) are presented.

*Table 1 - ITIL Process Groups*

<b>Process Group/Books</b>	<b>Elements</b>
Service Strategy	Financial Management, Service Portfolio Management, Business Relationship Management, Demand Management, Strategy Generation
Service Design	Service Level Management, Availability Management, Capacity Management, IT Service Continuity Management, Service Catalog Management, Information Security Management, Supplier Management, Design Coordination, Requirements Engineering, Data & Information Management
Service Transition	Change Management, Service Asset & Config. Management, Release and Deployment Management, Transition Planning and Support, Service Validation and Testing Change Evaluation, Knowledge Management
Service Operation	Incident Management, Problem Management, Request Fulfilment, Access Management, Event Management, Technical Management, IT Operations Management, Applications Management, Service Desk, Operational Activities in other Lifecycle Phases
Continual Service Improvement	Service Improvement, Service Measurement, Service Reporting

Almost every entry in the elements part is an operational process except those under the Service Strategy domain and Continual Service Improvement domain, which are considered as Governance Processes. Regarding the Service Operation domain, Technical Management, IT Operations Management, Applications Management, and Service Desk are considered functions. While a process is a “structured set of activities designed to accomplish a specific objective”, a function is described as “a team or group of people and the tools or other resources they use to carry out one or more processes or activities”.

### 2.3. Related Work

To obtain information in the scientific literature, a Systematic Literature Review was conducted, under the orientations of Kitchenham (2009), in which, according to this author “is a methodic rigorous review of research results” aiming “aggregate all existing evidence on a research question” and “support the development of evidence-based guidelines for practitioners”. The next steps consist in analyzing existing information in some relevant academic research databases to investigate relevant topics related to the main theme of this dissertation and to determine the research activity related. The SLR procedure adopted in this study includes three main phases and ten steps as below shown in Figure1 (Brereton, et al. 2007):

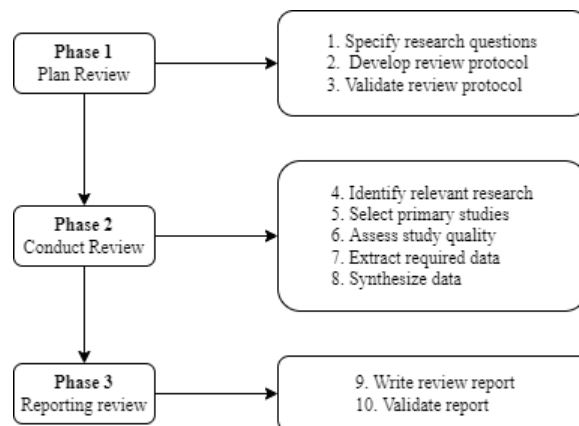


Figure 1 - SLR procedure (Brereton, et al. 2007)

Below are presented the Research Questions:

- RQ1: Which topics of ITIL processes applied to cloud-based environments are researched and published?
- RQ2: What is the activity for SLR?

In terms of academic research database repositories, the following were used:

- ACM Digital Library (A Guide to Computing Literature)
- EBSCO (All Databases)
- IEEE Xplore Digital Library
- Scopus
- Springer Link
- Web of Science (Core Collection)

- Other Sources (Google Scholar, Research Gate)

After trying several keywords, the keywords that produced the most accurate results were the following:

- ("ITIL" OR "Information Technology Infrastructure Library") AND Cloud

The criteria for including/excluding the studies are presented below in Table 2:

Table 2 - Inclusion and Exclusion criteria

Inclusion criteria	Exclusion criteria
Both ITIL and Cloud computing topics are covered in the publication	Gray literature
Conference proceedings or journal articles	Full text is not in English
	Unavailability of the full text for consultation

In the first instance, a full-text search was performed without applying any filter which brought an extensive number of results. For that reason, five filters were applied to obtain satisfactory results.

Table 3 - Filter list and results from repositories

Research Database	Keywords	1st filter Full Text	2nd filter Abstract	3rd filter Title	4th filter Year > 2010	5th filter English only
ACM	"ITIL" AND Cloud	282	22	1	1	1
	"Information Technology Infrastructure Library" AND Cloud	92	7	1	1	1
	<b>Total</b>	<b>374</b>	<b>29</b>	<b>2</b>	<b>2</b>	<b>2</b>
EBSCO	"ITIL" AND Cloud	1541	41	7	7	1
	"Information Technology Infrastructure Library" AND Cloud	43	2	1	1	1
	<b>Total</b>	<b>1584</b>	<b>43</b>	<b>8</b>	<b>8</b>	<b>2</b>
IEEE	"ITIL" AND Cloud	517	20	2	2	2
	"Information Technology Infrastructure Library" AND Cloud	147	19	0	0	0
	<b>Total</b>	<b>664</b>	<b>39</b>	<b>2</b>	<b>2</b>	<b>2</b>
Scopus	"ITIL" AND Cloud	861	60	11	11	10
	"Information Technology Infrastructure Library" AND Cloud	113	18	2	2	2
	<b>Total</b>	<b>974</b>	<b>78</b>	<b>13</b>	<b>13</b>	<b>12</b>
Springer	"ITIL" AND Cloud	1158	X	6	4	1
Springer	"Information Technology Infrastructure Library" AND Cloud	232	X	1	1	1
	<b>Total</b>	<b>1390</b>	<b>0</b>	<b>7</b>	<b>5</b>	<b>2</b>
WOS	"ITIL" AND Cloud	50	34	7	7	6
WOS	"Information Technology Infrastructure Library" AND Cloud	21	15	2	2	2
	<b>Total</b>	<b>71</b>	<b>49</b>	<b>9</b>	<b>9</b>	<b>8</b>
	<b>TOTAL</b>	<b>5057</b>	<b>238</b>	<b>41</b>	<b>39</b>	<b>28</b>

In the first filter of Table 3, the keywords for each repository were introduced and a search was performed applying them to the abstract. In the second filter, the same logic was applied for the title of the document. In the third filter, only journal articles or conference proceedings published after 2010 were selected. In the fourth filter, the selection was made only for publications in English. The fifth filter is for removing the duplicated publications and the last filter is for applying quality requirements about the Journal or Conference rank.

Due to the reduced number of articles identified in the electronic repositories, an additional step was included in this process, consisting in analyzing the references that supported those articles. In that sense, after applying the same basis (filters and inclusion/exclusion criteria), 6 other articles were found, containing relevant information for this dissertation, in which, Google Scholar and Research Gate were the repositories that provided the results. The classification of the Journal Articles and Conference Proceedings was performed using Scimago and Conference Ranks. Even though for some of these studies, the respective ERA (Excellence Research in Australia) or QUALIS ranking was not classified, given the fact that the criteria assumptions were met, it was decided to include them in this study due to the information within, which contributed to framing the theme.

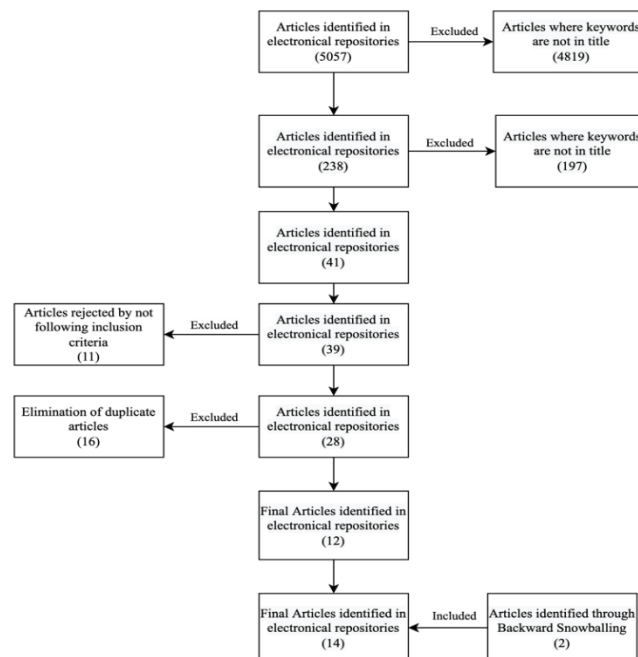


Figure 2 - Flow of filtration process

After carrying a careful analysis about these 14 contributions, 10 of these papers were mostly aligned with the defined criteria and are analyzed in the following subchapters. The flow of filtration is presented in Figure 2.

Regarding research activity, in Figure 3, it can be seen in the below graphic that, according to the filters and criteria used, in 2014 and 2018 the activity research was higher than the other years.

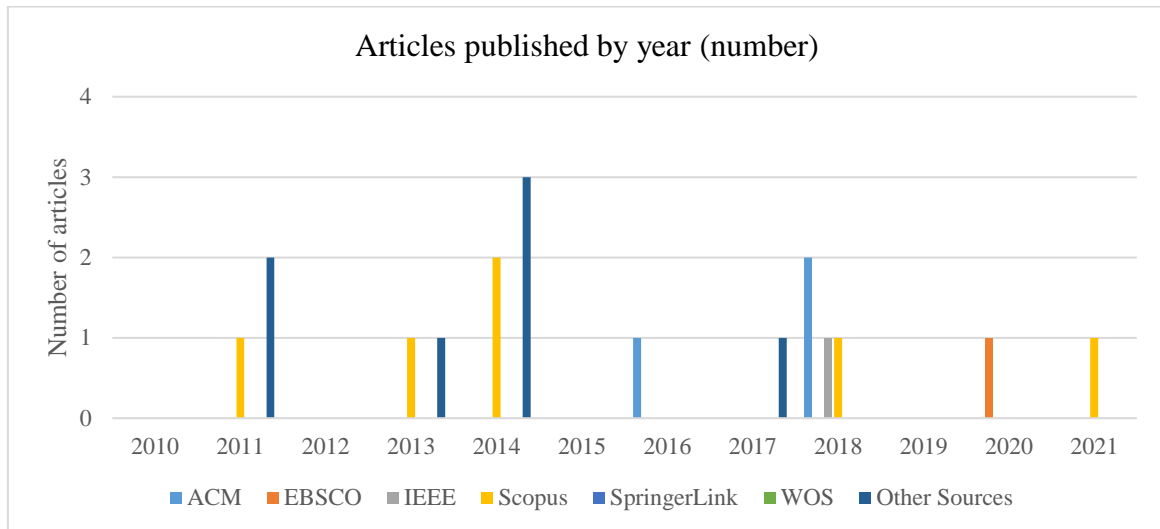


Figure 3 - SLR obtained articles published by year

The number of studies published is low as well as the difference between these years and the remaining years in the range. In terms of electronic database repositories, Scopus provided most of the studies used in the present work. Nevertheless, through backward snowballing, other studies were collected from Google Scholar and Research Gate.

In the following sections, each one of the main articles is analyzed. In ‘Table 4 - Final Articles selected information’, these articles are listed, outlining some relevant information as well as its purpose regarding the present research.

### Quality Measurement of ITIL Processes in Cloud Systems

Fiegler et al. (2016), in this research, focuses on the definition of measurement methods and metrics from the view of the Cloud Providers. Therefore, two new metrics were: “system operation learning rate” and “system entropy rate” to measure the quality of the Incident Management processes within the Cloud-based model systems. The first metric has per goal to measure the number of incidents that occurred when the cumulated

production volume increases, which is expected to be lower due to automation and proactive incident management. The entropy rate is used to measure the disorder in the systems and is used for validation of the growth type, either volume or diversity increase. For three years, the authors observed both the number of incidents and the number of different incidents for three environments, two with classical on-premise hosting and the third as a private cloud.

While contexting the research topic, it is established the relation of Cloud Computing characteristics and ITIL processes in Figure 4, such as rapid elasticity and service operation processes, resource pooling and Service Transition processes, and On-demand Self-Service of Service Design Processes, stating the need of automating the ITIL processes due to the CC model characteristics.

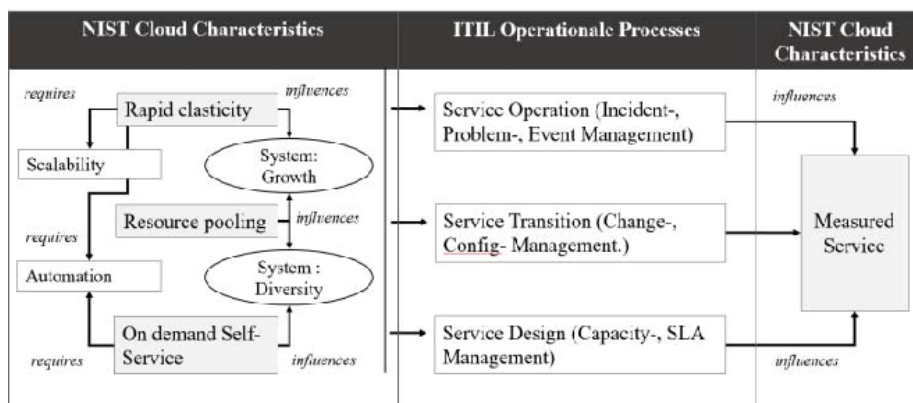


Figure 4 - Relation between Cloud characteristics and ITIL Processes (Fiegler et al. 2016)

As a result, for on-premise IT environments, a significant learning rate was verified while on the Cloud-based environment, the entropy rate was substantially increasing when compared to the other environments and the learning rate was not significant. For Cloud-based model environments, the authors consider that an increased learning rate and a decreased entropy rate are crucial to ensure proper SLA Management in these environments due to the implicit elasticity characteristic.

### **ITIL process management to mitigate operations risk in cloud architecture infrastructure for banking and financial services industry**

Mahalle, Yong, and Tao (2018) analyze the need of having well-established ITIL Operation processes, focusing on Incident Management, SLA Management, and Change

Management, for the banking and financial sector, in the Cloud-Based architecture context.

Those processes are depicted in the analysis performed emphasizing the banking and financial sector that is characterized by having a substantial cloud architecture, involving multiple teams. One of the most relevant aspects highlighted is the significant existence of high-priority incidents that lead to emergency changes deployed in the Cloud architecture. For this specific sector, this constitutes a significant financial loss. To reduce their number, the authors point out some of the reasons that justify their creation related to incorrect incident priority assignment, lack of training of the CSPs, lack of communication with the stakeholders, unavailability of the staff to perform changes outside working hours, and incorrect emergency change approval by the Cloud Service Manager. These risks can be mitigated by the rising experience of the CSP, inflexible operational control, and collaboration between the entities and the CSP.

### **Information Technology Infrastructure Library and the migration to cloud computing**

Cardoso et al. (2018) focused their analysis on the application of ITIL to support the Cloud-based model adoption by organizations minimizing the associated risks and ensuring a proper transition from an on-premise model to the cloud context. Two main vectors are being analyzed in this study, one referring to the potential benefits that ITIL brings to cloud adoption regarding service migration, apps, and data. The other is related to the individual knowledge-accessibility skills that can be enhanced through the application of these procedures.

After analyzing several IT frameworks, ITIL was the one selected due to its acceptance and objectives. Consequently, a framework was developed to assist organizations in the IT services migration to the Cloud to attest mapping between ITIL and the transition to the Cloud-based model. In this proposed framework, its processes are mapped with ITIL processes such as:

- “define a strategy” and “identify and understand “with “requirements analysis and definition”;
- “define, analyze and map” with “migration to production”
- “migrate and govern” with “operation and improvement in production”

In summary, the authors concluded that the migration of IT services to the Cloud from on-premise environments can be supported by ITIL although it's mentioned that organizations do not need a complete ITIL implementation to perform this migration.

### **What does IT Service Management look like in the Cloud? An ITIL based approach**

In this article, Jansen (2011) introduces CC and ITIL theory and then presents a discussion about specific ITIL processes for IT Service Management and their relevance in the CC context.

This analysis starts by defining which processes within the ITIL v3 lifecycles phases should be considered in the scope of CC. Then, an extensive discussion about each one of them is performed to identify what should be adapted to this model.

The main conclusions of this article are the following:

- Process approach in a cloud-based infrastructure needs to be considered differently when compared to the traditional infrastructure.
- Customer and Service Providers points of view are different and specific lifecycle phases may be more important than others for each one of the parties;
- The ITIL v3 needs to be reviewed in some of its processes concerning CC.

### **Towards Cloud Computing Management Model based on ITIL processes**

In this research article, Karkošková (2018) starts by referring that Cloud Computing has brought the need to reassess the management principles and processes in the view of the cloud service consumers. Despite the ITIL framework could provide guidance on these aspects for the organizations, its reassessment is required since was not initially designed for the CC context. This would allow ITSM to be more suitable for consumers.

This analysis has two main research questions:

- “How should ITIL framework be adapted in terms of managing cloud computing services from cloud service consumer perspective?”
- “What changes to ITIL processes are needed to support the adoption and utilization of cloud computing services?”



After performing a literature review, the author provides a proposal of an ITIL 2011 extension called “Cloud Computing Management Model” focused on the cloud consumer service perspective. In this model, some phases and processes may be compared to ITIL being more suitable to accommodate cloud computing environment requirements.

### **Cloud Computing; Design of a Management Model for Service Migration Using Itil as Knowledge Manager**

In the study presented by Lopez, Paredes, and Tapia (2018), a Methodological Proposal for service migration into the Cloud is proposed, using ITIL processes as a reference. The main ITIL v3 processes that are most relevant to ensure a proper transition into the Cloud-based model are identified. Therefore, Service Portfolio Management, Availability Management, Service Validation and Testing, Knowledge Management, Service Desk, and Access Management are the ones that need require additional effort and attention.

Ultimately, the authors point that the main risks of the migration are the existence of oversized resources that represent higher costs for the organizations and the possibility of having data hosted in countries where the data regulations may not be aligned with the organization’s expectations, which can create privacy issues. Nevertheless, ITIL is considered a reference that may provide some guidance helping the companies on this transition and the usage of the Cloud may enhance the organization’s productivity.

### **A comprehensive study of the role of cloud computing on the information technology infrastructure library (ITIL) processes**

In this study, Wang, Zhong, and Li (2021) performed a literature review about the effects of the cloud-based model in ITIL processes. Its goal is to check how the ITIL processes problems can be solved and what is the role of the Cloud Computing model to achieve it. The related work results were categorized into two groups, cloud service providers and cloud server providers. After analyzing the results, two main conclusions are presented in the study:

- The CC model has not only a significant impact on the way IT resources are used but also on the role of enterprise architecture, accentuating the need for ITSM. When using the Cloud-based model, organizations may focus on their core business and reduce information service construction costs. Therefore, ITSM frameworks as ITIL play an important role in Cloud Computing management but must be reframed to cover the CC context.
- There is no research activity about the application of the Cloud system with ITIL, although ITIL provides high-level guidance for organizations in the way the services are managed. Introducing cloud systems in ITIL is a complex, costly, and risky task.

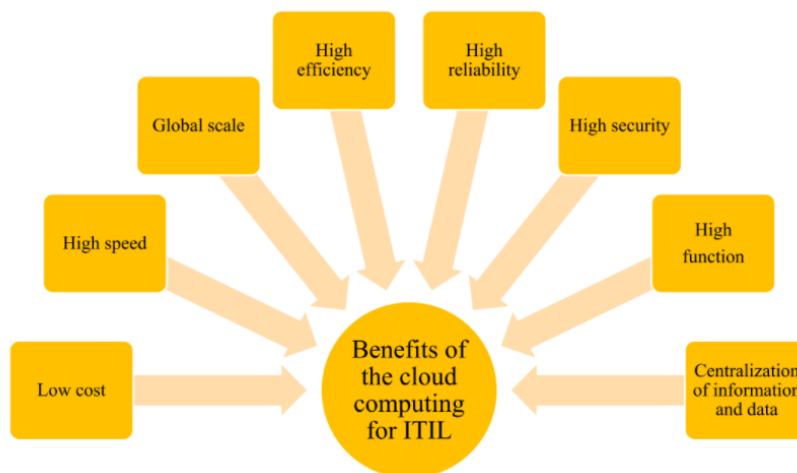


Figure 5 - Benefits of the cloud computing for ITIL (Wang, Zhong and Li 2021)

The benefits of the CC model for ITIL implementations are identified in Figure 5, nevertheless, the migration for the Cloud constitutes a serious decision and organizations must be aware of it. The authors suggest that more research on these topics should be performed through the adoption of a broader method to the investigation design.

### **The Impact of Cloud Computing on ITIL Service Strategy Processes**

Al Mourad and Hussain (2014) focused on the ITIL service strategy process, more specifically, on the effects of the Cloud-based model implementation in the strategy subprocesses. A case study approach was performed in which four different organizations were considered, where semi-structured interviews were conducted to capture experience

and opinion insights. Those companies either partly adopted the cloud-based model or consider adopting it.

In summary, the authors concluded that ITIL, in the context of the cloud-based model, should be reframed, especially the Service Strategy processes, although its objectives should be kept. Implementing a rigorous strategy program would decrease the organization's exposure to avoidable situations without responsibility for the delivery of end-user services and constitutes major risks to any entity migrating to cloud-based solutions.

### **An IT Infrastructure Library (ITIL) Maturity Strategy for Private Cloud Sourcing Models: A Literature Review and Research Methodology Formation**

With regards to the ITIL Maturity scheme, Miller et al. (2013) proposed a roadmap for the first step of ITIL implementation for companies shifting to the cloud service-sourcing model. Being included in the organizations' 3 to 5 strategic program, the authors provide Business and IT leaders a method for implementing ITIL assisting in the migration strategy into a private cloud solution. Primarily, a literature review was carried out containing the perspective of ITIL knowledgeable professionals and industry surveys. Then, a review of the research method used is presented.

As indicated by the authors, the most relevant conclusion that can be extrapolated from this research is that a well-implemented ITIL plan will guarantee success in the long run for organizations aiming to operate in private cloud-based sourcing.

### **Related Work Synthesis**

From the SLR results, although the number of relevant studies identified is not high, its contributions provided valuable insights. Therefore, it has been possible to identify some of the ITIL processes that can and/or should be adapted to the Cloud context, to attest to the importance of the ITIL guidance in the migration to the Cloud. Moreover, it allowed us to understand which and how the widely known cloud model characteristics may impact the ITIL processes (Fiegler, et al. 2016). Some of the articles identified, either present an ITIL extension to accommodate the cloud characteristics (Karkošková 2018) or develop a framework to assist in transition (Cardoso, Moreira and Escudero 2018). Others suggest that due to the benefits and risks that are implicit in the Cloud-based

model, ITIL should be entirely reframed to mitigate the risks and make better use of the benefits to enhance organizations' performance (Wang, Zhong and Li 2021, Al Mourad and Hussain 2014).

Regarding the five NIST Cloud essential characteristics (On-demand self-service, broad network access, resource pooling, rapid elasticity or expansion, and measured service), it is observed that three of them may influence the way ITIL processes are implemented and operated in practice (Fiegler, et al. 2016). Therefore, rapid elasticity may influence Service Operation processes such as Incident, Problem, and Event Management, Resource pooling will have an impact on Service Transition Processes such as Change, and Configuration Management and On-Demand Self-Service may produce effects on the way Service Design processes are handled such as Capacity and SLA Management.

In Table 4, it's indicated which are the main ITIL processes in which the Cloud Computing model adoption will require more effort for organizations when compared to the traditional on-premise model. It can be verified that Service Strategy is the most referred process impacted by the migration to the Cloud.

*Table 4 - Final Articles selected information*

<b>Author</b>	<b>ITIL processes impact/focus</b>	<b>Rank</b>	<b>Type</b>	<b>DB</b>
Fiegler et al. (2016)	Operation, Transition, Design	B4	Conference Proceeding	ACM
Mahalle, Yong, and Tao (2018)	Service Operation	Q4	Journal Article	EBSCO
Cardoso, Moreira, and Escudero (2018)	All Processes	Q2	Journal Article	ACM
Jansen (2011)	Strategy, Design, Transition, and Operation	N/A	Journal Article	Scopus
Karkošková (2018)	All Processes	N/A	Journal Article	ACM
Lopez, Paredes, and Tapia (2018)	Service Strategy, Service Design, Service Transition, Service Operation	B1	Conference Proceeding	Scopus
Wang, Zhong, and Li (2021)	All Processes	Q1	Journal Article	Scopus

Al Mourad and Hussain (2014)	Strategy	N/A	Journal Article	Research Gate
Miller et al. (2013)	Strategy	N/A	Journal Article	Google Scholar

In a nutshell, the SLR produced the expected results. These valuable inputs will serve as a basis to conduct the following Semi-Structured Interviews to collect information about the most impacted processes in ITIL implementation, arising from the characteristics of the Cloud Computing model, as depicted in the following chapters.



### Chapter 3 – Research Methodology

The findings produced in the ‘Related Work’ chapter, suggest that there are limited results in the traditional literature. Therefore, it was necessary to adopt a methodology that allows the researcher to gather in-depth knowledge experience out of the traditional literature. Moreover, it was necessary to adopt a methodology providing a clear strategy about how to gather, organize and extrapolate significant conclusions, meeting the initially proposed objectives of this study. Therefore, was used qualitative research through the one-on-one Interview research method was through semi-structured interviews, using either Zoom or Microsoft Teams to record the interviews for further analysis. This technique is a significant tool that allows the interviewer to gather subject insights regarding experiences (Rabionet 2011, McIntosh and Morse 2015). It provides some flexibility combining specific and open questions, allowing the interviewer to probe and use follow-up questions (Hove and Anda 2005, McIntosh and Morse 2015).

The interviewees are proven knowledgeable professionals in the area, that work or worked closely both in the traditional on-premise IT model and Cloud-based model and have a certification in ITIL framework, at least, from the ITIL v3 2007.

In the first phase, and, a profile analysis under LinkedIn was performed to gather the relevant results. Therefore, the search was “ITIL” and/or “Cloud”. Under the “ITIL” results, it was analyzed if the professional had experience with the Cloud-based model, based on the experience and/or certifications. Under the “Cloud” results, it was analyzed if the professionals had ITIL certification from ITIL v3 2007 to ITIL 4, either is ‘Foundations’, ‘Expert’ or ‘Master’. Some of the interviewees in which their profiles also fit the above-mentioned criteria were directly invited since they are widely known for their ITIL framework ‘white papers’ or ‘articles’ in the area. From the 40 invitations, only 13 professionals accepted, and 2 of them, after introducing the questions, recognized having a lack of specific knowledge. The others 22 invited professionals were unavailable.

In a second phase, an interview guide was created, following the orientations provided by McIntosh and Morse (2015) as below presented in Figure 6.

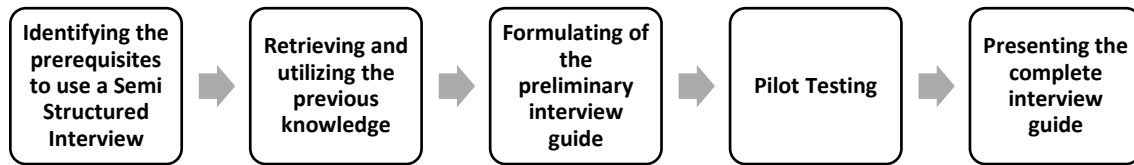


Figure 6 - SSI interview guide main phases (adapted from McIntosh et al. 2015)

It was used in each one of the interviews, combining open and closed questions, that allow the interviewee to share both their experience and thinkings about the topics approach on this dissertation. Also, this method allows the interview to perform additional or side questions to mitigate or remove ambiguity by rephrasing or dividing the questions into further sub-questions, or to get more in-depth knowledge answers about a certain topic that has relevance for the present study. The interview guide can be assessed in Attachment B – Interview Guide.

In a third and last phase, both qualitative data collection and data analysis were performed using maxQda, which is a widely known computer-assisted qualitative data analysis software (CAQDAS), which was the chosen tool for transcribing the recorded video interviews, organizing the content of each interview and assist in conclusion extrapolation of the interviews.



## **Chapter 4 – Data Collection and Analysis**

### **4.1 Qualitative Data Collection**

In the sub-chapters below, a synthesis of each one of the interviews is presented, having in mind the premises and goals of the present study. The full transcription of each one of them is available in Attachment C – Interviews.

### **4.2 Profile of the interviewees**

The profile of the interviewees is presented in Table 5. Regarding gender, the sample is only composed of men. The predominant education is MBA although at the BSc level many participants have an IT or Electronical Engineering degree. Regarding nationality, there is some disparity although Portuguese is the nationality most observed, and the average work experience is 21 years. Regarding the sector, IT is predominant and ITIL Foundations is, as expected, the certification that is most held by the participants.

Their experience is synthesized in the following sub-chapter.

Table 5 - Profile of the Interviewees

ID	Gender	Country	Job Title	Work Experience	Industry sector	ITIL certifications
1	M	Portugal	Head of IT Processes	22 years	Telco	ITIL V3 Foundation, ITIL Manager, ITIL Expert
2	M	Brazil	Consultant	14 years	IT	ITIL V3 Foundation, ITIL MALC, ITIL Capability (OSA, PPO, RCV, SOA), ITIL Expert
3	M	Kenya	Consultant , Trainer	16 years	ICT	ITIL Expert, ITIL Practitioner, ITIL 4 Managing Professional Transition
4	M	USA	Head of Service Management	28 years	IT	ITIL Master
5	M	Brazil	Professor	25 years	Education	ITIL Foundations, ITIL Master
6	M	Bulgaria	Information Security Officer	15 years	IT	ITIL Foundations
7	M	Philipines	Director of IT	20 years	Energy	ITIL v2 and v3 Foundations, ITIL v3 Foundation, ITIL Intermediate (OSA), ITIL 4 Foundations
8	M	Denmark	Process Architect	35 years	Transport	ITIL Master
9	M	Portugal	Project Manager	18 years	IT	ITIL v3 Foundations
10	M	Portugal	Client Success Manager	12 years	ICT	ITIL Foundation in Service Management, ITIL Intermediate Certificate in IT Service Transition, Service Operations, Continual Service Improvement, Service Strategy, Service Design, MALC,
11	M	Ireland	CEO	22 years	Consulting	ITIL Foundation ITSM, ITIL Practitioner Change Management, ITIL Practitioner Problem Management Certificate, ITIL v2 Service Manager, ITIL v3 Expert, ITIL Master

### 4.3 Interviews Synthesis

In the following sections, a summary of each interview carried out is presented. The interview guide containing the questions, can be assessed in the ‘Attachment B – Interview Guide’. The full transcription can also be assessed in the ‘Attachment C – Interviews’.

#### 4.3.1 First Interview

Regarding the first question of the interview, the interviewee considers that “ITIL is a tool that is basically used to manage services” used by organizations. Nevertheless, although ITIL v3 2011 is still applicable for the Cloud context, two different perspectives must be analyzed in which the approach must differ: client-side and provider side, since the impacts of the Cloud in implemented ITIL processes will be different. From the Provider side, ITIL is a “way to provide more reliable services”. For that reason, the ‘Service Design’ process group must be carefully addressed in a different way regarding the Cloud context. From the Client-side, ITIL must be adjusted to the cloud characteristics since “the client doesn’t own the infrastructure” and the management approach must be adapted.

The impacts of the Cloud-based model in terms of the ITIL processes approach must also be seen from these two perspectives, but the impact on the client-side is more identifiable. Therefore, in the Service Strategy group, Financial Management must be addressed differently. The traditional model requires a “huge CAPEX investment and low OPEX” contrary to Cloud that constitutes OPEX costs which “organizations are very reluctant”. The financial departments must understand that Cloud is OPEX and constitutes an investment. In the Service Design group, Service Level Management must also be addressed differently, since the SLAs are usually standardized by the Cloud Provider and therefore, the “negotiation power of the client is low”. Capacity Management must also be approached due to scalability and elasticity characteristics differently since there is no need for exhaustive monitoring since this function is assumed to be handled by the Cloud Provider. Supplier Management must be also enhanced since there is a need to closely deal with them and “deeply understand what is being offered to avoid future problems for instance in the continuity of the service”, avoiding possible outages.

In the Service Transition group, Change Management, Service, and Asset Configuration Management must be also reviewed. For Change Management, if a

Provider performs a change in the scope of “technological evolution operations”, the Client must be involved, and “notifications must be sent on time” to mitigate unexpected impacts on the “applications that are installed in that client’s machine”. Since usually “a cloud asset is not seen as an asset”, Service Asset & Configuration Management must be also reviewed, and cloud assets must be truly recognized by the financial departments since is “something that brings costs” that must be optimized.

At the work level, the framework used by the interviewee is ITIL v3 2011 along with ISO20000. For Cloud specifically, ISO27001 would be suitable since it addresses security topics that must be covered within this context.

According to the interviewee’s professional experience, there are three main benefits that the Cloud-based model brought to organizations. Cloud allows to use IT services “without having the cost of ownership” the infrastructure, there is cost optimization when compared to on-premise infrastructure and ultimately, it enables the possibility of quickly scaling the service capacity enabling organizations to “fulfill the recurrent and changing business needs”.

The full interview can be assessed in Attachment C1 – First Interview.

#### 4.3.2 Second Interview

The interviewee considers that ITIL offers a flexible “guide of best practices” in its implementation and must be agnostic of the model used. Although ITIL was somehow considered bureaucratic for some controls and processes, the latest version “introduces some new concepts such as Agile and DevOps”. More than just “adopting the technology”, it’s necessary to adapt the processes to maximize the benefits of the Cloud-based model, mitigate the risks, and “ensure that the control is not lost”.

In terms of ITIL processes, the impacts are observed in the Service Design, Service Transition process groups.

In Service Design, Supplier Management and Service Level Management processes became now more important since there is a dependency on external providers and there is a need for proximity, and “the contracts must be well understood and agreed” with both parties. Capacity Management is also important due to the elasticity and scalability characteristics and Information Security Management is now crucial since there are “vulnerabilities that must be assessed, the exposure level” of the data and the providers must ensure a proper “disaster recovery plan” of the client’s data.

In the Service Transition group, Change Management must be addressed differently the Cloud-based model allows some agility and automation that do not need a typical change request and change approval procedures. Service Asset & Configuration is another example given since it will be necessary to maintain an enhanced “control of the assets and the relations with the components” since through automation, it is possible to quickly “have a server available”.

Regarding the second question, the interviewee is using ITIL v3 2011, but considers that ITIL does not fully cover the cloud-based characteristics since it’s not fit to the “newest technologies cloud-based”. Although ITIL 4 has somehow “filled the gap” about Agile, DevOps and Cloud, there is still nothing solid and orientated providing detailed orientation about to approach the cloud context, although the bureaucracy level is lower when compared to the previous editions.

As the main benefit in providing IT services, scalability characteristic is beneficial since it allows a “better time to market” in service delivery which constitutes an advantage for organizations, enhancing competitiveness. Since the infrastructure is now outsourced by the Provider, the organizations can now “focus on the core services” and the significant costs of having specialized IT infrastructure teams are now “delegated to the provider”.

The full interview can be assessed in Attachment C2 – Second Interview.

#### 4.3.3 Third Interview

According to the interviewee, the newest ITIL version is aligned with the Cloud Context since it’s a “huge update from the previous ITIL version” and “adapted to the digital age” which requires an adaptation from the “modern ways of working” to the latest technologies where the Cloud is included. Clients are demanding more resilience and agility. Agility is perceived as “flexibility and speed” in terms of performing “changes to existing products and services” and Resilience is the organization’s ability to recover from a “crisis or a disaster and bounce back”. These values are focused by ITIL 4 and “Cloud is leveraging on this”, ensuring customer needs are met to deliver the best value. The Cloud capabilities can be leveraged for ITIL 4 guiding principles “especially when adopting an agile way of working”. The interviewee considers that there is a strong relationship between ITIL 4 and Cloud, since “ITIL 4 is written for the digital economy and the Cloud is at the core” of it. On the contrary, ITIL v3 was built for on-premise

reality, nevertheless, although it does not cover Agile, DevOps, Lean, and other practices, “it’s still suitable for the Cloud”.

The framework used by the interviewee is ITIL 4, nevertheless, he has already worked with ITIL v3 2011. Regarding ITIL v3 2011, the interviewee considers that the biggest impacts of the Cloud are mostly felt in the Service Transition domain such as, Release and Deploy Management, Service Validation, and Testing, and Change Management. In the Service Design domain, the Supplier Management process “becomes key” as well as the Financial Management in the Service Strategy.

Release and Deploy Management and Service Validation and Testing are tightened and are truly impacted by technologies that the Cloud provides, especially DevOps CICD “Continuous Integration Continuous Deployment” since Cloud “facilitates automated testing”.

Change Management, due to the speed and flexibility that the Cloud provides, must be addressed differently since it’s now possible to implement a higher volume of change requests when compared to the traditional model, especially when using CICD.

In the Service Design domain, Supplier Management became more important since now they are a “key supplier” where the concerns of continuity are now delegated in the Provider, having much more control than in the context of an on-premise model.

From the Service Strategy, Financial Management was pointed out as a “very key topic” since “cloud moves from buy to rent” and costing must be addressed differently. According to the interviewee, even in ITIL 4, this process should be enhanced since organizations are facing unexpected “bill shocks” in terms of Cloud and Providers are enhancing cost monitoring for the users enabling “thresholds” to avoid unexpected costs. In that sense dealing with “Cloud Pricing and bill shocks” is a topic that must be addressed by upcoming ITIL versions to ensure organizations have the proper controls to “monitor spending on the cloud”.

The benefits of providing services via Cloud are perceived by the interviewee since implementing ITSM tools was a very demanding challenge in the traditional IT context, since typically these tools are meant to be customized which means effort in bug fixing, there were issues in the communication between client and vendor. Cloud-enabled “Service Management practitioners to focus on Service Delivery” rather than manage “infrastructure, platforms, and updates”. Nevertheless, there are some constraints in the usage of a Cloud-based model such as data exposure in countries where “data privacy laws” are not the expected ones. For that reason, is important to choose a “reputable

provider” that has the necessary “mechanisms in place” and meets the data storage requirements that organizations need.

The full interview can be assessed in Attachment C3 – Third Interview.

#### 4.3.4 Fourth Interview

For the interviewee, the relationship between ITIL and Cloud is highlighted by the need of having a “discipline managing Cloud Providers” and therefore ITIL is “still very relevant”. Although the Cloud enables automation, for instance in his organization, the Change Management process is quicker and “less than 2% of changes are normal changes” since much more automated changes are being performed, contrary to the on-premise model where there was a higher need to review the changes. In that sense, there is “less human intervention in the process layers”. Nevertheless, the ITIL framework is still important, especially ITIL 4 that has better practices when compared to ITIL v3, especially regarding “core processes” such as “Problem and Change” management.

Regarding the framework used, in the interviewee’s organization, among others, ITIL is used but only for key operational Service Management areas such as Service Operation group of processes such as Incident, Problem and Event Management, and Request Fulfilment. Nevertheless, the interviewee provided his insights about the most impacted processes by Cloud which are Supplier Management and Information Security Management from the Service Design group. Therefore, Supplier Management becomes critical since there is a lot more effort allocated in managing the 3<sup>rd</sup> party suppliers, especially in case of technical issues from the Provider that requires them to provide a “mechanism to engage from their standpoint”. Information Security Management becomes also critical since the organization relies on suppliers to ensure that “we are safe in our application stack”.

The benefits of providing services through the client, in the interviewee’s view can be verified by the possibility of performing quick capacity adjustments, the inherent elasticity cloud characteristic, cost efficiency when compared to on-premise which “has a lot of capital expenses”. Another benefit highlighted was that Cloud allows “much more redundancy” since “cloud solutions have already redundancy built” enhancing availability.

The full interview can be assessed in Attachment C4 – Fourth Interview.

#### 4.3.5 Fifth Interview

According to the interviewee's perspective, there is a "good relationship between ITIL/ITSM with the Cloud" model since automation capability reduced bureaucracy and requires less human effort, saving time. The benefits of the Cloud-based model are evident such as cost efficiency and "lot more flexibility", but "it must be managed".

The framework used in his organization is ITIL v3, but not only since Lean, Scrum, DevOps are also used. ITIL is mainly used for operational processes such as Incident and Problem Management that belong to the Service Operation group. Nevertheless, the interviewee provided his insights about the most impacted ITIL processes by the Cloud-based model which are IT Service Continuity Management, Availability Management, and Capacity Management from the Service Design group. Availability Management is now easier since it's possible to minimize incident downtime enabling availability for the end-users. IT Service Continuity Management is now enhanced since the "cost and effort associated" to disaster recovery scenario is now lower, since it's very to "duplicate the computational resources", bringing huge benefits to the organizations. The interviewee considers that the other processes "didn't change a lot in practice" such as Incident and Problem Management from the Service Operation group.

As benefits in providing IT services via Cloud, "scalability is the most important" since with the "automation to grow capacity", there is no effort needed in "preparing physical servers" to accommodate increasing computational resources consumption arising from the business side.

The full interview can be assessed in Attachment C5 – Fifth Interview.

#### 4.3.6 Sixth Interview

In the interviewee's perspective, in Cloud adoptions, ITIL has an important role "in several aspects in terms of Strategy". In that sense, these aspects allow the organizations to raise awareness and consider important factors when deciding to move into the Cloud-based model. Organizations must do their research "to address the concerns" they may have, before taking this step. Therefore, internally the main questions are related to the need of owning the infrastructure, deciding to move "the whole business to the cloud" or "just part of it", selecting the "type of cloud that should be used", either "public, private or hybrid". Additionally, for international organizations, it's necessary to be aware of "data protection and laws". Regarding portfolio management, a proper analysis of the



“Cloud Service Providers services in the market” is required to meet business requirements and the investment level. Then, when the contract is established and the organization becomes “customer of the Cloud Provider”, financial management is an important aspect since organizations do not have the “control they have on-premise” and the Provider must provide detailed information about the consumption bills and implement a “billing process to satisfy” organizations’ needs. Another important aspect is to ensure proper SLA Management especially in “peak periods” otherwise it constitutes a risk that “could lead to damage for the customer business”. Providers must also be supported to ensure alignment about the client’s perspective of service and meeting “business and requirements” needs. Therefore, the “ITIL processes must be in synch”.

The framework used in the interviewee’s organization to manage cloud services is SOC, although in the past he has worked with ITIL v3. Therefore, in his opinion, ITIL v3 covers the entire Service Design process group. Nevertheless, for the Service Operation group, the Incident Management process is the most impacted due to the nature of the incidents that derive from the Cloud Computing model. The other processes in ITIL “can still be the same” if the nature of the service is considered.

Regarding the benefits of providing IT services via the Cloud, if “proper planning” is performed, “agility, scaling cost, improved collaboration, availability, and business continuity” are the main aspects. As risks, it was identified the “lack of control” from the client-side.

The full interview can be assessed in Attachment C6 – Sixth Interview.

#### 4.3.7 Seventh Interview

The interviewee considers that ITIL and the Cloud-based model have a strong relationship in which the CC model has influenced the way ITIL evolved, especially from ITIL v3 to ITIL 4. The premise behind ITIL v3 is “about providing value-added services to the client” while ITIL 4 is about “value co-creation” in which Cloud is aligned and has an important role. In this model, the “synergy between client and the IT organization” becomes more complex, in which the infrastructure is shifted to another organization that has its “underpinning contracts that are very important”. For that reason, it’s necessary to ensure process alignment between both entities.

Regarding the framework adopted in his organization, ITIL 4 was recently implemented, but before that, it was ITIL v3 2011, which was “adjusted for the Cloud”.

The interviewee considers that both ITIL v3 2011 and ITIL 4 are “aligned with the Cloud environment”.

When compared to on-premise context, providing IT services through the Cloud-based model there are “evident advantages”, that be translated into “money and resource savings”, cost-efficiency, scalability needed for supporting the business needs, and the ability to work remotely which saves time and avoids unnecessary physical displacements from professionals.

The full interview can be assessed in Attachment C7 – Seventh Interview.

#### 4.3.8 Eighth Interview

In the interviewee’s perspective, ITIL is about the adoption and adaptation of the principles that organizations need and must be agnostic of the context, either in Cloud or on-premise model, enabling organizations to “take the right decisions” in the context of IT management.

The framework used in his organization is ITIL v3 in which the interviewee considers that cloud characteristics are completely covered in its processes, especially in Change Management, Incident Management, Service Level Management, and the processes within the Continual Service Improvement group.

Regarding ITIL 4, the interviewee does not consider it to be a significant evolution from the previous edition, although he considers it “a better framework now”.

As the main benefits of providing IT services via the cloud-based model, the interviewee considers that outsourcing the services to a third-party company provides the availability for the organizations to focus on their core business. Nevertheless, there are some risks such as loss of control. For that reason, organizations must select a “trustable and reliable provider”, otherwise they will invest “a lot of time, resources, people” monitoring the cloud services provided to them, and it can be quite expensive in that sense, just to “confirm what they paid for”.

The full interview can be assessed in Attachment C8 – Eighth Interview.

#### 4.3.9 Ninth Interview

In the interviewee’s view about the relationship between ITIL and Cloud, the framework is still “relevant both in on-prem and in Cloud context. The Cloud-based model brought significant “productivity gains” when compared to the on-premise model

where a “strong business case” was required to minimize both direct and indirect costs that now become more evident since, for instance in the “lift and shift model”, organizations do not have to manage their infrastructure when moving from the traditional datacenter to IaaS model. Therefore, ITIL plays an important role “especially in the Service Design phases” where SLA’s must be well defined and agreed between the Client and the Provider, and the costs must be carefully predicted to avoid unexpected impacts in the business case. Besides ITIL relevancy in this context, the framework requires less technical concerns such as the “internal implementation side or how to make it available” but rather “activate, buy, license” and “define governance”.

ITIL v3 2011 is the framework used in the organization for which the interviewee is working, and in his view, the framework must be agnostic from “the environment itself, cloud or on-premise” and “doesn’t need any revamp to support cloud characteristics. The most relevant concepts of this model such as “SLA’s, OLA’s, RACI, responsibility definition of each entity” are reflected in the framework. Formerly, organizations were more focused on the “application to be developed” and not on the service to be delivered to the client. Nowadays, there is more “SOA thinking” and more effort is put on “service delivery, “thinking of designing the services, transition, and operation of the services” which was not so compatible with on-prem environments reality, and ITIL at the time “was much more aligned and prepared to cover those needs of planning and management”. Nevertheless, Change Management is approached differently from the Client-side than it was in the on-premise model since the control is on the Provider side. An example is the lack of control from the Client-side when “something comes to a Production environment and how or when it is delivered to the users”.

Regarding the benefits in providing IT services through Cloud, “there are great advantages for the same reasons cloud is beneficial for other contexts”, such as “knowledge and volume synergies” and “cost-reduction”.

The full interview can be assessed in Attachment C9 – Ninth Interview.

#### 4.3.10 Tenth Interview

According to the interviewee’s view, ITIL is flexible and the “approach of ITIL shouldn’t be different because of Cloud”. With the introduction of ITIL 4 with its Agile and Scrum methodologies, organizations want to be more “agile, quicker, even ignoring some ITIL principles” due to the “ease and speed in execution” capability that the Cloud-based model allows. Nevertheless, the way ITIL was implemented so far in the scope of

Cloud, produced some “inflexible, bureaucratic procedures” due to the vision that organizations had of ITIL v3 implementing “very controlled and bureaucratic” procedures, since “ITIL is about guiding principles” and must be adapted accordingly with the organization’s needs “with the proper logic, instead of “making it bureaucratic”. Therefore, ITIL v3 processes can be implemented having in mind an “agile way”.

The framework adopted by his organization is ITIL v3 2011 edition and the approach on its processes must be the same, regardless of the model used. Cloud is perceived as “just a data center” and “the processes should not be different or approached differently because of that”.

For the interviewee, the benefits of providing IT services via Cloud when compared to the on-premise “is low or nonexistent”, since “Cloud is typically more expensive”. Nevertheless, the scalability characteristic in performing “upgrades and downgrades” according to the organization’s needs is “a great advantage of the Cloud” model.

The full interview can be assessed in Attachment C10 – Tenth Interview.

#### 4.3.11 Eleventh Interview

The relationship between ITIL and Cloud is not perfectly matched since “ITIL frameworks were designed for this traditional IT up to ITIL 3” and “Cloud delivers IT services and business services differently”. Even in the latest version, there are several gaps such as in the Finance and Governance domain, and in the cloud context, they can “only address certain parts of the solution”. For that reason, organizations “need to understand how to use multiple frameworks” and get the parts needed. Previously, on the traditional on-premise model, frameworks could be applied because “we could control what we got and how we got it”, but since there is some perceived lack of control from the client-side, organizations “must think how to apply this stuff”, that is, IT frameworks.

The framework used by the interviewee in his company is” not a single approach”. Instead, is a “management mash” in which “pieces from various frameworks” were taken and used to build a common framework.

In the previous ITIL versions, Change Management is one of the processes impacted by the Cloud-based model due to the “on-demand self-service” characteristic where changes occur much faster than in the on-premise model where it was a more “bureaucratic” process requiring an “approval process that could take days, weeks”. So, this process must be approached differently to “adopt the velocity of change”. If the Change Management process is slowed, “on-demand self-service agility” is lost. On the

other way, allowing “too much on-demand self-service agility” can constitute a risk of “having an outage, loss of data, customer impact”. Incident Management must also be approached differently since in on-premise, incidents are managed “end-to-end with the supplier”, and now that control is delegated to the Provider. And in that sense, the Provider offers “availability in service” for the client. In the Service Level Management, the impacts are felt in the sense that organizations are not constructing the SLA’s they want, but rather “getting the SLAs by somebody else” which is the Provider.

Capacity Management must also be addressed differently since there is some uncertainty about the usage of cloud resources by non-IT departments within the organization.

In the view of the interviewee, the thinking behind ITIL 4 for the aspects of the Cloud is “still in the past”, although some updates were performed to “match those IT processes into Cloud” context.

Regarding the benefits in providing IT services through the cloud when compared to the on-premise model, in the interviewee’s view, “Cloud is very positive”, but still for almost every benefit, there is a constraint associated that organizations need to be prepared for. There is less effort in managing hardware and datacenter issues since it’s now part of Providers’ function, which frees up time for organizations to “upskill and understand the business side of the Cloud”, but “upskilling resources have a cost associated which constitutes a constraint. The organizations will have “access to the latest technologies and recent updates” more quickly. A “quicker time-to-market” is also seen as a benefit, but that means adopting “DevOps which is a cost”. Since the “IT is outsourced to the Cloud Providers”, the “Provider measures the service” for the Client, which is considered a benefit, but “at their terms”. Another constraint indicated is related to the financial aspect, where “Cost savings is not an initial benefit” is are the “transition costs in migrating from the traditional data center to the cloud”, and a lot of CAPEX investment was previously applied in ‘building’ the datacenter. The full interview can be assessed in Attachment C10 – Tenth Interview.

#### **4.4 Qualitative Data Analysis**

To analyze the significant amount of information gathered from the eleven interviews performed, it became necessary to have a systematic and rigorous methodology. In this sense, Gioia methodology was applied (Gioia, Corley and Hamilton 2012), to preserve the quality and authenticity when refining raw data. As stated by the authors, this

methodology has per purpose to provide a “systematic approach to new concept development and grounded theory articulation that is designed to bring ‘qualitative rigor’ to the conduct and presentation of inductive research”. It’s important to mention that the research model of this study is not covered by the “Ground Theory” approach since the goal is not to formulate new theories through data analysis. Below, in Table 6, the benefits of using this technique in the data analysis step, are presented:

*Table 6 - Features of Gioia methodology in Data Analysis*

Step	Key features
Data Analysis	Perform initial data coding, maintaining the integrity of 1st-order (informantcentric) terms
	Develop a comprehensive compendium of 1st-order terms
	Organize 1st-order codes into 2nd-order (theory-centric) themes
	Distill 2nd-order themes into overarching theoretical dimensions (if appropriate)
	Assemble terms, themes, and dimensions into a “data structure”

In the first step, the first-order concepts were defined by extracting significant fragments either transcriptions or descriptive extraction (Gioia, Corley and Hamilton 2012), organizing them into categories or first-order codes through open coding (Strauss and Corbin 1990). In the second step, axial coding was used “relating categories to their subcategories” (Strauss and Corbin 1990). By assembling the categories having in mind their similarities, it was possible to define the “2<sup>nd</sup> order themes” which are situated in a higher abstraction level. To achieve the “Aggregate Dimensions”, it was used the same principle was. Both 2<sup>nd</sup> order themes and aggregate dimensions are analysis vectors that were expected regarding the research topic of the present study. The results of these steps are below exposed in Table 7.

The aforementioned methodology allowed us to perceive the dimensions of the topics discussed which were categorized in three main Aggregate Dimensions: ‘Relationship’, ‘Impacts’ and ‘Factors’. In ‘Relationship’, we defined ‘Fit-for-use and adaptation for CC model’ and ‘ITIL independence from the model’, as topics identified in the first question of the interview focused on ITIL v3 2011. As ‘Impacts’, it was defined ‘Impacted processes of ITIL / coverage of CC model’ and ‘Impacts on Client and Provider side’, gathered in the 2<sup>nd</sup> question of the interview. Finally, the 3<sup>rd</sup> question of the guide aimed to perceive the ‘Benefits’ and ‘Constraints’ of providing IT Services via Cloud when

compared to the traditional model, which we defined as ‘Factors’. All this information was supported by the 1<sup>st</sup> order concepts, as previously indicated through the usage of this method, which is extractions from the interviews.

Table 7 - Gioia methodology Data Analysis procedure steps and outcomes

1st Order Concepts	2 <sup>nd</sup> Order Themes	Aggregate Dimensions
<ul style="list-style-type: none"> <li>• Need of managing Cloud Providers</li> <li>• Important role “in several aspects of strategy”</li> <li>• CC model has influenced ITIL latest evolution</li> <li>• “The Framework still relevant for both contexts”</li> <li>• ITIL still can be used but not fully due to the “gaps in Finance and Governance”</li> <li>• There are benefits of the CC model “must be managed”</li> <li>• “ITIL v3 2011 is not adapted to the newest technologies that are cloud-based”</li> <li>• “...when it comes to ITIL and Cloud adoption, the focus should be in several aspects in terms of the Strategy”</li> <li>• “...you can use ITIL for all your cloud solutions”</li> <li>• “ITIL will always be ITIL. In general, ITSM frameworks will be always relevant both in on-prem and in Cloud context”</li> </ul>	Fit-for-use and adaptation for CC model	Relationship
<ul style="list-style-type: none"> <li>• Approach must be the same regardless of the model used</li> <li>• “ITIL must have an agnostic approach when it comes to the technology”</li> </ul>	ITIL independence from the model	
<ul style="list-style-type: none"> <li>• Some of the ITIL v3 Processes were impacted by the CC model adoption</li> <li>• “Supplier Management, the Operational Management with all these suppliers must be performed differently”</li> <li>• “The Change Management must also be carefully reviewed” from the Provider side</li> <li>• “the biggest impacts are in the Service Transition (...) such as Asset and Configuration Management”, “Release and Deploy Management” and Change Management</li> <li>• “Supplier Management would be the most important process in terms of Cloud integration”</li> <li>• “There are two processes in which Cloud had a huge impact: Continuity Management and Availability Management”</li> <li>• “Incident and Problem Management (...) didn't change a lot in practice, with the introduction of the Cloud.”</li> <li>• “for instance, Incident Management is different in the Cloud”</li> <li>• “...Incident Management remains the same, Problem Management remains the same”</li> <li>• “ITIL covers, in its processes, the Cloud characteristics very good”</li> <li>• Strategy and Design are the most important for the Client because the operational processes are more on the provider side</li> <li>• “Change Management is impacted there because one of the cloud characteristics is 'on-demand self-service”</li> <li>• “all processes should be addressed in a different way. Some of them, more than the others”</li> <li>• “the approach of ITIL shouldn't be different because of the Cloud computing model”</li> </ul>	Impacted processes of ITIL / coverage of CC model	Impacts
<ul style="list-style-type: none"> <li>• The client-side approach is different but “in the Provider side is the same”</li> <li>• “The Change Management must also be carefully reviewed. Frequently, a Cloud Provider must perform its technological evolution” and “it may affect the client”</li> <li>• “probably, the more weight is on the customer side. Because in the end, you're accountable and responsible for your own choice. For the Provider, it's almost the same due to reputational or brand image risks”</li> </ul>	Impacts on Client and Provider side	
<ul style="list-style-type: none"> <li>• “Cost efficiency”</li> <li>• Scalability and elasticity of computational resources</li> <li>• Delegation of technical effort to the Provider</li> <li>• Availability and Business Continuity</li> <li>• “Focus on the core business”</li> <li>• “Knowledge and volume synergies”</li> <li>• “Access to latest technologies”</li> <li>• “Quicker time-to-market”</li> </ul>	Benefits	Factors

<ul style="list-style-type: none"> <li>• “Exposure of data” due to unexpected privacy laws</li> <li>• Effort in “choosing the most suitable Provider”</li> <li>• Proper transition planning</li> <li>• “Lack of control” from the Client-side</li> <li>• Monitoring, transition, and “upskilling costs”</li> <li>• Services “measured in providers terms”</li> </ul>	Constraints	
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In Table 8, it is presented some more specific information regarding the insights gathered during the Interviews regarding the framework used in each Interviewee’s organization. In almost 50% of the participants, the framework used for managing IT services is ITIL v3 2011. The other frameworks indicated were ITIL 4, ITIL v3, SOC, and VeriSM corresponding each one to 18%. Regarding the need for reframing the ITIL v3 2011, unanimously, 100% of the interviewees don’t consider that the CC model should be reframed or revamped. Regarding the main ITIL v3 2011 processes, the impacts of the Cloud-based model characteristics are more visible in some of the ITIL v3 2011 processes. In the total of the responses from the Interviewee’s, Change Management, Incident Management, Supplier Management, was pointed out respectively 30% and 15%, followed by Service Asset & Configuration, Supplier Management and Capacity Management with 10% each.

Table 8 - Interviewee's view about ITIL v3 2011

Interviewees	Framework used	Need of reframing/revamp (ITIL v3 2011)	Main Group/Processes affected (ITIL v3 2011)
Interviewee 1	ITIL v3 2011	No	Change Management, Service Asset & Configuration Management
Interviewee 2	ITIL v3 2011	No	Service Design and Service Transition groups
Interviewee 3	ITIL 4	No	Release and Deploy Management, Service Validation, and Testing, Change Management, Supplier Management
Interviewee 4	ITIL v3	N/A	Supplier Management, Information and Security Management
Interviewee 5	ITIL v3 2011	N/A	IT Service Continuity Management, Availability Management, Capacity Management
Interviewee 6	Other (SOC)	No	Incident Management
Interviewee 7	ITIL 4	No	N/A
Interviewee 8	ITIL v3	No	Change Management, Incident Management, Service Level Management, and Continual Service Improvement
Interviewee 9	ITIL v3 2011	No	Change Management
Interviewee 10	ITIL v3 2011	No	None
Interviewee 11	Other (VeriSM)	No	Change Management, Incident Management, Service Level Management, Capacity Management







## Chapter 5 –Conclusion

The Cloud-based model provides several benefits for the companies, as well as risks, which were exhaustively depicted in this study. Therefore, it is necessary that organizations adapt both their internal and external procedures. Although the impacts are not felt in the same way by Clients and Providers, both must ensure a close partnership to maximize service delivery value. More than a technical decision, moving to the Cloud is a business decision that also has impacts on the technical domain. In that sense, a good strategic approach is needed, especially in the Financial domain, where the costs must be correctly predicted and in the relationship with the Supplier. Otherwise, instead of having financial cost-efficiency, Clients will be faced with unexpected bill shocks arising from Operational and Transition domains. Nevertheless, when it comes to the major impacted ITIL v3 processes, Change Management was described as “completely different (...) from the on-premise environment” was the most referred process “due to the speed and flexibility that the Cloud provides” and due to the “control on the Provider side”, posing “additional responsibilities and risks”. Incident Management the second most mentioned process due to the “nature of the incidents that derive from the Cloud Computing model” that needs to be managed “end-to-end with the supplier”, especially since the “control is delegated to the Provider”

Regarding the need of having a reframed ITIL version adapted to the Cloud, all interviewees consider that the framework “is still applicable” and “does not need any revamp to support cloud characteristics”, although this framework was “written having on-premise in mind”.

### 5.1 Contributions to the scientific and business community

The SLR performed suggests that there is no exhaustive research about the specific topics approached in this study. Therefore, this study may contribute to the research on the field, especially by having gathered significant inputs from knowledgeable professionals in the area, bringing empirical experience into the academic research.

At the business level, as previously mentioned, there are serious business implications that must be considered when migrating from a traditional on-premise structure to the Cloud-based model. In that sense, for the organizations, the goal of this study is to raise awareness among decision-makers about the factors they must consider when migrating their

services to the Cloud-based model, especially on the Client-side. By implementing ITIL framework processes for guiding IT management, this study suggests that the Cloud benefits may be maximized, and its constraints may be mitigated.

## **5.2 Research Limitations**

The most perceptible limitation of this study is the fact that ‘data saturation’ was probably not achieved, which means that additional qualitative interviews are only producing already discovered information, not bringing additional significant contribution. Marshall et. al (2013) have deeply studied this concept and how to measure it and according to its orientations, this study should include between 15 and 40, instead of 11 contributions. However, these valuable insights from the interviewees surely complemented the information available in the traditional literature and provided additional information beyond the scope of this study.

## **5.3 Future research proposal**

According to the results from the SLR, there is room for more research in those topics relating to a framework like ITIL and the Cloud Computing model. For other known ITSM frameworks, there was a limited number of published studies. Applying the same methodology for the specific ITIL v3 processes mentioned would be of interest, as well as for the newest version of ITIL 4 would be of interest to the academic research.



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## **Attachments and Appendices**

Attachment A – Mail sent to the interviewees

*Dear <Guest>*

*I would like to invite you to participate in the realization of my master's thesis on ITSM frameworks and Cloud Computing.*

*The objective of the dissertation is to understand if the adoption of the Cloud Computing business model requires that ITSM frameworks (the focus will be solely on ITIL) are updated in compliance with their processes.*

*Your participation would be in the form of an interview with an expected duration of approximately 1 hour. This interview would be recorded, using it for academic purposes only, with the utmost secrecy, safeguarding the anonymity of the interviewees.*

*Due to your domain experience, it would be of great importance to be able to count on your contribution that will certainly enrich this research.*



## Attachment B – Interview Guide

1. In your opinion, what relationship exists in an ITSM structure (ITIL) and the adoption of the Cloud (experiences in practice, synergies, benefits, and constraints).
  
2. Do the framework you're working with already covers the cloud characteristics?
  - a. If yes, where?
  - b. If not, where?
  
3. What benefits are there in providing IT services (those where ITIL/ITSM covers) via the Cloud? (when compared to traditional IT model)



## Attachment C – Interviews

### Attachment C1 – First Interview

I: The objective of this interview is basically to identify which are the impacts of the Cloud Computing Model in an ITSM framework. In this case, ITIL was chosen since it is a widely accepted standard, although there are others like MOF, ISO 20000, and others. So, in your opinion, what is the relationship between ITIL as an ITSM framework and the adoption of the Cloud Computing business model. In this sense, I'd like to have your opinion based on your real in practice experience, the benefits, the cons, and the risks of this model adoption. How do you see it?

R: *First, in my view, ITIL is a tool that is basically used to manage services. In that perspective, we must put ourselves in the place of the service provider. One of the most common Figures is that I am an IT department and I provide services to my organization, to the organization to which I belong. In the quality of internal provider, I may have to use Cloud services to provide the necessary services that my organization need to fulfill. That is, I'll contract Cloud services, for instance, mail services, and instead of having that all necessary infrastructure and technicians, I'll contract those services as a cloud service and I'll provide them to my organization. That is one perspective. The other one is being on the other side, that is, I'm a service provider and I offer services to my clients. Among other services, I offer cloud-based services. And that is the other perspective. In the first perspective in which I'm the IT department and the client of cloud-based services, I must consider other variables. I can have a cloud-based environment or a mixed environment because I may have legacy services that cannot be replaced, I can have traditional IT services, I can have these all mixed. There are many different situations in which I can be. Currently, it is undeniable, in my view, that cloud-based services aren't added value for an organization or for those who need IT services. Nevertheless, I can't speak about ITIL if the organization itself doesn't have an IT department unless we're referring to low dimensioned companies, micro-companies who buy SaaS services but don't have an IT department, and for these companies, is pointless to talk about ITIL.*

I: A start-up would be a good example? Or the criteria is to have an IT department in it, right? Perhaps, only companies with a big dimension?

R: *The dimension itself is relative since there are companies, for instance, Lawyer Societies that have small structures and have their own IT department dedicated to Desktop Management and also for the applications they need, but still, they have their own IT department. For using ITIL, we don't need to have a 500 people IT department. For an IT department with 20 to 30 people, it can make sense to apply ITIL orientations, if not fully, at least partially. Still, if there is no IT department, it doesn't make sense to use ITIL. Regarding cloud-based services, it is a great offer. It's an alternative to provide services in a very simple way, faster, less expensive. From the view of the Cloud Service provider which has several clients, they can have a substantial scale economy because they have the infrastructure to support all these clients and can reduce the cost of providing these services due to that scale economy. The services themselves have the characteristic of being available to be bought and to available to use immediately. Typically, this happens for most of the services. For a bigger organization like mine, cloud-based services are also consumed and use third-party cloud-based services. We have our internal cloud-based services, but we also have external cloud-based services, due to financial reasons to decrease the cost of the services, in the short and long term. In the short-term, because I just pay what I consume I don't have to do a high initial investment and on the other side, I don't have to contract specific expertise or other additional services. Nevertheless, how does ITIL position itself in this context?*

I: Indeed, that's the main question. I'd like to know what you think both from the perspective of the Provider and Client-side.

R: *Let's start from the easiest part. From the Provider's perspective, it's needed to provide more and more reliable services. And ITIL is undoubtedly a way to achieve it. As a Cloud Service provider, in my way of providing services, it's the same as if it was a traditional IT service. I need to buy my technological infrastructure, have my technicians, and other things, to be able to provide those services to my clients. For the Service Provider, providing IT traditional services or IT Cloud-based services, it is managed as if it was in the traditional IT services.*

I: So, for the Cloud Provider, ITIL must be applied in the same way it was applied when providing traditional IT services?

*R: Indeed. When we include cloud-based services in our offer, I don't remember our processes to be modified or adapted. The only thing we had to be careful is that in the phase of service conception, and ITIL has some considerations about the Service Design, we have to attend to some particular characteristics of the Cloud-based services but the approach itself from my view, in the Provider side is the same.*

**I: What about the Client Side? Do you think it's the same situation?**

*R: At the client level, there is a lot of things that changed. But this doesn't mean that ITIL v3 2011 as a tool is not applicable anymore. In my view, I think that ITIL v3 2011 is still applicable. Nevertheless, it is necessary to adjust it to the cloud characteristics from the client perspective, because it's not possible to manage a traditional IT service in the same way a cloud service should be managed. In a cloud-based service, the client doesn't own the infrastructure. But of course, it depends on the service level. From the most elementary, we can have IaaS and then we have PaaS, and then SaaS. The most impacted level is SaaS. Let's pretend I work for a bigger Book Publisher. This Book Publisher must have its own IT department. Then the IT department buys the infrastructure in the Cloud but then uses this infrastructure that has been bought to provide the necessary IT services to the organization, placing there the software needed even if that software that is bought is not bought as SaaS it will be bought by installed by them or even developed by them, it will use that infrastructure. So, depending on the cloud service type that I'm using, I can have different approaches. In big companies, even if there didn't exist cloud-based services, in terms of functions, we had a department that provided us the infrastructure and we had another department that performed the application development. One is a provider of the other one. The management and the concerns of one department weren't the same as the other one, even knowing they are linked. Related to process management, Outsourcing is another case I'd like to talk about in which, a company provides services to 3rd party companies. In this context, outsourcing requires a specific management approach, even if it's not in the cloud-based model. Now focusing on the client-side, if I'm in this context, I can be a client of several cloud providers with several cloud-based services, and I must have a holistic view about this for my organization. And for that reason, the Supplier Management, the Operational Management with all these suppliers must be performed differently. When compared to the traditional model, the principles are basically the same, but the focus must be different. For instance, in the Change*



*Management process, if I perform changes to my infrastructure or my operational environments, on my apps, etc. If I am in a cloud-based model, for instance in SaaS I won't do anything related to this process. In the IaaS context, at least on the infrastructure component, I also won't do it. It will be the provider to handle it.*

I: Still, what about the Change Management Process, how does this process fit in this context?

R: *In my perspective, we still need Change Management, but with a different focus in the Cloud context. For instance, if I want my service to be changed, or contract more capacity or reduce it, or subscribe to additional functionalities, I'm performing changes to the cloud service I bought.*

I: So according to your last words, would you think that Capacity Management and SL Management processes should be also addressed within a different approach in the cloud context when compared to the traditional IT model?

R: *I'd say that all processes should be addressed in a different way. Some of them, more than the others because some are more impacted. But the principles should be kept. The tool (ITIL v3) can be used, but with a different focus. Nevertheless, I believe future versions, as we've seen on ITIL 4, will incorporate even more the Cloud theme. But let me just summarize the main changes, for instance, for a cloud-based service's client, the first one will be on the strategic side. With the introduction of Cloud Computing, the Strategy perspective in IT Management must be reviewed, because from a strategy view, using a traditional IT model or using cloud-based services is very different. From the beginning, it's very important to understand which are the pros and cons for the company. One of the main cons is in the Service Level Management because as a client, my negotiation power is low and I may not have the SLA's I'd like to have, because the Provider has already a not negotiable standardized offer. And even some of them, don't have an SLA for Incident resolution, as client companies would like to have. Some of them only have SLAs for availability. So first, from a strategic view, a company must know the contract they're assigning and how the services will be delivered. Regarding Asset Management, the traditional IT model covers the software licensing, the hardware that is bought, etc and the company's financial department knows how to account for it. In the*

*cloud-based model, financial management must be reviewed. For instance, in the traditional IT model, it's assumed that the OPEX investment must be done, and it's defined since the beginning and also has a CAPEX part. In the Cloud-based model, there are no CAPEX costs. Cloud is OPEX, like a rent that companies pay per use. From the financial point of view, this is quite different, because in the past we had a huge CAPEX investment and low OPEX. Now, in this model, we have no CAPEX and a bigger OPEX amount. And organizations are very reluctant to OPEX costs. CAPEX on the other side is seen as an investment while OPEX is seen as a cost. This does not leave us with a need to change the process. But this situation must be understood and accepted, otherwise, it will cause problems in the future. Typically, a cloud asset is not seen as an asset from a financial perspective. But in this context, it should be seen as an asset because it's something that brings costs and I must optimize those costs. If I don't consider it as an asset, I'll lose track of how much I spend, for instance on a SaaS subscription. Another example is Service Design. Designing services in the traditional model is completely different when compared to the Cloud-based model. In traditional IT, the main parameters are the technological components that matter. In the cloud-based model, the technological components have a completely different weight, when I'm designing services. The most important is the Capacity, for instance, how many servers would I need? How many CPUs? How much memory and disk? The Capacity Management approach won't be the same for these two models.*

I: So, in your opinion, the Capacity Management Process should be seen within a different approach. Could it be related to Cloud widely accepted characteristics such as scalability and elasticity? Because in the traditional model, for instance, if I need more computational resources, it will take more costs and time, and perhaps require a different management approach. Could it be?

R: *Indeed, it's exactly that. In the IT traditional model, I must be aware of the thresholds. For instance, if I want more storage, I must be aware that my Provider will take 3 or 4 months to provide them to me, so I have to anticipate my requests in 3 or 4 months, also I must know how much do I have to buy at a time. Another example, in the traditional IT model, I must monitor this capacity I have, while on the cloud-based model, it is implicit in the service delivery by the Provider. But still, the principles of Capacity Management must be kept and are the same for both models, I want to have my capacity optimized as*

*possible, neither excess nor lacking. And in my view, in the vast majority of the other processes, it will happen like this. The most operational processes such as Change, Incident, Service Request can be more impacted when compared to the traditional approach, but still, the ITIL principles will be the same. And ITIL becomes even more important if we have several Cloud Providers and services, otherwise, we can lose track of the subscribed services. There is also another relevant aspect no matter the model we're in, Cloud, Outsourcing, Traditional IT, the responsibility of the services I'm providing as integrators, is mine, even if I have multiple cloud providers, especially if in the services I provide even internally, I have combined services in which some of them are fully provided from our organization and others I have contracted one or several Providers.*

I: So, just as a quick recap, in your opinion, ITIL principles must be kept but the approach must be different especially in some process groups. At the strategy level, the financial, design, service level, capacity, supplier are the most impacted processes although you mentioned that all others must be approached differently in the cloud-based model, these were the ones you referred to the most. Do you agree?

R: *Indeed. Strategy Management is crucial. Then, Supplier Management on many levels especially when negotiating the contract, deeply understand what is being offered to avoid future problems for instance in the continuity of the service. If the service is stopped, the business will be impacted, and managers must be aware of this when negotiating the contract to include service continuity scenarios. But still, this is common and even the services we provide, the clients must subscribe it (the service's continuity) as an additional service and has additional costs for both entities and some clients don't value this aspect in the same way and Providers usually don't include it in the standardized offer. And even after the contract, when having one or several providers, I must have daily contact with them. For instance, if the commercial department raises an incident, it can be related to the service provided by Provider A or B and they're not connected. Then I must do my analysis and ask for feedback from them because usually Cloud Providers solve the incidents but do not provide much information about the anomalies themselves. So, the Supplier Management must be performed more intensively, in a daily way in a close relationship.*

*The Change Management must also be carefully reviewed. Frequently, a Cloud Provider must perform its technological evolution operations. Depending on the type of service, it may affect the client. For instance, if we do need to perform an evolution to the Backup Service, we need the client to install a different version of the backup agent. But this backup agent version requires a new version of the Operative System and the OS version may impact the applications that are installed in that client's machine. So, if we want to perform our evolution, clients must perform this change and this requires a huge effort of coordination. From the Provider side, the notifications must be sent on time, the deadlines, etc. From the Client-side, this must be well understood and accepted, and some preparations are required. On the other hand, in the traditional IT model, the IT department has full control of the evolutions or changes that must be performed, while on the cloud-based model the client can be involved in the process.*

I: So, for the Provider, Change Management must be addressed differently when compared to the traditional IT model because in some cases, the client must be engaged so the Provider can 'provide' better services.

R: *Indeed. And another important aspect in the Change Management context, for instance, say that I want to finish my subscription with provider A and move to provider B. The vast majority of the clients are not aware of this, they simply don't ask, they sign the contract, and, in the future, they have unpleasant surprises. Signing a contract is easy. Ceasing a contract and no longer being a customer it isn't. So how do I keep my information or services? These are questions that must be done, and the client must be aware of this. In the IT traditional model, it's not that important since if we cease the services, it means that we want to finish them, and they're no longer needed. In the cloud-based model, ceasing means Provider change. For instance, in the SaaS model, it means that I want to keep using that application or software but within another Cloud Service Provider. So, the client must know if this is possible, how is performed, and also if the contract covers this or not. In the IT traditional model, this is not a very important concern, but in the cloud model, it must be.*

I: Moving to the 2nd question, the framework you're using in your work, already covers the Cloud characteristics?

R: *We use ITIL v3 2011 as guiding principles, but in practice we use ISO20000. Our processes are based on the mix of these two frameworks. But still, we don't have different processes for the Cloud-based model when compared to traditional IT. We have uniform processes that can be applied in both realities and even for hybrid environments since we also have legacy systems with more than 30 years and also cloud-based services both internal and external.*

I: From what I know, ISO20000 doesn't mention any specification approach about the cloud-based model. In your opinion, ISO20000 is like ITIL v3 2011 in this context? That is, although there is no mention about it, this framework and its processes are still adapted to the cloud context?

R: *Indeed, ISO20000 is a more prescriptive framework than ITIL. It's basically a framework for Providers that don't approach the cloud subject in a specific way but it's still applicable. Moreover, I'd say that ISO20000 applies to any kind of service, IT or non-IT. But for Cloud specific, there are other frameworks just like ISO27001 which is focused on Security, and there is even another one related to the security of the services in the cloud context but on the management side.*

I: My last question was already partially answered but still I'd like to have your opinion about it. In your opinion, which are the benefits and the cons in providing IT services in the Cloud-based model, when compared to the traditional IT model, based on your experience?

R: *Perhaps one of the benefits is the fact that I can have IT services without having the infrastructure, the technicians, etc, and can use them as I want to. So, I have the benefits without having the costs of ownership. Also, on the financial aspect, it is much less expensive to have cloud services than having IT on-premise services. Another major aspect is the speed, that is, I can increase or decrease the service itself or the service capacity according to my needs, besides the economic factor, it allows me a great level of adaptability to fulfill the recurrent and changing business needs. Having the possibility to have what I want and need, almost immediately is a true advantage of this model.*

## Attachment C2 - Second Interview

I: In your opinion, what is the relationship between an ITSM framework, in this case, ITIL, and the adoption of the Cloud-based model indicating the benefits, the cons, and also the view from Provider and Client-side, based on experience.

R: *In my view, ITIL must have an agnostic approach when it comes to technology. Since the beginning of the framework and its best practices, the goal is that ITIL keeps being a guide of best practices, no matter the technology is being used. So in my view, the cloud-based model such as other technologies that are also dynamic and evolutive, the automation brings a lot of value. So ITIL has certain flexibility in its application. Even in the latest ITIL version, which is ITIL 4, there are new concepts such as Agile, DevOps, and this is something that some professionals used to criticize before because ITIL brought some bureaucracy due to some controls in some of the processes. For instance, if I want to change something in my Production environment, I must create a change request and this one has to be approved. Some professionals consider this as a certain bureaucracy. Nevertheless, these practices are adapting themselves and evolving and specifically in the Cloud context, but still, those controls I mentioned must be considered. For instance, for some specific processes, ITIL brings some complications in the Service Asset and Configuration Management. This process requires an IT inventory and control of the assets and the relations with the components and services and business processes. Since Cloud is very dynamic, in a matter of seconds you can have a server available, then, this is a way of automation, it brings agility but also brings risks. It's not only a question of just adopting the technology, it's also necessary to have a strong process supporting it, well designed and aligned, so the tracking is not lost. Let's imagine a company with traditional processes, with on-premise infrastructure, and this company wants to migrate to the cloud model, at least for some of the products or services. I think that in that case, there is a need to have alignment with the Governance and Processes departments of the company, so the control is not lost. And these are the risks. Of course, there are a lot of benefits there are widely known, but the impacts must be measured, and the risks mitigated.*

I: You mentioned two processes from an ITIL v3 2011 process group such as Change Management and also Service Asset and Configuration Management. Besides this two, do you think that are other processes that must be approached within a different view?

*R: Yes indeed. For instance, the Supplier Management process. It's a very important process because the contracts must be well understood and agreed upon since we have external providers. Consequently, the SL Management process because the SLA's due to the response times, the Availability process is also important because I'll have a contract with an external provider, I'll measure the availability of the services that are being provided, both the internal services of the client and the provider services. The Capacity Process is also important so I can know if I can increase the computational resources or decrease them. Capacity, Availability, Continuity, and also Information Security since the vulnerabilities must be assessed, the exposure level, the providers themselves, the security level, if there is a backup service or not, how do we act in case of disaster recovery what is the plan?*

I: Basically, ensure redundancy to also ensure the continuity of the services?

*R: Indeed, the processes are all connected. There are also others such as Incident and Problem Management. The operational, design and transition, and also continual improvement processes are related to every group of processes.*

I: Moving to the second question, basically, in work, the framework that is being applied, already covers Cloud characteristics? Which is the framework that is guiding the IT processes that are applied to your functions?

*R: Currently we're still using ITIL v3 2011.*

I: And does it cover Cloud-based model characteristics, in your opinion? Do these guiding principles and best-practices are still available and applicable for the cloud-based model, given that it's quite different from the traditional IT model?

*R: Yes, but not fully. If we search on the ITIL v3 2011 books, perhaps we can find some cloud concepts in a generic way for the IT operations, technical management, roles, and*

*responsibilities at least on the Service Operations book. But still, ITIL 4 has filled the gap that existed for the Agile, DevOps, and Cloud that were needed to cover, that the authors brought in this latest update. Nevertheless, I think that we don't have anything solid and oriented, stating how to do it, it doesn't give you that detail level, it's more a question of adapting the reality for each organization. And I think that ITIL 4 came to fill the gap of these topics since ITIL v3 2011 doesn't cover it. Since technology is evolving at a faster pace, I think the frameworks must be brought to speed and adapt themselves to the newest technologies. And I think that technology goes much faster than the frameworks and processes. In this sense, ITIL 4 brought some valid updates, some designations were changed, for instance, processes are now practices and brought some more flexibility to some processes that were seen as bureaucratic in the ITIL v3 2011. So, ITIL v3 2011 is not adapted to the newest technologies that are cloud-based.*

I: Then my last question is, what benefits can we find in providing IT services using Cloud when compared to the IT traditional model? What are the benefits, cons, risks?

*R: Well, it brings scalability because now I can have a better time-to-market to deliver my services and products which is a competitive advantage for the organization. If I have a market demand for some specific services or products, with this flexibility, I can launch them in a faster way to faster fulfill the market needs. In larger projects, if I take too long developing a service, system, or product, I can lose my competitiveness. So currently, there are so many innovative companies that use cloud-based model and frameworks such as Lean, Agile. That brings a lot of agility in delivering projects. So I'd say the flexibility, the speed, and of course the Outsourcing since I'm transferring the cost and the risk of the environment management to a 3rd party provider that is an expert of these technologies. It is very expensive to have specialists in IT infrastructure in each IT area and in this way I can delegate these functions to the provider, through a contract and just be responsible for the business part, focusing on the core side of the company.*

I: So, just a recap and bringing some ITIL concepts to this context, and, correct me if my wrong, but for the financial part it brings us to the Financial Management processes. The flexibility you mentioned, that is, the scalability and perhaps elasticity too is connected to capacity management, which are widely known characteristics of the Cloud-based model. Do you agree?



*R: I do. Indeed, these are the processes that are related to the characteristics I mentioned before.*

### Attachment C3 – Third Interview

I: In your opinion, what is the relationship between an ITSM framework, in this case, ITIL, and the Cloud-based model? I'd like you to share your opinion about the synergies, the benefits, the cons, both in Provider and Client perspectives, based on your experience.

*R: OK. So, ITIL has been the world's leading framework in ITSM in the last 30 years, since the 80's it has been the reference for IT Service Management for many organizations and individuals around the world. Now, ITIL 4 was recently published in 2019 and it was a huge update from the previous ITIL version, which was version 3 from 2011, and ITIL 4 is actually adapted to the digital age. So, it's looking at taking the best practices but now, optimizing them and adapting them to the modern ways of working in the modern technologies which include the Cloud. So, for instance, the previous ITIL versions were focused on on-premise technologies, but now ITIL 4 from 2019 is much focused on the digital age where organizations develop a cloud fast approach. And how ITIL 4 aligns with Cloud? The premise of ITIL 4 in terms of services and service management is about delivering value and that in the technologies space, what clients demand the most is agility and resilience. Agility here means flexibility and speed in terms of either coming up with new products and services or making changes to existing products and services due to either customer demand or environmental demand and then, resilience is the ability of an organization to go through a crisis or a disaster and bounce back. And the Cloud is actually meeting these two particular needs. The Cloud is providing the kind of flexibility that organizations need in terms of quickly setting up and deploying new products and new services because, in today's age, products and services in the tech sector must be delivered very quickly, so the Cloud is allowing that and then, the resilience aspect is covered because major cloud providers are providing resilience through capabilities such as geographically separated regions, backup as a service, automatic scaling or spinning of virtual environments, when you have a disruption so these capabilities are actually aligned to ITIL. So, in ITIL, the focus is on value in terms of resilience and agility and the Cloud is actually leveraging on this. ITIL 4 has been written with a focus on the key concept four dimensions of Service Management which says all these dimensions must be considered. So if you go through the text of ITIL 4, the four dimensions are organization & people, information & technologies, value streams & processes, and partners & suppliers. And so, these 4 dimensions are critical. Focusing*

on them will allow you to get the value you're looking for, agility, resilience, meeting the customer needs, and enhancing customer experience. When you go through the publications, there is a lot of guidance that is cloud-centric. They refer to organizational structures that provide flexibility and product focus and the kind of competencies that are needed in today's age, which is a cloud-centric that looks at coding, data analytics, artificial intelligence. Those capabilities are needed in people. In terms of information and technology, it's pretty straightforward, it's about leveraging the technologies to deliver the best value. And in terms of the Cloud, because the Cloud provides the ease of setup that the traditional IT you need upfront capital before you could set up a service. With regards to Cloud computing, those barriers are removed. If the business wants a service, then, the technology that providers can deliver through the Cloud quickly, and the adoption of modern technologies are no longer a barrier. Especially, if your organization wants to invest in data analytics, AI, cognitive computing, then cloud providers are actually allowing that even for small and medium companies to take advantage of it. In terms of value streams & processes, automation has become crucial from a process perspective and the Cloud provides those capabilities that allow streamlining and automation of workflows in business activities. Then in terms of partners & suppliers, a lot of organizations cannot produce everything by themselves, they need to leverage on external providers. And Cloud providers are providing that capability, so a lot of organizations have outsourced their workloads, their storage, their data processing, and analytics to cloud providers due to the capability they offer that meets the needs of the organization. So those four dimensions areas that the ITIL 4 talks about. Then finally the Service Value System which ITIL 4 has introduced. Service Value System is simply an approach that talks about 5 key components that organizations need to work together to facilitate this value creation. And these 5 elements are guiding principles, governance, service value chain, practices, and continual improvement. If you go through these 5 elements you realize that all of them are pointing towards making life easy for the business in terms of being able to exploit opportunities and demand from customers, translating it to value. So, Cloud has a capability that can be leveraged for guiding principles, especially when adopting an agile way of working which the cloud supports. In terms of governance, leadership focus needs to leverage cloud capabilities through digital strategy, just guiding the organization to take advantage of the cloud from a governance perspective for subjects like data privacy, data governance, and all those data aspects. You have the Service Value Chain which are the activities involved in

*creating, delivering, and supporting services via value streams. And for you to actually, effectively manage value streams in a technology space, cloud technologies provide a lot of capabilities around that. Then you have the practices. There are many practices in ITIL 4, that touch different areas such as Architecture, Business Relationship Management, Supplier Management, Service Desk, Incident Management. All these practices in the ITIL 4 publications are based on the four dimensions. So, in terms of technology, the practices are also written in how to deploy these practices in a cloud-based environment. And then, finally, you have Continual Improvement that says, in Service Management, organizations must invest in Improvement in all of the four dimensions. So, the Cloud provides a very strong basis for improvement from a technology perspective, because improvements can be implemented quickly with no upfront costs, innovation can be supported because we can leverage on cloud capabilities in a way we get speed. The upfront cost is removed, and we get capabilities in which we can leverage such that, an organization can focus on the core services and not care about data center management or infrastructure management, by taking advantage of SaaS, IaaS, and PaaS offerings. In a nutshell, that's what ITIL 4 covers. If you go through the ITIL 4 publications, when you search for cloud, you'll get around 130 hits referencing cloud technology. If you look at the practice guides, you'll see cloud references on them. If you go to the Specialist publications, they will all reference cloud in one form or another. So ITIL 4 is written for the digital economy and Cloud is at the core of the digital economy.*

**I:** Just a side question, Joseph, from what I understood from yours, Cloud is somehow covered in the ITIL 4 framework. What about ITIL v3 2011, do you think somehow this framework takes into consideration the cloud-based model aspects? Or at least, do you think ITIL v3 2011 can still be adapted for cloud reality?

*R: OK. So, when ITIL v3 was written, it was in 2007 and reviewed in 2011, still as v3, at that particular point, Cloud was still very recent, at its start. ITIL v3 refers more to organizations with on-premise IT, but if you look at the processes themselves, they're still fit for use regardless of the technology environment and so, the essence of ITIL is about adopting and adapting the best practices. ITIL is not rules, it is guidance, and so, as you read ITIL v3 and ITIL 4, even though ITIL 4 was re-written for the digital age, a lot of best practices is similar to those in v3, just updated because of the modern way of working*

*and the practices of Agile, DevOps, Lean, and all those sorts of things. So, you can still take a significant amount of ITIL v3 and adapt it to the cloud. The principles, the policies, the process activities are still suitable for the cloud in many respects. So yes, you can still use v3 to the Cloud-based model.*

**I:** Another side question for you about ITIL v3, if you don't mind, in terms of processes, in your opinion, which do you consider the most impacted by the Cloud-based model characteristics when compared to the on-premise model?

*R: ITIL v3 used to have a lifecycle, the service lifecycle as you are aware. You have Strategy, Design, then Transition, Operation, and Continual Service Improvement. About the most impacted processes, they can be seen in the whole spectrum. But the biggest impacts are in the Service Transition. A lot of the service transition elements such as Asset and Configuration Management. These particular processes were written having the traditional on-premise model in mind, so the biggest change is that when you look at this from a cloud perspective, this is a huge change from what the cloud introduces. Another thing is Release and Deploy Management, if you notice on Cloud, in the DevOps context you have the CICD - Continuous Integration Continuous Deployment, which integration, testing, deployment to your environment including your live environment. ITIL v3 was written having on-premise in mind, but of course, now the Cloud means you have to now consider these modern approaches because CICD is now fast becoming the approach when it comes to Release and Deployment. So along with Release and Deployment, have Service Validation and Testing, which is deeply tightened to Release and Deployment, because is within these areas testing takes place. And the Cloud, of course, facilitates automated testing and other cloud-centric technologies such as containers or microservices for instance. So, in terms of the core context, you can say Service Transition within the cloud is what changed the most. Change Management in the cloud model is completely different from Change Management in an on-premise environment, especially if you're going to implement CICD. Now, because of the speed and the flexibility that Cloud gives us, the technologies allow us to implement much more changes within a very short time when compared to on-premise. As a result, if you're thinking about Transition, Planning and Support and Knowledge Management, based on the changes that are happening, from a technology perspective, then, also the thinking behind Planning and Support, the translation from design to a live service, then the*

*thinking has changed. So, I'd say the processes within Service Transition were the most impacted. Design is more or less unchanged, it's just applying the technical aspects, but the thinking around Availability, Security, Service Levels, Capacity, Design, Coordination, Supplier Management, and Continuity, the process approach is similar, the only difference is that we're in Cloud now. Supplier Management becomes key because now you have to consider the Cloud Providers as the key supplier. Service Continuity is different because before companies had to invest in backups, alternate datacenter and all these continuity aspects are now incorporated within the cloud. Now, it's expected that the Cloud providers have these concerns and not you. Information Security is simply now the perspective of understanding what the Cloud Provider provides, as opposed to what you want to set up on your on-premise. Service Levels, before, if you were on-premise, you were controlling the service levels. Now, in the cloud, you have to think about the Service Levels the Cloud Providers provide for you and adopt that as part of your service offering. In the Service Operation group of processes, the approach whether is on-premise or on cloud won't change. For instance, in Access Management, providing access in the cloud is the same as providing access in an on-premise environment. In Monitoring, the same with exception to some technological aspects. All the remaining processes will be applied in the same way, but now what matters is to understand what the organization controls and what the Service Provider controls. And so, if there is an issue, we leverage on the Supplier Management practice, because, for instance, if we're in SaaS, we don't control the infrastructure. So, we go back to Supplier Management, we look at the contract and try to handle it with the Service Provider. In terms of strategy, this one is business-centric, so, what matters in Strategy is simply thinking about how we can exploit the cloud capabilities, how can we deal with changing demand by exploiting the cloud for instance. The cloud is better suited to scaling and adapting to demand when compared to on-premise. Financial Management has become a very key topic in Cloud Management. While in ITIL v3 you were looking more at infrastructure costs, licensing. Now, Financial Management from the cloud moves from buying to renting. Now on-demand pricing, traffic, processing loads, all these things became very key. Costing for Cloud has become like science in itself, so Financial Management is one of those processes that has to be approached in a very significant way when it comes moving from an on-premise environment to the Cloud. Business Relationship Management is simply about how we support the business to identify the best cloud offerings, rather than saying, we'll provide you the solution on-premise. Hope*

*this gave you an overview of what changed from ITIL v3, comparing on-premise and cloud models.*

**I:** Indeed. It was a very complete overview, you provide me an analysis of all process groups and you depicted each one, so indeed, it was very enlightening.

*R: If you read ITIL 4, they've moved away from the concept of Lifecycle and now they talk about Value Streams. Before you had processes, now you have practices that can be applied in the whole SVS. So, this was a huge shift from the thinking behind the v3 to ITIL 4 because of the digital way of working.*

**I:** Moving on with the questions, in your work, which framework are you using now?

*R: I use ITIL v4.*

**I:** So, as you already confirmed, this framework already covers Cloud characteristics, right?

*R: Yes, indeed. As I said, I just reiterate that ITIL 4 main premise is agility and resilience for the digital age, and Cloud is very well suited for both agility and resilience. The digital age is all about tuning customer requirements into working products and addressing customer issues as quickly and efficiently as possible. And Cloud gives these capabilities in low upfront costs, speed in deployment, infrastructure, applications, and then resilience in high levels of availability, distributed computed platforms of data across regions. So, ITIL 4, the way it was written, was aligned with those particular areas, leveraging on those capabilities to ensure an organization can provide value through its tech services by taking advantage of the cloud.*

**I:** Moving to another question, you already said that ITIL 4 covers the Cloud characteristics. But still, is there any particular process or practice that could be enhanced to better cover the cloud reality?

*R: That's a good question. Yes, what I can say in terms of improvement would be the Financial Management practice, because organizations adopt the Cloud and there is a*

*huge industry right now in optimizing costs for the Cloud. There are cases in which organizations are shocked by the bills they receive. A lot of cloud providers are now providing additional services when it comes to monitoring, defining thresholds to do not pass particular pricing. So, the thinking behind computational and cloud pricing specifically has not been specified in ITIL 4 for Financial Management. The practice talks about accounting, budgeting, charging. But right now, there is a huge focus on cloud pricing and managing and that hasn't been referenced significantly in the Financial Management practice. I do hope they're updated because these practices must have an evolutionary mindset and can be updated quite fast. In the next iteration, we expect to see specific topics around Cloud pricing and dealing with bill shocks, and putting in place controls to ensure you monitor your spending on the Cloud. That has become a problem for a lot of organizations.*

**I:** That is quite interesting, and I wasn't aware of that. So, there is some lack of control when it comes to the costs with the Cloud in which the managers aren't expecting. This is a well-known issue, but still, ITIL 4 could focus a little more on this and provide some guidance. Perhaps we'll see it on the next version of ITIL. Let's move on to the last question, that is, in your opinion, what benefits can organizations have by providing IT services through Cloud, when compared to the traditional on-premise model?

*R: So, previously, in my work experience, setting up for instance an ITSM solution was very heavy and undertaking for an organization. You have to approach it in a waterfall type scenario, where you need to have defined all the requirements upfront, if customizations were needed would mean a lot of bugs, with a lot of back and forth between the vendor and the customer who hosts, for instance, some discussions arise because the clients didn't communicate the specifications correctly and the issue was from the customer side and not vendor side, for instance in terms of operative system or some other aspect. So there were some particular challenges. And then, upgrades are also a significant challenge if you are on-premise, because of license costs and things like that. Evolving the capacity was also a challenge. But now, with Cloud offerings, then Service Management has been made a lot easier in terms of adoption and onboarding. What used to take months, can be done now in days. When you get a Service Management instance, it is almost ready for you to get started. Setup is intuitive and user-friendly. So now the*



*consumer does not need to deal with things like upgrades and if the client needs more capacity, the client gets additional capacity when he needs it. Scalability is now quite easy. Access to new features and new capabilities is now much easier too. Even if Cloud Providers let you test their platforms for free allowing the clients to do trials with this platform for a few weeks and it will not cost anything. With on-premise installations, a trial would be a very complicated process. In Cloud, the flexibility allows service management practitioners to focus now on the Service Delivery part as opposed to managing infrastructure, platforms, and updates. And that is good. Also, the ease at which the capabilities you can access now like automation, integration with cloud-based applications like social media, platforms, collaboration tools like Slack or Trello, project tools like Jira or Asana. A lot of these cloud tools are coming with API functionality that allows you to integrate with enterprise systems of other cloud systems. This will allow a lot more flexibility for the Cloud Service Provider. So, Cloud has provided some advantages around Service Management practices. If you now try to buy an on-premise Service Management tool, the providers will price it higher or provide less capability or less support when compared to the cloud reality. And for instance, Jira is no more offering on-premise services, unless privacy is a very important issue for the client. If not, they'll want you to come for the cloud. So the main constraint regarding the cloud is giving up control of your service management to a third-party provider. Some organizations will not feel comfortable with that. Especially when some countries put in data privacy laws, Cloud providers must now provide an instance in your country so you can only host that data in your country. But the fear remains in putting the data into the cloud because it exposes the companies. But if you balance risk versus opportunity, then the benefits of the cloud overtake those risks, especially if you work with a reputable provider, who has security mechanisms in place and can provide an instance in your country and meet the requirements of data storage and you can leverage on that.*

#### Attachment C4 – Fourth Interview

I: So my first question would be: in your view, what relationship exists, between an ITSM framework, in this case, ITIL, and the adoption of the Cloud-based model? I'd like to know the benefits, cons, synergies, based on your experience.

*R: From a cloud perspective, the processes in ITIL still apply to the Cloud, because even though we're moving to a hyper-scale. For example, if you're on-premise, managing a data center whatever process it is, even if you go to a Cloud provider like Azure or Amazon, you still have to have a discipline managing those Cloud providers. So, what I mean by that is, SAP moves the SAP solution to Google Cloud, the payroll services right? Even though the payroll service is in the Cloud, you still have to have a way of managing incoming incidents to happen to that solution, or, managing incoming problems. So that framework is still very relevant. However, there is a lot more automation now. So, what I see happening now, for instance in Change Management, I see a lot more automated changes happening now in the Cloud, versus (on-premise) everybody having to review changes manually. Now the changes are happening extensively quicker. For example, ServiceNow, in the Change Management, less than 2% of changes are normal changes. Almost all changes are standard and automated changes. So, the majority of the changes happen automatically. They're pre-approved already in the solution and they're updated automatically, so, there is a lot more automation happening. And in that perspective, I'd say there is less human intervention in the process layers, as we go more and more to the Cloud. But we still need to have a good ITIL framework. And ITIL 4 now has practices when compared to the processes in ITIL v3, but those practices now, still include the core processes about Problem and Change, those are still very important.*

I: Just a side question, since you know ITIL 4, do you think ITIL 4 brings some more adaption to the Cloud computing business model when compared to ITIL v3?

*R: There are some elements in there around Cloud, and also brings more to the picture the concept of value and DevOps which are more evident in ITIL 4 framework than in version 3. And those topics are more developed extensively. I know there are some white papers regarding ITIL and Cloud.*

I: Indeed, yes, I'm aware of those white papers, especially those from Axelos. Moving on to the next question, the second question. The framework you're using, already covers the Cloud computing business model characteristics or not? First, which is the framework you're currently using in your company?

*R: So, the framework we're using, I mean, SAP has its own approach of managing the Cloud. I'm not that tight to the Cloud organization but more on the ServiceNow and IT Service Management side of the organization, but basically, the public SAP strategy, for Christian Klein, was, they want to move customers on-premise to the cloud. Moving customers to the cloud requires rigorous discipline transition. There is a big architectural discussion around if we move on-premise to Google Cloud or Azure Cloud. It's just not bringing the SAP application there, you have to reconfigure the solution in the Cloud to support SAP application specifically and have specific reporting inside the Azure Cloud or Google Cloud. It's not just bringing SAP application and installing it on there, there is a lot more into it. And there is a lot of processes involved during the transition, so, from an ITIL perspective, Service Transition is very critical. When you're transitioning on-premise services into the Cloud, so, there is a lot of relevant areas there in terms of those practices of transitioning. Change Management, data center migrations, application migrations, there is a whole discipline that is still relevant in terms of ITIL.*

*I: So, If I understood, SAP has its own framework for managing the Cloud solution.*

*R: Indeed, we have our architectural board, that, for example, decides the architecture of how instances must be architected before implementing the solution. We have process governance boards to decide how to execute the solution. Integration architecture too since you have a lot of integrations in the Cloud, so you could have some SAP solutions that migrate to the cloud that required some specific integrations. Security too, we have some security concepts for every integration. Also, in the customer engagement model, of how you're going to onboard customers from on-premise to the cloud, there is a lot of customer engagement.*

*I: But when it comes to the whole IT Management, do you specifically use the ITIL framework, or do you use your frameworks or others?*

*R: Yes, we use ITIL but it is just one of the frameworks we use, so for security, we use NIST, ISO 27001, ISO 27000. For business continuity management, we use Business Continuity standards. So, we use a lot of different frameworks. DevOps is also used extensively. We also use Agile methodology so; we just don't use only ITIL. ITIL is only*

*a framework we use to support our key service management process areas, but, when it comes to the Cloud computing area, we use other frameworks that are in the market too.*

I: Understood, but still, although you only use it for Service Management because in the whole spectrum of IT Management you use a lot of different frameworks, what are the process or process groups that you're using?

*R: I mean, we do use ITIL, mainly for Incident Management, Change Management, and Problem Management. We use Service Request Management, we use Event Management, we use Knowledge Management. We use all ITIL processes within our Google Cloud services team.*

I: So, in that context, which are the processes that in your view, are mostly impacted by the Cloud Computing business model, when compared to the traditional IT on-premise model?

*R: I think all those processes are still very important. I think the ones probably most critical for us, when we got into the Cloud, definitely is going to be Supplier Management, because we have to manage our Cloud Providers that will be hosting the SAP solution. Also, the other one is going to be Security Management, that's very critical too, the insurance from the suppliers that we are secure in our application stack. Capacity is not going to be impacted that much because capacity is dynamic. The cloud is now elastic, is now dynamic, so Capacity is not concerning to us like it was in the past, because we can use capacity as we need. But I would say Supplier Management would be the most important process in terms of Cloud integration between SAP and the Cloud solutions.*

I: So, Supplier Management is important and even crucial because SAP Solution relies on different cloud providers and the management processes must be enhanced when compared to the on-premise model.

*R: Yes, for instance, our clients may want to install the SAP solution on Azure. But we need to make sure that, when it's installed in Azure we understand if an incident happens on Azure, what are the Supplier SLAs and the Cloud SLAs are in terms of response time if something goes wrong with the Cloud. Because it can happen, Google Cloud can have*

*an outage, and we need to have a mechanism to engage from a Supplier Management standpoint.*

I: Moving on to the last question, that is, which benefits exist, in your opinion, in providing IT services via Cloud, when compared to the traditional on-premise IT Model?

*R: The advantage of Cloud in providing services it's in the dynamModerator: way to make adjustments to the capacity, elasticity, more cost-effective because you're only using what you need. On-premise has a lot of capital expenses. So, from a cost perspective, you save money in the long term, and secondly, from a capacity standpoint, you're not limited to what you have on-site right now. You can expand as you grow, so it's much more dynamic and elastic. The other thing is, from a Change Management perspective, things are much more automated now, and there is much more redundancy versus single points of failure because the cloud solutions have already redundancy already built in them. So, your availability is going to be much higher.*

## Attachment C5 – Fifth Interview

I: In your opinion, what is the relationship that exists in an ITSM framework, in this case, ITIL, and the adoption of the Cloud-based model. I'd like to know which pros and cons there exist, synergies all based on your experience.

*R: That point about ITSM is crucial. Sometimes, people that work deep in the Agility domain, they forgot sometimes the ITSM domain. The cloud world simplifies a lot of things, I see a very good correlation. Without the Cloud, the ITSM had a lot of manual steps, for instance, if I'm going to implement something into the Production environment, I'd to raise a Change Management ticket, then there it should go to committee's approval, sometimes filling a lot of documents is required. So, with the Cloud, it is possible to automate a lot of things, it has made life easier. For instance, you can have two environments, one for Production and another that is a clone of a Production environment, all in the Cloud. And then, I can have two systems at the same time in the Cloud. Then, Service Management gets better, because, in case of a new version, instead of implementing it for 100% of the clients, I make it available for only 1% of the clients and I put it on an identical version that is hosted into the Cloud. If in this version, everything is OK, I make it available for more clients and when I'm sure everything is OK with this version, I make it available for the remaining 99% of the clients. So, in my view, there is a huge benefit, the cost usually tends to be lower, and there is a lot more flexibility. But it must be managed. Having all environments in the Cloud can be more expensive, but I see Cloud as a good thing of course. Let's imagine we didn't have Cloud, during this Pandemic period, how would we do like in the past 30 years? With physical servers, that would be difficult. We're having this meeting like if we were side-to-side. So, I gladly see a good relationship between ITIL/ITSM with the Cloud.*

I: Alright, indeed that wouldn't be possible. Moving on to the 2nd question, I'd like to know if the framework you're using right now, already covers the characteristics of the Cloud-based model. If it does or if it doesn't, in which processes? But first, what is the framework you're using in your daily work?

*R: Actually, in the past, we used ITIL v2, then ITIL v3. In practice, we don't only use ITIL as a framework. We use a lot of agile practices and also DevOps because they fit together.*

*What we do is look at all methodologies, frameworks, and practices and choose those who are suitable for our reality, it's a mix of several models. Lean, Scrum, DevOps, and a little bit of ITIL. For instance, Incident Management aims to quickly reestablish the quality of the service, Problem Management aims to search and understand the Root Cause, so we have been working with these ITIL practices.*

I: So as far as I understood, you already worked with the ITIL v3, but you also work with some other methodologies resulting in a mix of frameworks, right? But actually, in that mix, you're using ITIL v3 2011, right?

*R: Indeed. Already analyzed the ITIL 4, but we didn't adopt it yet. We're still using the ITIL v3 2011 in the set of frameworks we're using right now, alongside Agile and DevOps. In the past, we only used ITIL v3.*

I: So, in that sense, and focusing on the ITIL part, which processes do you consider the most impacted by the Cloud-based model characteristics? Or even, do you consider there is only a partial impact or no impact at all? What is your view about this?

*R: There are two processes in which Cloud had a huge impact: Continuity Management and Availability Management. Let's imagine we're in the past, we had to have physical servers in distant different cities. Since I'm working for an Insurance company, we have some regulatory obligations. We had to prove that if website A went offline, we could have website B online.*

I: Disaster recovery, right?

*R: Yes, disaster recovery. Then, before the Cloud, the cost was very high as well as the effort associated. Let's imagine, Rio de Janeiro had a server and São Paulo must have some kind of mirroring. If we have a problem in Rio de Janeiro, then São Paulo becomes immediately available. Actually, with the Cloud-based model, this is a lot easier. We can make a contract and have a hybrid cloud. Having two providers facilitate a lot of the Continuity and Availability aspects. We can now in a very easier way to duplicate the computational resources. So, I think that currently, every company that uses the cloud aligned with the ITIL processes we've been talking about, there is a huge benefit.*

I: Since you've referred to Continuity and Availability, would you think that Capacity would be another important process that has been approached differently, with the introduction of the Cloud?

*R: For sure, forgot to mention that one. And that one deserves to be included on that set of processes impacted by the Cloud. Before the Capacity, we manually did the management, for instance, let's imagine the usage of my server is rising and the demand is also rising. In that case, I must buy more server capacity. With the Cloud, that became dynamic, so the capacity is also a process that was benefited with the introduction of the Cloud.*

I: What about the other processes? Do you think that there are processes that have no impact at all when it comes to moving into the Cloud?

*R: Well, regarding the Incident and Problem Management, it doesn't change a lot, if we're on the on-premise or in the cloud-based model, because when it comes to solving incidents, the goal is to quickly solve step-by-step according to the SLA's. And Problem Management involves finding the root cause. So, these processes, in my view, they're independent with regards to the architecture and the structure, if it is in the Cloud or not. And it's a very interesting point, I've seen some cases where when solving the Incident, it's much better to perform a restart on the server than searching the root cause at that moment because we have the system available. So, there is shame in restarting a server. But if that happens every week, then, we must search for the root cause. The essence doesn't change. The cloud-based model facilitates some tasks, for instance, you can set an automatic restart, if the server has stopped, you can set a rule for a reboot. It may help, but the essence doesn't change a lot. And Incident and Problem Management are two good examples of processes that didn't change a lot in practice, with the introduction of the Cloud.*

I: Moving on to another question, that is the last one, in your opinion, what benefits exist in providing IT services via the Cloud-based model, when compared to the traditional IT on-premise model? I would like to have your view about this based on your experience.



*R: In my view, scalability is the most important point, which is related to the Capacity process that we've discussed earlier. For instance, in e-commerce, before the Cloud, in Black Friday, instead of having 100k clients, I'll have a million clients. Before the Cloud, I had to prepare the physical servers and manually perform changes to grow the capacity. Now, with the cloud introduction, that service becomes easier, because now, if more capacity is needed, I can have some kind of automation to grow my capacity under the business needs. And this made a lot of things easier. Before, if we had an access maximum peak, a lot of times the structure wasn't ready for this. And it resulted in a lot of problems. Nowadays, we have that possibility with the automatic scaling of the Cloud. So, considering the part of the services that impact the client, I see that the cloud brings this huge benefit because you don't have to care about having a team there, looking at the CPU consumption, the memory consumption, client numbers, rising of demand. So, I believe that, at that point, Cloud brings a lot of benefits.*

## Attachment C6 – Sixth Interview

I: First, of all, I'd like you to ask in your opinion, what is the relationship between an ITSM framework, in this case, we'll only consider ITIL and the adoption of the Cloud Computing business model. I'd like to know your opinion based on your experience, synergies, benefits, and cons.

*R: From my perspective, when it comes to ITIL and Cloud adoption, the focus should be on several aspects in terms of the Strategy. First of all, if we consider IT Service Management, then there are several questions that first you have to answer. First, you have to do your research about the Cloud computing environment, to address the concerns that you may have. Such like, does your organization needs to be with its infrastructure? For example. Because the IT Service Management must first determine whether the computer infrastructure is not expensive for it, and too inflexible. Then, probably you need virtualized Cloud Computing because it saves money. Before taking this decision, you have to do this analysis first. Whether is required to move the whole business into the Cloud, why should not just part of it be moved into the Cloud? Some applications, or even building your application or business processes which may evolve in time as requirements. Of course, the Cloud can significantly reduce time-to-market when rolling out new functionalities and processes. But does this fit your organization and your needs? Then you have to consider which type of cloud should be used? Public, private, or hybrid? And how will information and data be secured? New measures have to be taken and those are required to help ensure how the data can be accessed, anywhere and anytime. If it's an international company with data spread worldwide, regarding your data storage there is data protection regulation and laws must be taken also into consideration. Another aspect is Service Portfolio Management. We're also touching ITIL here. To assess the needs and requirements of particular departments, who wish to use certain cloud computing. The portfolio Management must contain all necessary information, which is required to assess which Cloud model is efficient to deploy and compare service competitiveness and effectiveness across different providers. It is essential that a portfolio be created for all potential external cloud deployment models. The Service Portfolio Management process gathers and analyzes the Cloud Service Providers services in the market. This ensures that the Service Provider has the right mix of services for you and your organization, to meet the required business outcomes. Are those appropriate for the level of investment you have to do? The Service Catalogue must be updated to reflect all live cloud computing services which are available through your provider. Now, consider if you're the customer of the Cloud Provider. Then the Financial Management is important to understand if it is cost-effective. It matters if it is cost-effective, the administration of the assets and resources in providing the IT services. Does the Cloud Provider do this for you in an efficient manner? How do you do your budgeting,*

accounting, and charging requirements? And, can the Cloud Provider fulfill these requirements for you? One of the key features of Cloud Computing is based on the fact that you know it's charged, based on consumption. Pay as you Go. Especially if you're using the SaaS, the Software as a Service. But Financial Management process must be changed to incorporate this fact when it comes to this cost analysis calculation. And you have to be prepared that you won't have that control which you have on-premise. Especially for sensitive applications such as accounting and finance. IT Accounting and Customers, let's say your customers, need to have information related to the consumption bill and details about what the Cloud Provider has built for you. If the accounting is fully responsible for explaining how the money is spent by customer services, that's fine. But the Cloud Service Provider needs to have a well-defined and implemented billing process to satisfy your needs, and your customer needs. And you have to make sure about that. It may happen that your service management processes in that terms differ from those of the Cloud Provider. And you have to find the balance and to think, somehow. Demand Management, Capacity Management, as part of the Service Design, is something very very important. The Cloud Service Provider must fulfill any sudden search in the Service Demand without compromising the grid performance. Now, the Service Level Agreements, when it comes to the Cloud, differ from the ones on-premise. And when using the Cloud performance requirements for the Cloud Service, must be very accurately defined, especially in the peak period, whether it's low or high, and must be clearly articulated in the Service Level Agreements. Failing to calculate and define the required performance is a source of risk. One of the high risks could lead to obstruction or complete damage to the customer business. The control there is a bit difficult, so you have to make sure that you have defined the right service level objectives and the right service level agreements for you. One key premise of Cloud Computing is that any request for modification or deletion of the existing capacity or resources has to be done in real-time. That's fine, but how does it serve your organization? And this is something that has to be considered very carefully. Now, Business Relationship Management, in the traditional context it identifies the needs of the existing implementation customers and ensures that appropriate services are developed to meet those needs. In the Cloud environment, the purpose of the business relationship management process is extended to form and uphold the Cloud Service Provider in the customer-business relationship. The objectives here include that you must ensure the Cloud Service Provider understands your perspective of service and is, therefore, to prioritize its service assets appropriately. The Cloud Service Provider should guarantee that is meeting your requirement and business need. Otherwise, you should be able to establish formal complaints and escalation processes, in place. A constructive relationship should be in place, driven by your business needs and understanding your customer needs at the same time.

I: In your last point, what you're saying is that the Cloud Provider must customize the product or service that is going to be delivered, according to the customer needs?

*R: Yes and that has to be ensured during the contract negotiations stage. And also, even before that, when you do your planning. Whether you want to adopt Cloud Computing, whether is in hybrid, private or public? is it going to be IaaS? SaaS? PaaS? And then, based on this accurate planning you have to do in advance, you have to pick up the right Cloud Service Provider for you. And you should avoid vendor-locking. In all aspects. Especially when buying particular services only from the same Cloud Service Provider, and sticking to its technologies, tools, or anything that they provide. You should be able to find the balance and to use the appropriate products and services for you, as a company, as a customer, rather than stick to only one expertise and portfolio. You should be able to search for alternatives. That's the most important when it comes to the decision about Cloud Computing. If you have adopted ITIL in your organization, you must ensure that ITIL processes are in synch with the Cloud Service Provider service management. When it comes to the focus of the business and your exact needs and requirements, if you have the decision to adopt the Cloud Computing model, it means you need some improvement to be done. Or that you want something that provides benefits for your organization. Then you have to make sure that there are processes, procedures, etc, and are built on top of that and they can just continue that you have started from somewhere. So basically, the Deming cycle is also present no matter whether it's on-premise, cloud computing, etc. Plan Do Act Check is a base principle everywhere.*

I: Although we already touched on some of these points, let's move on to the second question which is: in the framework you're using, does it already covers the Cloud Computing characteristics? If so, in which processes? If not, the same, in which processes? What is the framework you're using?

*R: Well, before we used ITIL v3, yes, but now, in this company, we use SOC (Security Operations Center) framework. This is what we're using as a basis, and this is going to be even expanded to adopt more cloud-related controls such as the Cloud Security Alliance as a standard, and then, others more complicated that would require additional effort to adopt.*

I: So in the past, when the framework was ITIL v3, you already worked with Cloud Computing?

*R: Yes, in one of the companies we even had our virtual private cloud, so I'd say yes.*

I: OK, then based on that experience, did you feel that ITIL v3 already covered the Cloud characteristics?

*R: In this particular organization, yes, because HP, since the very beginning has adopted ITIL as a service management practice. All processes have been built on that ground.*

I: Having in mind that experience in HP with ITIL v3, what were the main processes that already covered the Cloud question? Did you feel in that time in HP, that ITIL v3 already covered some of the Cloud characteristics?

*R: When it comes to the system planning design, those are covered, basically there are no differences, in the concept. But when it comes to system operations, then it's different. More adjustments are needed there because of the nature of the service. When you move to the Cloud, it's different. Not just because of the technology that you're using, but also the way you operate.*

I: When you talk about operations, please correct me if I'm wrong, basically you mean Incident, Change, Problem, Service Request, something like that?

*R: Yes, for instance, Incident Management is different in the Cloud. Because of the nature of the cloud itself. So, it poses much more risk there, when it comes to Incidents that can be derived from Cloud Computing. Also, just another thing, when I refer to 'Operations' I mean the improved collaboration in various offices, departments spread worldwide. You can imagine that when it comes to the Cloud. Of course, the agility is improved, the rapid provisioning of resources like storage or computing instances, this is what Cloud provides immediately. Scaling up computing resources as per requirement from different teams, offices, customers, it's spread worldwide. It doesn't matter where you are when it comes to Cloud Computing. And you're not interested where the service comes from, as long as it covers your requirement, operational or non-operational, and of course is regulatory and law compliant, when it comes to data protection. So you have an improved availability in business continuity. You have reduced operating costs, by paying only for the required capacity, and scale when the requirements change. Maintaining applications, infrastructure, platforms, becomes much different when it comes to Cloud Computing. So that's why I think that these are the mainly impacted. The others, when it comes to organizational aspects and the way you define the processes themselves in the very beginning during the Planning phase, those can still be the same, as long as you consider the new nature of the service. But the concept stays the same. But when it comes to the system operations, or even the transition phase, could be different in terms of managing the project itself. But the concept about the phase*

*itself, the domain itself or system transitioning, still stays the same. It's more the nature of the work that you perform after that.*

I: Just a side question, do you think that ITIL is impacted by Cloud Computing in an equal way for the Provider and the Client Side?

*R: I think so, yes, because I cannot divide the responsibility in either way. Of course, probably, the more weight is on the customer side. Because in the end, you're accountable and responsible for your own choice. For the Provider, it's almost the same due to reputational or brand image risks that you may face if in case you're not that compliant and not that customer-oriented. But at the end of the day, the customers are much more accountable and responsible for the choices they've made about the Cloud Service Provider and the cloud services they have.*

I: So, correct me if I'm wrong, but according to my perception from your answer, but the approach within the Supplier Management process should be somehow well addressed and well evaluated.

*R: Well, evaluated, yes. And if the decision is taken, first of all, again, you have to decide whether it needs to be the full organization or specific parts, processes, something that may fit into the cloud itself. And here comes the question of whether you're a service management-oriented organization because is it the cloud provider able to respond to that? Because it may happen that then you, being in the situation where you have to re-write all your processes, just because you have decided to go to the Cloud. No, it's not necessary, because you'll require much more effort, budget to be allocated, costs, expenditures, of course, people, time to drive this project or program. And it's fine if you made the required analysis and initial research in advance, and this is in fit with your current service management organization and processes, that's fine. But if you have to change that just because you decided to move into the Cloud, then I don't see much profit and value doing this.*

I: So let's move on to my last question. The last question is way more generic. So, what benefits exist in providing IT services through the Cloud Computing model, when compared to the traditional on-premise IT model, based on your experience.

*R: Very easy. Agility, scaling cost, improved collaboration, availability, and business continuity. That's it. But again, only if you did proper planning and you know what you are doing. This is very important as a remark here. Otherwise, it's going to be much more expensive than you have expected.*

I: So, strategy and planning is the fundamental key to this as you've mentioned before. Choosing the best model, choosing the best providers.

*R: Absolutely and again, this is very important. You have to consider in this planning, the IT Service Management, IT Service Portfolio Management, Financial Management, and Demand Management or Capacity Management, whatever you want to call it. This must be considered in your planning which is also vital when it comes to ITIL. It's more in the Strategy and tactical approach, rather than technology and something else. You should not be tightened to any vendor or technology. You have to be tightened to your processes, procedures, policies, organizational setup. Within your strategy, you have to consider where you are, where you want to be, and which is your best fit, whether it's going to be a particular process, a particular service, or the whole organization, whether you need cloud computing at all at this stage. For me, the biggest risk is that you're losing control. Most organizations are still relying on a hybrid solution where you still have both on-premise and cloud computing models operating together.*

## Attachment C7 – Seventh Interview

I: So, the first question is: in your opinion, what is the relationship between an ITSM framework, in this case, ITIL, and the adoption of the Cloud-based IT model. I'd like your opinion about the benefits, the cons, the synergies, from the Client and Provider sides and also would like you to share some experiences in practice about this.

*R: Maybe I'd start when I met ITIL. I was an ITIL certified v2 practitioner way back in 2002, so I think I was one of the first people in the Philippines to be an ITIL practitioner in the v2. So in v2, the focus is on the IT organization, trying to provide the standard processes in supporting your organization, in my particular case, our client. We were selling our services as best-in-class service, so we need to be certified, we need to align to ITIL, it's even more on the IT organization. When version 3 came in, version 3 is more about providing value-added services to the client, so, we're not only talking about only the IT organization but even more about providing quality services to your customers. And there is where Cloud infrastructure comes in. Software-as-a-Service, Infrastructure-as-a-Service, Platform-as-a-Service, etc. Before moving to that, I'd like to talk about ITIL 4. In ITIL 4 is not only the client or customer that is important right now. Now the goal is value co-creation. It's now like a partnership between an organization and the customers, creating value for the customers. So that's how ITIL evolved, particularly in my case, and in the Philippines, this is how ITIL evolved. Now, in terms of Cloud infrastructure, started coming into IT, ITIL is much affected by that one. So, before v3, ITIL implementations were very fragmented, each one is situated on each organization. For example, I'm a Service Provider, I'll tell my client I'm ITIL aligned and if the client is ITIL aligned too, then there is some common understanding of the processes. But when Cloud Computing came in, the synergy between the client and the IT organization started mixing up. The reason for that one is, for example, if you're a company, previously you were hosting all of your hardware, all of your IT infrastructures within your organization, within your control. Now, you are shifting that infrastructure to an outside location. And that outside location has its own ITIL organization. So, if you're familiar with Incident Management and Problem Management, if you have a Priority 1 Problem, previously, it was very easy to do Root Cause Analysis. You had to just call the person behind you. Now you need to coordinate with an outside entity, and they need to provide you with all those information and in terms of Service Level as well, you need to involve them in your*



*processes. It's not like having a meeting and saying we have SLAs of 4 hours. It doesn't work like that anymore. We're now dealing with a different entity with underpinning contracts that are very much important now. The operative level of agreement is very important now. So that's how IT evolved when Cloud Computing came in. As an IT organization, you need to look beyond your organization, trying to influence the other organization into adopting your processes. So I think that's the major impact of Cloud Computing on the ITIL framework on ITSM.*

I: Still, do you think the impacts you've described, have the same weight both for Client and Provider, from an ITIL perspective?

*R: Technically, yes. But when you are trying to implement all of those things, especially the client, they don't see any difference. They will always demand you to align to what they're asking. From the Provider's perspective, to be able to support that, if you're asking me something beyond what my capability is, you need to pay more. So, technically they are separated processes, but on the perspective side, there are some synergies and agreements that are put in place. On the Service Provider side, although they have a standard, they can do it beyond the standard, but they're going to ask the client the premium price on that. On the client-side, they will impose their processes on the provider side, but you know, it's not possible to impose your processes on another company. If you want to do that, you have to pay the premium for that one. So, technically, they're separated processes, but the synergies will be always able to provide the quality of IT services for the end-users.*

I: OK, so I'll move on to the second question. Regarding the framework which you're working on, it already covers the cloud characteristics? First, what is the framework that you're working on right now?

*R: So, we've just started implementing ITIL 4 for my organization, just last January. Before that, it was ITIL v3. In terms of the changes that are going to happen regarding processes. Actually, they're called practices right now. In terms of that, there is no big difference, Incident Management remains the same, Problem Management remains the same, but the way to deliver those services is the one that's changed. For ITIL v3, we wanted to provide value-added services for the customer. So, the IT organization's*

*thinking was "what can we do more for the customer". Now the idea is that we need to work constantly with the end-user to do a value co-creation for the business. So, it's only the IT group to provide inputs about what to do, about what to improve. We need the business to provide not only the feedback but to work directly with us to make these things happen.*

I: Still, in terms of processes or practices, do you think there are some specific processes or practices that are already covered, that are aligned with the cloud-based characteristics? Or are there some processes or practices that don't cover them? What is your view about this?

*R: I think both v3 and ITIL 4 are aligned with the Cloud environment. Specifically, ITIL v3 was just adjusted (v2011) for the Cloud environment. So ITIL 4 is the same, the dimension is just now more focused on co-creating value. But in terms of framework, I think ITIL v3 and ITIL 4 are aligned with the Cloud environment.*

I: Moving on to the last question, in your opinion, what are the benefits of providing IT services via the Cloud-based IT model, when compared to the traditional on-premise IT model?

*R: I think the benefits are for the business. In the perspective of the economy of resources, not only money value savings but resource savings. As you are well aware, if you are implementing an IT-aligned organization, you have maximum efficiency in the use of IT resources. For Incident Management, people are just objectively concerned in solving the issue as quickly as possible. So, in terms of resource efficiency, ITIL provides that one. In terms of the budget, cost, price-side, I can do it on the cloud environment, I think the Cloud environment provides a good cost-effective infrastructure, scalable. Because previously, you had on-premise. And in on-premise, if you need to add servers, you need to procure the server, wait for the delivery maybe 1 or 2 months, then configure the server, and it would take maybe 3 months to have that server ready. In the cloud environment, scalable, if you need the server, one click and you have the server. So, in terms of cost is very good. In terms of efficiency in delivering services, providing the scalable infrastructure to support the business, I think it's there. So, on the economic side, Cloud*

*and ITIL are better now for the business. In terms of IT support, that also makes life easier. You can now do remote support, instead of having to travel to the datacenters. So I think there are some evident advantages in providing IT services through the Cloud when compared to on-prem.*

Attachment C8 – Eighth Interview

I: So, in your view, what is the relationship between a framework of ITSM, in this case, ITIL, and the adoption of the Cloud-based IT model? What is your opinion about the benefits, the cons, the synergies, based on your personal and practical experience? What is your thinking about this?

*R: One of the strongest things in ITIL is that you can use it for everything in IT. So, ITIL thinking is based on adopting and adapting principles. This means that, if you want you can choose the part of ITIL that you want to use, and you can throw the rest away. So, it does matter which Cloud solution you're actually into. You'll find a part of ITIL you can use for that. And it does matter how big your organization is, how big interfaces you'll have in your Cloud solution. You can always choose ITIL because it's scalable, whether you have 2 or 500 people in your organization. You can use it on a small cloud solution or a bigger cloud solution. So, ITIL is a framework that helps you to make the right decisions and organize them in the right way. And it's not so important which Cloud solution or organization you want to adopt.*

I: So, in general, ITIL is basically adapted to every Cloud model and every organization no matter the size?

*R: Yes, you can use it for small cloud solutions, for big cloud solutions, it doesn't matter. Because, ITIL is based on experience, based on a lot of companies who tried this before and found the best way of doing it. And there is a lot of smaller businesses and larger businesses that came together and build this framework. So, in that way, you can use ITIL for all your cloud solutions.*

I: Let's go to the second question then. Which framework are you using in your job?

*R: I'm using ITIL. I'm an ITIL expert and I fo have an ITIL master and I'm working with ITIL every day in our organization. I'm working for an insurance company in Denmark. My role is to organize the setup in IT, how we work together, how we interfere together, how our processes are supporting the IT department.*

I: Is it ITIL v3? v3 2011? ITIL 4?

*R: We're still using ITIL v3. ITIL 4 is a small development from ITIL v3. I've been teaching ITIL 4, so I know it very well, but it's a lot more similar to working with ITIL v3 because, the processes you should use in your daily work, such as Change Processes, Incident processes, problem processes, it's easy to understand when using ITIL v3. I don't personally consider ITIL 4 as an improvement, it's just suggestions, most of the things in there, we were already doing it. So, for that reason, we have been using ITIL v3 and we are working in outsourced provider companies that even work with ITIL 4, but it's no problem in fit, in working together even using different ITIL versions.*

I: In that sense, do you think ITIL v3 already covers the Cloud-based model characteristics? Are those characteristics already covered by the ITIL v3 processes? If so, in which processes? Or, if not, in which processes?

*R: I think it is covered. I think that ITIL covers, in its processes, the Cloud characteristics very well. It's simple to understand the Change process, the incident processes. I'm working closely with Service Level Management processes, CSI processes, and making sure we have the best processes to fulfill the demands from the business. I don't think that ITIL 4 has improved ITIL that much, but it's a better framework now. There is a lot of new recommendations in ITIL 4 and of course, it's nice to have, but as I said before, I think that most of ITIL 4 are something quite obvious. And if you worked with ITIL for some years, you will have implemented the thinking from ITIL 4 in your daily work. You don't need to start renaming your processes or changing the way you're acting in your daily work.*

I: Just a side question, do you think somehow, some of the processes would need to be approached differently while using the Cloud-based model? What is your view about this?

*R: I mean, you can always bring a lot from frameworks. I think there is a lot of frameworks that are getting closer and closer to each other. When we first heard about ITIL v3, we didn't speak about DevOps, and project management wasn't a part of ITIL v3, and there were some limitations to ITIL v3. As time goes by, we're getting closer to the ITIL way of working in your release process, or in the way you implement your projects. And that has*

*been a development through the last 5,6 years, that we're getting closer and closer. We're getting closer to DevOps as well, and they also have the ITIL thinking in implementing small routines. A few frameworks are getting closer and closer, and I think that in a few years, probably in ITIL version 5 or something like that, it will melt into DevOps and maybe some Project Management framework like Prince2.*

I: Understood your point there. So, I have a 3rd and last question which is way more generic. In your perspective, what are the benefits of providing IT services via a Cloud-based model, when compared to the traditional on-premise model? What are the advantages of providing services through the Cloud?

*R: First of all, you don't have the full responsibility 24h a day, keep your system up and running. You can outsource it to a 3rd party company. Actually, there are different cloud solutions. But it's good that some of your work is taken care of by somewhere else, so you can concentrate on the organization. Make sure we are organized, that we have the right processes, the policies, that we have everything right in our organization. So, we can take in information from the cloud and interact with the cloud vendor in the best possible way. It's very good, normally, you also lose a little bit of control. I've seen many places we have also a little bit of that sickness that we are looking a lot into what is happening in the Cloud. And we are trying to interfere with the Cloud and tell them what to do it. Actually, that's not a good thing, we want service from the cloud provider and we already paid for that. We have to just relax and believe that we're getting what we paid for. I think many companies and ours as well, are losing a lot of time, resources, people, checking on what's happening in the Cloud, what exactly we're getting, and so on. The cloud solution can be quite expensive if you first paid for the solution, and then you have a lot of people sitting, looking into the solution to see if we're getting what we paid for. Most cloud solutions are very good, but you must have the discipline to accept that this is something that when the vendor or the provider is running, and you do your own job and you just get the information from the Provider. And what is your job, is to understand how to interact with the Provider, and not go into his area and try to understand how he (Provider) is working and so on. So, I'll say that cloud is in my opinion good, but you must have at the start, a trustable and reliable provider and trust the work that Provider will do for you.*



## Attachment C9 – Ninth Interview

I: So my first question is: in your opinion what is the relationship between an ITSM framework, in this case, ITIL, and the adoption of the Cloud-based computing model for an organization? What do you consider as benefits, cons, synergies, and I'd like you to share some experiences in practice.

*R: I think ITIL will always be ITIL. In general, ITSM frameworks will be always relevant both in on-prem and in Cloud context. ITIL in Cloud context highlights some aspects that probably, regarding solution the on-prem environments, were not so highlighted, such as the following example. Usually, moving to the cloud from your on-prem environment, you had to have a strong business case. So, it requires you to understand not only the direct cost, because these are easy to identify such as the cost of the machines and energy of your datacenter versus the direct cost of subscribing a to service in the cloud, but also it requires you to think in another collateral aspects that sometimes were not so valued and now become. The productivity gains of your IT because they don't have to directly administrate the physical datacenters and servers, and there are efficiency gains. And even other indicators that usually we don't pay much attention to. In that perspective, I think ITIL will be always useful and valid, because moving to the Cloud environment, in practice but not always because you can move to the cloud in the lift-and-shift model, that is, changing from on-prem infrastructure for infrastructure-as-a-service, and that brings you value-adds of not having to manage your own datacenter, etc. Obviously, there are evident value-adding and the business case is, therefore, subjective for each company and must be adjusted. But usually, what happens is a mix. You just don't migrate machines to the IaaS, a lot of times you migrate for SaaS or PaaS, depending on the context. And in that point of view, thinking the ITSM framework and ITIL particularly, requires you to, for one side, think in the Service Design phases in another way, because if you look to ITIL you always could have services designed internally or externally. But the reality showed us that, a lot of times, when the IT is internal or in a shared services unit, the services are designed and calculated what is being intended to be delivered to the end-users, but sometimes it doesn't match their expectations. And this happens because, for instance, you didn't well define the SLA's or the OLA's as they should be defined, probably you won't measure in practice. You define the service you want to deliver to your client, but you don't correctly establish the limits*



*between one service and the other one and its interactions. While in Cloud, you're required to think a lot more on that because, for one side, because a big relevant part of the Service Design was already performed regarding the service that you're subscribing, if it's Amazon, Google, or Microsoft, whatever it is. A big part of this Service design is already performed, especially when it comes to scaling providers they are already deeply defined the indicators, better than you would do on your own, internally, etc. On another side, it requires you to think in the concrete context which you're delivering to your clients. You know that offering that service to your internal clients, you already know what you're going to have because it's an already developed platform. You just have to subscribe to Microsoft products and you pay Microsoft licenses, but that, due to the adoption of the service, requires you to design the service, and understand very deeply what you're going to offer, if it is video conferencing, if it is a collaborative platform, if you let the collaborative platform to opened to everybody to modify something as they wish, if you'll have governance in terms of structure. So that requires you to think about the service in a way more detailed. And if this was in-house or internal service, probably you wouldn't think like that. Even because, several times, that service definition requires costs, because you can have Tier0, Tier1, Tier2 licensing, you can have add-ons, other things. While doing the business case, you're already defining the type of services you wish to have. Unless you are one of those companies who buy top-level licenses and, in a later phase, you think what you're going to offer to your clients. It happens to, but not for every company. Therefore, from that perspective, it requires you to design the services more deeply. On another side, the ITIL process phases are still valid. That is, this is the initial phase of the Design of the Service that, most of the time, already has an impact on the business case, and in the definition of your costs, but then, in the part of Service Transitioning, for instance, the people that had Skype for Business or Lync, and now have Teams, this transition must be planned and followed with training, Change management, new governance, because you'll now manage new platforms and phase out the previous service. So, all those Service Transition and Service Operations remain valid. The only difference that I find, is that a lot of times, you already have from the Service Provider you're contracting, a huge platform of a knowledge base about how to perform these transitions or operational monitoring of the platform. And obviously, most of these platforms already provide you with the SLA and OLA definitions, present in the contract, which helps you from the monitoring of the service perspective. So, from a service perspective, I think that the framework remains very relevant. More than relevant, it's*

*now more directed to the context where you don't have to think that much in service, from the internal implementation side or how to make it available. Now you have to think more from the perspective about what do I have to activate, buy, license, etc, and how am I going go to define the governance of that service, how will I perform the Change Management of my users and how will I make it available for them. And therefore, that is where I relate ITIL and other ITSM frameworks and I think they are still valid for the Cloud context, just like they were already valid before.*

R: So, you almost mentioned the whole group of processes from ITIL v3: Strategy, Design, Transition, Operation. You just didn't mention CSI, but that one is indeed deeply related to the whole cycle. Do you think that Strategy and Design are the most important for the Client because the operational processes are more on the provider side? Would you agree with this statement?

*I: Yes indeed, I'd say it would be easier the Service Operation because typically, you already have it in a lot of platforms that already offer you that. But that doesn't mean that you don't have to think in these aspects and operationalize the service even in the perspective of the internal resource management, because although you are contracting the service in terms of cloud, it doesn't mean you don't have to have knowledgeable and available people to manage that operation. And therefore, that Operation part must be also planned. Also, each time, the platforms are offering new updates, new features in a more fast-paced way. And from the perspective of Service Operation, it's not about viewing logs of configuring monitoring platforms like Nagios or others, to monitor, but it's more about enabling people to know how to monitor and how to react to that monitoring. And that requires investment in terms of training, in terms of time, and following-up, otherwise, you won't take advantage of Cloud evolutions in terms of features that the Providers are making available.*

R: Now let's move on to the second question, regarding the framework subject itself. In your view, do you think that the framework you're using in your job, already covers the cloud characteristics? If so, in which processes? Or if not, in which processes also?

*I: Well, I believe with the authors that consider that ITIL v3 2011 doesn't need to be reviewed just because of the environment itself, cloud or on-premise. I think the*

*framework doesn't need any revamp to support the cloud characteristics. The relevant concepts for the Cloud, such as SLA's, OLA's, RACI, the definition of the different responsibilities of each entity, whether is provider, client, IT support, etc, are already reflected in the ITIL framework. But, in my opinion, at the time, there wasn't enough maturity as we have right now about SOA (Service Oriented Architectures), and many times, in on-premise, the thinking behind it was applications. Backward, of course, they wanted to deliver a service, but the main concern was focused on the application about to be developed. And ITIL, in that time, was much more aligned to the service delivery, the thinking of designing the services, transition and operation of the services, and many times, there wasn't this correlation so strong with the environments on-prem. The difference is that, in the Cloud-based model, many times, you already have the SOA thinking, and from the perspective of the Cloud Service Provider offer, is already service-oriented. So, when we are thinking about moving to the Cloud, we already think about the services themselves, and ITIL was already much more aligned and prepared to cover those needs of planning and management.*

R: I have another last question, that you already answered, at least partially. But let me ask you anyway. So, in your opinion, what benefits exist in providing IT services through the Cloud-based model, when compared to the traditional on-premise IT model? What are the advantages now?

*I: Well, regarding that, we already worked together in the ITSM domain, with ServiceNow which is the biggest provider of that kind of platform. I think that there is a great advantage in providing IT services via the cloud, for the same reasons the cloud is beneficial for other contexts. For instance, the knowledge and volume synergies involved, because we have benefits with the experience and with the best practices applied to other companies, the cost-reduction, etc. One of the points I consider interesting to look at, in a certain way, some ITSM processes are not that transparent or less immediate. For instance, Change Management, in on-premise, was somehow easy to understand. You have typically the three environments (Dev, QA, Production), you build the Change Management process, then you have a CAB if you want, to review the change requests, you have a support tool for that also, a deployment tool, etc. Nowadays, what I see is that you can't have that level of control, especially when dealing with larger platforms, such*

*as Office 365. In that situation, there is a commitment between the client and the Provider and the lack of control you're about to have because if the Provider performs an update or inserts a new feature in the platform, they're delivering to you, you don't have control. In that view, you have a challenge on the Change Management side, because you are already losing the control you had over what and when something comes to the Production environment, on how and when you're going to deliver to the users. In the cloud-based environment, you cannot control the Change Management process because it is on the Provider side, and you don't have a great solution for that. So, of course, there are additional responsibilities and risks, especially in Change Management and communication with your end-users.*

## Attachment C10 – Tenth Interview

I: My first question is: in your opinion, what is the relationship that exists between an ITSM framework, in this case, ITIL, and the adoption of the Cloud-based model? I'd like to know the benefits, cons, synergies and also you to share some practical experiences.

*R: So my experience is not on the applicational side, but rather on the infrastructure side. Since early, 2017, I've been dealing with the Cloud. The approach on Cloud on-premise was the same. It was handled like a normal data center. Since last year, since ITIL 4 was launched, everything wants to be more agile, quicker, even ignoring some of the principles that ITIL has, for more ease and speed in the execution, which is what Cloud provides, when compared to the on-premise systems. I think ITIL tried to have an evolution following Agile and Scrum methodologies. I think the next ITIL will be much more like the unification of all these existing tools and frameworks. Before we had much more inflexible, bureaucratic procedures that will disappear. But that's because this was the way that people saw ITIL. ITIL doesn't need to be heavy and bureaucratic. ITIL is about guiding principles and each company adapts itself according to its needs. I think that the approach of ITIL shouldn't be different because of the Cloud computing model, the approach should be different for everything in IT. We must have quicker mechanisms because the reality we're living on requires it. This is not like before, where everything was very controlled and bureaucratic, now everything is pointing for the fast development. The thing is, this all depends on the person and on the way that ITIL is implemented. A company can decide to implement ITIL with the proper logic and processes or just by making it bureaucratic. Because you can have all these processes in an agile way. It's not necessary to add more bureaucracy. Cloud is just another tool. It's not different from the other ones. Cloud just exposed this situation and that's it.*

I: So, let's move on to the second question, do you think that the framework you're using, ITIL V3 2011 already covers the cloud characteristics within its processes? If not, which ones? if so, which ones?

*R: Yes, I think it already covers the Cloud characteristics. I just think that people are not yet prepared for the terminology that is used. And people read that in a way that will add bureaucracy, that is not needed. ITIL provides you with guiding principles, and then, it's up to you to understand if that fits your organization or not. For instance, a change can be defined as standard even with a high risk. But the company assumes it as a regular and necessary activity and becomes standard because of that, and the risk is accepted. In this context, what is important is to understand if the company understands the risk associated. Of course, a standard change*

*will have a speed very different from those that have to be submitted to CAB approval or other process approvals, or planning approvals. A standard change is already standardized and documented in the way it is executed, so there is a work here of back-office that must be performed that the organizations should perform. The Cloud and I say it again, is only exposing that fragility because it makes the whole process quicker. That is, in a normal data center, for creating a virtual server, you would take about 1 hour. In the Cloud, you'll take about 5 minutes. It's a click. And ITIL 4 tries to change the concepts and the paradigm, to facilitate the understanding to the people that want to implement it.*

I: Indeed, ITIL 4 brings some new concepts into the framework such as Agile, DevOps, etc. Cloud is mentioned several times in the ITIL 4.

R: *Yes, in the v3 and v3 2011 editions it wasn't even mentioned. Cloud, in practical terms, is a data center. The difference is that this data center is exposed to a lot of people. And the service component that is on top of that, exposes the weakness of the most bureaucratic procedures that exist in the organizations, which the ITIL 4 tries to approach with DevOps and Scrum, etc.*

I: But still on the second question, do you think some of the processes should somehow be adapted or not to this Cloud-based model reality?

R: *As I said, for us Cloud is a data center. And that's it. The processes should not be different or approached differently because of that. It's the same. But still, I'm on the Infrastructure side, not on the Applicational side.*

I: So moving on to the last question, what benefits do you think there is in providing IT services through the Cloud-based model when compared to the traditional on-premise IT model? What are the benefits and the cons?

R: *I think it's trendy to have things in the Cloud. That is, the benefit of having things on the Cloud rather than having a robust data center is low or does not exist. Cloud is typically more expensive. But Cloud allows you to have scalability that on-prem doesn't allow you to have, without the companies do, beforehand, acquisitions and purchases, and so on. And for me, that is the great advantage of the Cloud in the upgrades and downgrades. But then, it's up to the companies to understand if the additional cost they're going to pay makes sense or not. What I do see now, is that the on-premise data center is cheaper than the Cloud. In terms of performance, I don't see any reason for them to be different, because 12 CPUs on-prem, and 12 CPUs in the Cloud are the same thing. What I see is that agility is the fit of the system, to grow or to shrink, according*

*to the needs. And for me, ITIL is adapted to both universes. There is no difference between both realities, Cloud just exposed the already existing fragility.*

I: Just a side question, do you consider that the companies, most of the time, don't perform a strategic evaluation well enough when migrating from on-premise to the cloud? As you said, there are costs related, Cloud is expensive, sometimes more than the on-premise environment. But still, as you said, it's trendy. So why do companies still do that? Is it due to a bad strategy analysis?

*R: That's a tricky question and probably involves some political aspects. I wouldn't say that Cloud must be forgotten and everything should be on-prem. I think companies should have their data spread whether is Google, AWS, Azure, or on-prem. I think that, in my vision, the biggest part of the infrastructure should be on-prem. Of course, for a small company, having a data center with 2 servers wouldn't make any sense. But in the case, we're talking about with 1000 or 2000 servers, then yes, it makes sense to have their physical data centers. I think it's a political decision and not a technical decision, most of the time. Some things like the DNS, some ADFS components that is the Single-Sign-On, it makes sense, some things are more native in the Cloud and yes, it makes sense. From the technology perspective, of course. But most of the time, what happens is that this decision is political, for marketing purposes to promote that we are a very dynamic company because we are Cloud services. And that's not entirely true. A company can be highly innovative by having a traditional data center. But still, in the Cloud, you don't have to deal with hardware renewals, scalability is easy, and that, in a physical datacenter, that's of course much more complicated. Every 4 or 5 years, the hardware must be all changed, upgrades are limited.*

I: So, the greatest advantage is scalability.

*R: Yes, and even the best thing for the companies is to use both models. For instance, when a company wants to acquire new hardware, it will take a lot of time and meanwhile, they can put their things into the Cloud. We cannot be only focused on one of the universes. The best is to spread the information across both models and different providers, always after a deep analysis and evaluation of course.*

## Attachment C11 – Eleventh Interview

I: So, one of the main objectives of this thesis is to identify, understand the main characteristics of the Cloud based-model such as the cons, the benefits, the risks and to understand if they are already accommodated or not by the ITSM framework, in this case, by ITIL from the processes perspective.

*R: May I ask, the scope of your thesis, is it related to the ITSM framework and ITIL specifically? Or is it more broader?*

I: We only focus on ITIL processes in this thesis.

*R: I think it's a good thing then. ITIL is a specific framework for IT, but it doesn't cover all of IT. Even ITIL 2, 3, or 4, there are gaps in Governance, there are gaps in Finance, there are gaps in all sorts. From ITIL 2 to ITIL 3, there was a big evolution, now ITIL 4 is a different thing. One of the challenges from ITIL, a few years ago, was that it was seen as the only framework for IT, and companies didn't realize the big picture they're missing (other frameworks). But there are lots of them, out there such as the ISO's, eTom, MOF, etc. But they all suffer the same thing, they cannot cover so much.*

*The framework you need is to understand how to use multiple frameworks and get the parts you need out of them. But the individual framework won't tell you that, they're proprietary frameworks and they want market adoption. And there are other reasons for that, I'm sure we'll cover some of those. Let's get back on the landscape where in the past, ITIL was the panacea (solution for all problems). You've now heard of DevOps. So DevOps is the new panacea that is going to fix everybody's ills, but it's not, because DevOps, quite rightly suits development, in a cloud agile world, to a point, but it doesn't do anything with the error stuff in the IT. So, it can only address certain parts of the situation or solution, or whatever framework you want to apply. But organizations don't think like that, they think of 'what is the new shiny panacea that we can buy and train people on' and they think that will fix everything. None of it it's working, nothing, that thinking isn't just not working anymore. And I think the way Cloud has kind of, amplified the way, and you can't just use one thing anymore. And when we talk about hybrid Cloud and multi-cloud scenarios, which are very common now, just one thing won't fix it. But I think the challenge is, for organizations, 'what do we do for people? I think where we are,*



*in today's world of work in IT, not just IT, but in general, we have very limited time to think. It's all about to do, run, operate, agile, fast, speed, velocity. We can't think. The answer, in terms of framework, is to get time to think about how we can apply what's there to our Cloud environments. Different organizations have different needs and requirements. But there is nobody out there thinking about it. They just try to apply models and frameworks, instead of thinking about what they really want and what they need. There is so much flexibility with the Cloud, we can almost do anything we want to do. But that's not necessarily the right thing to do or the most cost-appropriated way to do it. Just because now DevOps says 'we can increase the velocity of change and make all sorts of changes quick', that's great. But at what risk? If you're a bank and you make a DevOps change, and it doesn't work, and you can't go back? There's a risk there. You can be too risk-averse and lose opportunities. So, we have to work out things as a balance. It's a challenge that organizations are facing. In the past, we could apply frameworks because we could control what we got and how we got it. Now, we lose that control, which is not negative. It's good. But we need to think about how to apply this stuff.*

I: DevOps is another concept that is somehow tightened to the new ways of working in modern IT. Didn't had the chance to work in that context yet.

*R: Of course. Robert Stroud, sadly passed away some years ago unexpectedly, was doing great work in the Service Management, Risk Management framework types. I remember a meeting a few years ago in the UK, I said 'Robert, what's happening with Service Management in the US? It's now the dirty word?', then he said that in the US, companies were firing and retiring the Service Management people, who they've trained over the last 10, 20, 30 years, Service Management is old and 'old' has a negative connotation. DevOps is the new thing to do, so we're going to exit, retire, fire, whatever our Service Management group. We're going to bring the DevOps people, and then, where we find gaps, we'll bring back Service Management people. And that was the way he said companies were doing it. And to me, that's lunacy. There is a lot of people that are using and have been trained on ITIL practices, amongst others, they have significant amounts of company information, knowledge, ability, capability. Just because there is something new or new methods, it doesn't mean that the previous ones have expired, and we need to get rid of them. These people around their 40's or 50's have the capacity to learn new stuff. They have passed for significant iterations of IT change, so they're valuable*

*resources. But sometimes, companies look at their resources as cost. And I think we're in danger of looking at the cost profile of some of these folks, against their education and skills today. It doesn't take much to educate and train them into Cloud, and the business mindset of all of this and reengineer the workforce, rather than trying to bring something new, because you lose so much company information. All that political know-how, who can 'grease the wheels', who can get things done, all this kind of stuff. It's just a matter of educating and training these resources into DevOps. Of course, you can bring DevOps people, but just write them off (the Service Management professionals), because of a framework of Service Management doesn't seem great anymore. I think it's incumbent for organizations to upskill them. But nowadays, companies are just looking at costs. And you'll find in the IT organizations different agendas. The CEO has an agenda, generally, that is, to increase profits. And there are two ways to do this: grow the business or take out costs. Growing the business is difficult. Take out costs, not so difficult. Then we have the CIO, that is under pressure: innovate while reducing budgets. I won't say it's ridiculous, but the IT industry hasn't done herself a favor, because promises like 'buy this new IT system, or cloud or whatever it is, save money. But it costs money to do. You have to spend before you get the savings, and not always do you get the savings. For instance, in retail sales, where you have to serve yourself at the checkout. Some people don't like that. If you go to the bank, there is nobody at the bank anymore. There are only machines and things and they can only do some of the things. And then, you pick up the phone and you're on hold for 50 minutes to wait for someone that can help. These are the costs of using IT and innovation. But it's losing the customer. We have CEO to CIO, but when it comes to Cloud, it's a misconception over the last years, it's now being recognized as something that will save money. And the Cloud people will sell that to you. But they don't count on the people management and all the other things around it. All the support you need, all the controls you need, all the DevOps you need, everything else, that is a cost when you enter the Cloud. So, we are in this situation to try to innovate without decreasing budgets, but CIO can't change that. The CEO has driven an agenda of increasing revenues and decreasing costs.*

I: Indeed. Sometimes, using for instance chatbots is not the most practical way to perform some kind of action or to search for information. Usually, in my experience, chatboxes only provide me with the information that is available on the website of the company. Most of the time, there is no phone number or even e-mail address I can use. And from

what I've seen, there are no chatboxes for companies with websites having lack information. So, it turns out that to the point that the first thing I do when I'm using a chatbot is: "I'd like to talk with a human person". And then I get my problem or question solved, most of the time.

*R: Yes, indeed. Chatbots is a good example. I've rarely seen good chatbots designs. Usually, they don't make more than infuriate customers and make them lose their time. And that's why we have all this great technology, and we're using it to try to save money. But I'm convinced that we're pushing it too far because we're losing the customer. All the banks are using chatbots and all of them are doing the same thing. You can't go to another bank and expect better service. Same for telcos. I saw some banks promoting great profits, while the customers are on hold for 2h trying to ask why their cards don't work. That CEO revenue influences all the way down to everything we do, even to Service Management. One of the big challenges in ITIL is the absence of Financial Management and the importance of Financial Management. If you're on the ITSM and you need more investment for, for instance, Problem Management, because you want to expand your team, ITIL covers Problem Management in detail and how to do it. It does not tell you anything about how to get funding to do it. Because no one outside your ITIL bubble team cares about Problem Management. Nobody in Finance nor the CEO cares about it. The CIO generally misunderstands.*

I: But here the tricky question might be, how to highlight these costs to the CEO? Probably they're more used to seeing the explicit financial costs such as bills and so on. Or are they able to measure the cost of losing a customer?

*R: That's exactly it. The ITIL v3 Problem Management book doesn't tell you to answer that question. In fact, it doesn't bring it up. So actually, there's one of the gaps in there. Problem Management is one of the more important processes in Operations because it can solve big things that can cause big issues. The ITIL Service Operation doesn't frame that conversation we're having. All you have is, in the IT Department, a lot of technologists or people that come from Technology into these Management roles and they don't really understand Problem Management or what it really does. They're just too concerned with the metrics and about how many problems we have, how do we classify them. I've seen people asking why can't we put an urgency and impact on Problem, just*

*like we do in Incident Management? You don't, you can't, Problem is based on risk, Problem Management is related to Risk Management. In fact, Problem Management should be called Risk Management, but it wasn't. It was a missed opportunity. Because now, nobody cares about it, and it's seen as an overhead (cost). I've seen Operations with Service Desk, Incident Management, Change Management. Problems were just logged, and nobody really understood them. Organizations should think of Problem Management and business should be aware this is important too. So that is one of the big misses in Service Operations, Problem Management. When we start thinking about Cloud, you going to find as well that Cloud is different from the way we get traditional (on-premise IT model).*

*In traditional IT we'd go to an IBM and say, "Build us a solution, here's what we want", and you'd be pretty much the owner, you pay for your consequences of it. So, that's a model and we found that model for 20, 30, 40, 50 years, and there's a legacy built-in there. But then Cloud comes along and says "we're going to give all this IT stuff, on-demand and all those characteristics thing, But you don't need to own it. We own it, the CAPEX, the investment wheel building, you just consume it". It's way more complex than this, but this is the basis of it. Fundamentally, this is a model of the change. That's a change in the business model. But where a lot of people are falling down is, they are still thinking (of Cloud) as technology. And they're not understanding, and I guess is a hard road for companies to understand that they're getting IT services in a different model, in a different way. And that's different. You're getting available in service. Not a Priority 1 ticket that you'll find in the ITIL Service Operation book. I see so many companies trying to measure, say Office 365. Office 365 does a lot for company A. Then they'll log a ticket for the HelpDesk, it's a priority 1. But the fixed time is 4h. That's nonsense because that's not what they bought from Microsoft, or Google, or from whatever that is. They've bought response and availability time, and if it's not fixed within that perimeter, they may get some credits back. It's a completely different thing. So, what you'll find in the ITIL world is that they fully don't really realize that either when you see in the ITIL 4 construct.*

*So one of the big things, for your research there, is that Cloud is a different model altogether, from what we've had. It's not defined by the customer anymore; it's defined by the Provider. So, take your SaaS, take your IaaS, take your PaaS things. Amazon, Microsoft, they're saying "here's what you get, here's how you get it, here's what you're going to pay". While the old model is "here's what we want, here's what we'd like, here's*

*what you want to pay". And you can negotiate on that. In Cloud, you're going to buy a service that somebody else has defined. But there's a lot of clarity there. For instance, I tested on my students if they knew the 5 characteristics of Cloud. No one knows them all in IT and most of the answers are wrong. It's so important because those 5 characteristics define what Cloud is. One of them is 'measured service', and ITIL 4 doesn't really cover the 'measured service' in this perspective.*

*The 'measured service' means your Cloud Provider provides you the service and measures it to their specification. Now, that may not be what you measure to what you believe your specification is. So, your service could be down in AWS. You're using IaaS and you're using a lot of code in there. That could be down, and you're measuring it as being down for say, 6h, but AWS is actually measuring the service being up. So, Amazon can tell you that your service is running fine, but your internal measurement, which is now costing money to set up, because you want to be sure that Amazon is measuring it, tells you the service is down. And how does that happen? If you didn't architect your service as per the contract, you may get to the point of a mismatch in the measuring due to having 2 zones, one is down but the other is operating. But being in two zones, that cost twice the money. And then, their measurement is down, but Amazon is up and there is a mismatch back to the business. And even with Office 365, say the e-mail is down and the business is used to ITIL, with incidents and response and solving times. Now you don't have that, because you bought availability, for instance, it will be up 95.5% at the time. So, there will be outages. But what I found is that the IT department and the IT Service Management folks are now explaining that to the customers. And then the CEO says, "the e-mail is down when it will be back?" and the only answer is "we don't know". But they don't tell you when it will be back. They will tell you: "there is an outage in 365 and we're working on that". If you read the contract, and this is another big miss with ITIL stuff because no one reads the contracts. If you read the contract, you'll see "we will provide you Office 365 with availability. We offer no fix times. If it goes down, we'll solve as quickly as we can". And I'm OK with that because that's what you're buying. But it's different, do you remember Cloud is a different model. The big miss in the ITIL IT Service Management world is to translate these changes back to your customers. Because, for 20, 30 years they've got services in a way. Now they're getting a different service but haven't been told that. If you think the people in the IT department don't understand Cloud, the people outside the IT department really don't understand Cloud. But they think they do.*

*I've been working with ITIL for 20 years now, I first came across IBM a long time ago, with ITIL 2 version. I thought it was very good. And then, early 2000's, I've been consulting in the Service Management and Management of IT, and then Management of Cloud. What I found is, in the evolution, ITIL v2 was pretty good. You can't really call something best practices because they can be improved. ITIL is actually good practice. It was an attempt to codify what was working well in the UK government. Codify and then teach the world. Because until then, we were doing a lot of different things with a ticket, incident, request, whatever. And that gave us a great lexicon and a great framework in the early '90s. And then they made the upgrade of ITIL v3, and that was OK. I had a customer last year, and I pulled ITIL v2 books and said "you need ITIL v2, not ITIL 4, you're not ready for any of that. And when they moved to that service lifecycle, they kind of confusing things, they kind of shoehorned (forced) processes in. And they went from 10 processes in one function from v2 to 26 processes and 4 functions. That was huge junk. They built an overhead they didn't need to. I did account one time for an ITIL course. Within ITIL 4, there were 102 different roles to find. They have just too much overhead, they've made it too big, and I think they lost a bit of the focus there. I think version 3, they've made it too big, and the lifecycle model was OK for the time. So, it's ITIL v3 a good practice? Or is ITIL v3, what we would like? I don't see it as good practice anymore, based on what we've seen elsewhere. I think it was a lot of stuff put together to expand it. It's not necessarily based on 10years of use in certain industries. There are a lot of good things, but I can tell you, out of the 5 books that I have, most of the companies are still using the same couple of processes from version 2. The other stuff is just seen as lots of overhead. I think that's where going in into ITIL 4 and DevOps, industry looking ITIL v3 saying it's too way complicated, too way bureaucratic, too big. But then, ITIL 4 has come along, and I think ITIL 4 is not a good practice either, is just kind of aspirational in terms of these things that are happening now and try to use them. They moved to this Service Value System, they took a lot from Lean, because DevOps is looking at Lean, Agile is looking at Lean.*

*I tell you my view on Lean. If you came across Lean as well, from the Toyota Quality Management. So, lean came out of what was found to be working well in Toyota's manufacturing plant. Well, Lean works well in manufacturing where you have a lot of inventory and flows, and that colinear works. I don't think is relevant in knowledge for Services Industry. Because we've chaos. However, like DevOps was packed full of Lean,*

*which actually can work in Software Development Cycles, because you are pushing Software Development through a pipe. So, I think you can look at that from a Lean perspective. For Service Management, I wasn't so convinced, and I gave some feedback on it. I wasn't so convinced that you should or could apply a lot of this Lean stuff. And now you see in the ITIL 4, they talk a lot about the Value Stream Mapping. I love Value Stream Mapping, in manufacturing. That's great. It helps in Just in Time. Value Stream Mapping, Lean, all related to Just in Time inventory and all this kind of stuff product. I don't see it in Service Design. I don't see it as straightforward. And I'm not convinced that trying to value stream map or trying to have ITIL 4 based on value stream mapping, anything today is really going to help solve the problem. People are still trying to do Problem Management and get funding for that. You're hardly unlikely to do value stream mapping and get the value from it. You'll see a lot of things now in ITIL 4 about the way is put in the backlog and all this kind of stuff. Backlog is just being a queue. A queue of tickets. But you can't handle a queue of tickets like if it was an inventory. Because it's a different nature. So, I think ITIL 4 now is becoming more aspirational and has brought in things that they think apply, without actually understanding or knowing how to apply. And I think they did more of that, again, with this basic understanding of Cloud as 'just a bit of technology over here. That's just my view. In ITIL 4 they describe the characteristics of Cloud, the deployment models, the service model, there are a few pages on that. But for the rest is just this Lean approach, Value Stream approach, etc, and all the context they're bringing in. And I think again that the volume is too big. It's another 4 or 5 books. And I think it's just too big. Even the certifications path, now have four tracks, one about trying to understand the customer, there's one about digital, but what you'll find there is the ITIL view of digital. Not a digital view of digital. And I think that there is where it falls down. They have this ITIL 4 Digital Leader, in one of the leadership tracks. Again, my view on that was, you're taking an ITIL view on digital leadership, and I don't think businesses are going to get the benefit from that, because ITIL on its own it's not good enough anymore. You do need ITIL, you do need DevOps, ISO20000 has some updates for Cloud, ISO27001 security has some updates for Cloud. There is a massive gap in the market for Cloud governance, about how to govern all. And I think that's what ITIL missed. But I think what ITIL is doing or has taken in ITIL view of Cloud, and ITIL view of Digital, rather than Digital view of Cloud, and Cloud view of Cloud. I think that's where the challenges will be. We have so many technologists in the context, but there is*

*a lack of business acumen in the IT function. I think that's a general gap that we have. We don't have business thinking and business acumen in there.*

I: I have a question about that, we'll approach that in my questions.

*R: Still, let me just finish about this business acumen thing, because the other thing you're missing is most of these frameworks are about cost. Cost allocation control cost monitoring. If you're running all of your IT functions out of the budget, the formula becomes last year's budget minus 10%. But if you're like a good CIO that can understand how to frame investment into IT to deliver something the business wants, there might not be cost savings but more agility. You're likely to increase your budget, but that's not in none of these frameworks. And they really struggle to get the business acumen side of the equation. Now, some may say that that's not their department. But I don't think you can have a framework that seats in IT without consideration of finance, and some guidance for that. So many companies I see doing something like 'here's what IT build would look like. But there is a centralized IT budget.*

*Now when you move into Cloud, centralized IT just won't work, because Cloud is variable by nature. The more you use, the more you pay. Then who pays? The IT budget? I don't think so. If you're in marketing, if you're in sales and you're using more cloud, you pay for it. But then in the IT world, in the IT function, are we able to actually identify those costs from the Cloud provider that needed service. Sometimes they can give us the bill, sometimes they don't. Are we able to architect how we understand who's using what bit of Cloud and then charge them for it? Or you showing them it, and then charging for it then later on? Some companies are doing that well, most are not. And they're still running from IT budgets and then budget overruns. The IT is going to look for more budget because some other department is using lots of Cloud.*

*You also need to architect things like reserved instances where you get discounts. But you need to be able to do it, it's in the ITIL capacity management, forecast planning. But it was easier when you were the owner of the IT equipment and you were able to forecast. But now you have to the business and say, "what's your use such of Cloud", marketing department and ask the cloud usage for next year. They just will go "we don't know". Nobody knows, no one has control there. And that's where you get challenges, that's where you get outsourcing happening, that's where budgets and costs increase as well. So, I think that in this cloud context, it's needed to bring some more business acumen into*



*the IT function itself, and work more closely with Finance, and understand Finance. Sometimes, when you're looking for CAPEX vs OPEX. Salespeople had a phrase like "move your CAPEX to OPEX". Sounds great, isn't it? But I ask the Salespeople "What does that mean?" and they said, "well, means you don't use this CAPEX money, but the OPEX money". And I said, "let's go deeper. What does that mean for the business?", and they don't have a clue of what it means. Is it cheaper to get CAPEX on the financial market? If it is, maybe you borrow that CAPEX and then put it in your OPEX budget, that's maybe one way to do it. One is the cost of the capital on the market against what you save if you're into the Cloud. Salespeople had no clue about the average cost of the capital. Another thing is that, if you want to move your CAPEX into OPEX spend, you'll have to pay it each month. Or your cloud will get switched off. OPEX relates cash flow. So, an expense. Now you know you can amortize certainly, but you still need cash flow to pay that bill whereas is your mortgage or not. So, if you don't pay for your e-mail, the e-mail gets dozed. Whereas in the CAPEX world, you bought your e-mail for the next 5 years. And you could sweat (worry) that for another 2 or 3.*

*So, this whole thing, when you get into this Cloud world, they say 'go to Cloud to save money, go to Cloud for this or that', organizations are moving their applications to the Cloud, for saving money. But applications are not cloud-native, so it's going to cost them more. They don't get the agility, they don't get the scalability, they can't do anything with it. It's just increasing their costs. While they have this data center over here which they paid for, they just pulled it back and stuck it back into the data center. Not everything needs to go to the Cloud. And that is missed somewhere within these frameworks where you got to have that decision-making process of 'do we move things to the Cloud, or don't we?'. I think before moving to the Cloud, you have to understand 'is this application right for the cloud?' and then you have to expect to spend money because it will cost you money to do a transformation. And then, when you put that in the Cloud, will it perform and behave that application in the cloud as expected? Or do you have to refactor it? There's nothing wrong with the data center like you've had in the past. There is now the realization of companies trying to understand what should and shouldn't go into the cloud. We really need to think about that. But who should be available to help with that? You need an IT view, and a business view. Going back to the business acumen, I think we're missing a bit of the business side on the IT functions at the moment. For the Cloud, I really think that you have to balance the technology and what you can do with it, and business thinking and business skills as well. A big miss, in general, in some of these*

*frameworks is that they're trying to get the IT function to understand that there are the people that can translate the technology of the Cloud back to the business. They need to understand that too. And frameworks don't go into that to help understand that. If you don't understand what you're managing, you can end up managing it badly. I think the right people are the IT functions people to translate all of this new Cloud stuff for something that the Business can understand because Cloud is still too parsed. One is deeply the technology and all the things you need to do to make it work. On the other hand, it's all about what is the business of what you're getting and how you're getting the contracts. I talked to architects and say, "have you read the contracts for the Cloud services?", "No", "So how you're going to handle with architectural constraints in that contract?", "Oh, we don't care about that". While for the client, this is not the best, for the Cloud Provider, everything looks good. Even on the training courses, I have, in a group of 10, I ask how many people have seen a Cloud contract. On average 2/10 have seen one. And when I ask them about the constraints in the contract, they said "I didn't really read it". If you look into a cloud contract, you'll see absolute differences: Cloud is a different model, it's delivered in a different way, defined by somebody else and you have to deal with that, differently. If you try to apply traditional frameworks (ITIL v3), to something that is different, it won't work. Other ITIL stuff will work. An incident is still an incident. But then, back in the days, you could manage the Incident end-to-end with your supplier. In Cloud you don't, you manage it to the point where the contract says, "it's now with the Cloud Provider". And they don't tell you what they're going to do nor when they're going to do. So, you just wait. Compared to traditional IT, they've lost a bit of control, but then there is a lot of advantages, sometimes cost, flexibility, better service. You've gained something but you've lost a bit of control. The same model just doesn't apply end-to-end. They still talk about SLA in the ITIL 4. In this Cloud world, you're not, constructing the SLA that you want. You're getting the SLAs by somebody else. Now when we go into the cloud of clouds or multi-cloud, you're using Cloud Services from Amazon, from Microsoft, from IBM, from, SFDC. There's a big stack of contracts. You're not going to go through all of these and figure out how does this works. And then, when you integrate SFDC SaaS into your Directory services, so you can authenticate login people, you now have to be able to figure where things break in that chain. But a lot of times you can't contact the Service Providers because they don't care, they'll say their services are up. So, you need to have more skills in IT because now in this hybrid mash of all sorts of different people, clouds and APIs, and all sort of things put together, all different*

*contracts associated. Whereas in the traditional model, you defined what you wanted, and need more ITIL controls over it, now you have less control over it. But that's not a bad thing. I don't say that's a bad thing. That's not necessarily a bad thing. But you may not be managing it well, you may not be understanding it well. So, another thing with this framework is that they try to shoehorn the Cloud world fit into your traditional ITIL framework. It doesn't work. There is no panacea, there is no book any person can give you, but rather people have to think about what they need to change in their organizations, and also understand the Cloud from a business perspective. And ITIL doesn't go well on that road. Now they can say that it's not up to them to go on that road, there is still a lot of techniques to apply to it but doesn't actually give you the fundamentals. But there is a lot in good there still. But I think it went from best practices to good practices to what you could do. And basically, that's it. Do you have specific questions?*

I: Let's move then to the questions. What is the relationship between an ITSM framework, in this case, ITIL framework, and the adoption of the Cloud-based model? I'd like to have your view about the benefits, constraints, synergies, and some experiences in practice that may illustrate it.

*R: OK, in the simplest terms, Cloud is delivered under a different model than traditional IT. Frameworks were designed for this traditional IT up to ITIL 3. ITIL 1, 2, and 3 were focused on traditional IT. Cloud delivers IT services and business services differently, it's defined by the Cloud provider, can be more generic. It has its 5 characteristics, deployment models. And basically, the service is defined as "if you want to use it, here's what it is". The frameworks are trying to overlay a traditional service management framework won't work 100%. You might get 50% or 60%. An incident is an incident at the end of the day, but you start to lose demarcation (the limits or frontiers of the process). And configuration management, configurations will still be on the Cloud, but you still have configurations in your datacenter, and it could be more overhead and trying to figure out what that is. Or with the Cloud, you can say "we don't care about configurations". We understand more the architecture and the API than the configuration items. Change Management is impacted there, because one of the cloud characteristics is 'on-demand self-service', and you can make it in your Cloud environment in seconds. Went to the Cloud Portal, make a change, done. Change Management has been seen as*

*a little more bureaucratic, once you log the change you want to do, there is an approval process that could take days, a week, whatever that is. So, you now have this Change Management clashing with the Cloud, under the Service Management framework. And what do you do? You then say, "a change is a change, you're not going to make a change go ahead. Just log it later on. That can introduce significant risks. So, the newer versions of ITIL still trying to understand how can you adapt to the velocity of change. And how you make more changes, more often, but understand the risk to what you're doing and trying to de-risk that as well. So, there is no right or wrong answer. if you slow down changes and Cloud because of your Change Management process, you're losing one of the core characteristics of Cloud: on-demand self-service agility. But if you allow too much on-demand self-service agility, that's own controlled outside of change, you significantly increase your risk of doing something wrong, having an outage, loss of data, customer impact. Where is the balance? DevOps is stepping in to be a bit of the balance, but I think there are challenges there because DevOps is tightened to Agile, Lean, it motivates you to the idea of making changes when you want. The challenge now of the new framework and DevOps coming in is, if you really want to do DevOps and Change Management and address the Service Management challenge, you need to buy a lot of tools to automate those changes. That, if the change happens in real-time and doesn't work on the use itself. But if you don't have automation, you're not going to achieve DevOps. And you're not going to achieve very Agile changes. So, there is an impact on Service Level Agreements. In the past, we used to be able to back them up to get Priority 1, 2, 3, 4. Now, the Cloud model changes that regarding, the Cloud Provider tells the Customer "here's what you get, in our terms, the way we're going to deliver this to you", and "you either sign it, or you don't". There is little room for negotiation, maybe for some little aspects of the service. But, by large, the generic SaaS public Clouds are "here's our terms and the way we want to deliver". But this has implications for incidents. When an Incident happens, say e-mail goes down. In the old model Service Management world, you pick up the phone, call IBM and say the incident would be solved in two hours or they would have redundancy built-in for things like that, you paid for it. But in the new world, when your office 365 or your Gmail goes down, you can attempt to call Microsoft, but it won't get you anywhere. So, there is nobody there. You can call your account manager, but they're not going to fix it. They have no power. They just going to say, "yes it's down, and should be up, when it's up". This is what you have bought. So, there is an impact there. At the Service Desk, how do you manage some of this stuff when it goes off into a*

*Cloud or not and how do you manage a situation like the e-mail is down, the CEO calls the Service Desk asking when the e-mail will be up, the only answer from Service Desk is "we don't know". Then the CEO says, "you're fired, you should know". Not understanding (from the CEO's view) that you didn't buy that type of service is a problem. There are implications there. There is a big thing about vendor-locking, but sure we've had vendor locking with IBM when somebody bought Mainframe back in the '70s. And you're still using it in the bank and insurance industries. That's locking and we've always had it. We need IBM to build your data center, they've locked you in there. So, Cloud has an element of locking, but I wouldn't be too concerned with that. And that's some of the implications of the frameworks and their ways of working. There is also an extra cost in upscaling and re-skilling, not only in the framework but also in other things as well. So there's a couple of impacts that have come up.*

I: Indeed, you provide me with a good overview of the impacts.

*R: There is another final impact that is, "people don't know they don't know". So, when I started to provide training to my students on this matter is that they didn't know what they didn't know. They don't realize how this big model change is significant. And I think one of the challenges with the frameworks is that there is a bit of reassurance that there is not much change happening here. And that's one of the biggest challenges here, they don't know what they don't know.*

I: So, let's move on to the second question. The framework you're using on your job, does it already cover the Cloud computing business model characteristics? If so, in which processes? If not, in which processes?

*R: From an ITIL perspective?*

I: From the perspective of the framework, you're using right now. Is it ITIL?

*R: It's not a single approach. What I do is, I've been doing this for 20years, taking from other frameworks and blending it all together. Actually, there is a thing called VeriSM. They have that management mash, where you take pieces from various frameworks and you adapt them in the way you want to do. What I've seen for ITIL 4 stuff is, in ITIL 3 they*

*defined the processes in the books, while in ITIL 4, they didn't put those processes in the books, like that. They're separated now to the books. And I don't think they really understand the new world that we're in. They're still in the past, although they did some updates. I think there is a challenge there, for people today, trying to match those IT processes into Cloud. And then, what's in the books, I think is new. There is no in-depth guidance in Value Stream Mapping of the IT function for Cloud as per ITIL. They talk about it; we don't see concrete guidance for people to do that and to get value out of it. Another challenge there is that the new ITIL 4 stuff talks a lot of collaboration and value. And I think they talk so much about collaboration and value that; they actually made those words meaningless. Because it depends on how you define value. And value is very subjective. And they do a lot of these value stream stuff and say, "if it's not delivering value, then don't do it". But there are a lot of things you do in IT that don't necessarily deliver value but need to be done. Collaboration is another word I don't agree with, I'd see it more like working together. The framework just says collaborate on everything and I think we just need to work to the common goals. Whether is collaborating or not, I don't know. One of the big challenges is that they speak a lot about value, but I think they don't fully understand what value really means. I think that in ITIL taking some of the high-velocity stuff is pretty OK, but I think organizations are going to have to find their management mash, using the VeriSM language. The only way you can do it is if you have people that understand the frameworks and the context they're working in, cloud from a technology perspective, cloud from a business perspective, and a little bit of business acumen. Again, if you're looking at the finance side of Cloud, some of the conversations are now saying to get investment for your cloud operations, you have to understand the way that costs its capital. To understand, whether a business invests money in there or not. Otherwise, it's kind of budget stuff, it's not a value conversation you're having. So, I think is a big miss. Absolutely, there is value in Cloud, but the value is subjective based on perceptions. And if you don't understand the business side of the cloud, you're not able to have a value conversation, you're always going on 'chasing the tail' to try to use Cloud to reduce costs. One of the worse things you can use with Cloud is to try to reduce costs if you don't know what you're doing. Because it gets very expensive, very quickly. One of the best things you can do with Cloud is to get Agility. But to get Agility, you have to weigh between agility and risk in doing too many things too fast. Not every organization has to be DevOps making 20 changes in their IT space in a day. They don't need that. They need to understand what is their velocity of change and it's not just one speed of*

*change in one area of IT. It's in different applications. Where do we need it, where don't we need it. Because these things get very very expensive. So, I think it goes back to that thinking, we now have to have people in the IT functions thinking about this, and designing it, and not relying on the books and say, "here's the map". There's something in the books, but you're going to have to accommodate that to whatever you're doing on the Cloud today if you want to get the right result. And the management mash is one of the better models that I've seen. Management mash says you can use bits of everything. The VeriSM tries to explain some Lean and all this kind of stuff, and that's good. We've got to bring some of our thinking and critical analysis to this.*

I: But still, being able to bring pieces of different frameworks to a common framework, it's quite a difficult challenge isn't it? Isn't it simpler for companies to adopt one or maybe two frameworks, and apply their guidance on their internal processes? Because getting pieces of several frameworks means having deep knowledge in several frameworks and that seems difficult for the majority of the companies.

*R: It is. But that's the world we're living in today. If you think about it, we were using say, mainframes in the '60s and the '70s and '80s, right? ITIL came along in the late '80s and the '90s. We have 30 years of significant IT equipment and management. ITIL did exactly what you just said, back then. I think now things have changed so much that are not as relevant anymore, and now need to be part of a bigger thing. So, we've now, that void, for the next couple of years, I don't know if it's 5 years or 10 years. Now we have a bit of a void, where traditionally we've gone to these types of frameworks (ITIL) and said, "there is an answer here". We're now saying "oh, we've got not to understand what out of this should I apply". So, we're a bit of a void. In the next 5 or 10 years, there will be some frameworks that will pull a lot more of this together because we understand it more. So, the technology always comes first, the mainframe came first in the '50s and '60s, ITIL in the '80s and '90s. Now that difference will shorten. Technology is moving faster, quicker than ever before. The gaps won't be 20, 30 years, it's gonna be years. I think that we're missing the ITIL of the 80's or '90s for cloud and digital today. So, it's a challenge to be fulfilled somewhere, where does it come from? I don't know. But now we have all of these proprietary frameworks, remember ITIL is proprietary, DevOps isn't proprietary but it's controlled by another group. It will take years before the frameworks evolve; technology always comes first. We will see something, as it is more understood.*

I: Alright, so let's go to the last question. What benefits exist in providing IT Services via Cloud in your opinion, when compared to the traditional on-premise IT Model?

*R: Cloud is positive. Very positive. Cloud suits some situations, not all situations. For instance, the CAPEX. Say, for an application of sales, you no longer have to go to someone to build your own sales application. Go to SFDC or others, they're the experts. So the idea is that they've created everything you need and it's all in there. And you pay for the OPEX model, the subscription model. Some good benefits there. But for every benefit, there is a constraint. The benefits are, you're less weighted, you're less involved in managing the 1s and the 0s, the hardware, the data center, that's managed for you now from whatever Cloud Provider. You're managing what you do with it. So, there is an opportunity for staff across all of IT, to upskill and understand the business side of Cloud a bit more to put them in better positions and organizations. Get them in in the business side of IT, rather than the IT side of IT. What's happening to the IT side of IT, it's been outsourced to Cloud Providers. Cloud is just outsourcing at the end of the day. You can get better service levels than you're were able to buy or provide your business in the past, to some degree. You're going to access to latest technologies, upgrades, and things like that. There are huge benefits. You get flexibility, agility, you can make changes on the fly, you can make instant changes if that's good, but it comes with risk. Getting risk comes with risk. Having new technology requires to upskill people and there is a cost. So, whenever I talk about a benefit, there is always a constraint. And say, the benefits are great, here are some constraints, and organizations have to understand what you want out of those. You have quicker time-to-market, and that's fantastic. Well, there's a cost in there, you need DevOps tools. Because you need to have to automate, your software cycle to get that quicker time-to-market. So, for each benefit there is a constraint, so what I suggest for organizations is to understand those, and make the right decisions. Agility in Cloud doesn't mean that everything suits the cloud. So, just don't take something from a Datacenter and put it there with the idea of saving money, because it might not work. It might cost you more money to be refactored. You might not get the agility by putting it up there. Here's another benefit, a benefit of going into the Cloud, is that they measure the service for you which is great. But the constraint is that they measure in their terms. You now need to measure in your terms. And put them together. I wouldn't say cost savings is a benefit because it's not an initial benefit of Cloud. I didn't agree with Salespeople on*



*this, and I still don't. Because, you already have invested your money in CAPEX and your data center, and when you move things to the Cloud it means to transition. And transition costs money. Probably, if you're early in Cloud and you don't understand, how to get the discounts from reserved instances, and things like that, you've probably architected it wrong. So, it will be more expensive. Now you can save costs over time by re-architecting it, buying reserved instances, doing better forecasting. So, I believe there are some cost benefits, but these don't come at the start of your cloud journey, it comes later. But what are the on-demand costs? There are different costs in Cloud, so if you're going to on-demand compute, that will cost you more than a few buys of reserved instances. But on-demand is, if you want more services it will cost you more, if you want fewer services it will cost you less. That's the on-demand out of Cloud. But then, the Cloud Providers want your money upfront, quicker, so they can build datacenters. So, they say "we'll reserve you this amount of computing whether you're using it or not". So that will cost you a fixed price rather than a variable price. So, they've changed a variable cost into a non-variable cost, which is a benefit, and at a cheaper rate. So, I think the benefits from Cloud come by really understanding the architecture and where to save money. But you need to have a technology view and a business view together. There is a benefit therefrom cost, but it's not like you think originally. Still, a lot of organizations just consider the cost of the VM's and all of that. But don't consider the costs of transition, licensing costs, and everything like that, they look at the costs in a very simplistic way, and not only the price points. There are always other things to consider like, will my application run faster, for instance? It's a gap that frameworks don't get. It's neither value nor Return on Investment. It's something in the middle.*