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A FRAMEWORK FOR CLOUD ADOPTION FROM ENTERPRISE ARCHITECTURE AND BUSINESS PERSPECTIVE

June 2014

Validation case study:
The Implementation of Cloud-based Contact Distribution in Philips Consumer Lifestyle

UNRESTRICTED

Diana Utomo – s1312448

A Framework for Cloud Adoption from Enterprise Architecture and Business Perspective

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Important: Some parts of this research have been restricted from public due to confidentiality issue.

Eindhoven, June 26 2014

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Preface

Since July 2013, I had started to find a topic for my graduation project. One day before my flight back to Indonesia and three weeks before my marriage, I talked to Pascal van Eck, my professor for Architecture Information System course, and asked for his advice about the available research topics and how to find an internship with a subject related to Enterprise Architecture and governance. One advice he gave was to approach the companies first and then see what topics they offer instead of having a list of specific topics in mind and adjust them to the company needs. Thanks to his advice, I started to send CVs to some companies which offered internship vacancies for any topics related to IT implementation.

This search finally became fruitful by the mid of November 2013. I would like to give my sincere gratefulness to Mr. Jan Prinsen, from Consumer Care Team - Philips Consumer Lifestyle, who has accepted me to do a research project concerning cloud computing implementation. During this project, he has been a wonderful mentor who gives me valuable advices not only for the research but also for life, encouraging me to be a more energetic and confident person. Then, to his secretary – Ms. Anita van Ravenstein, I owe her thankfulness for lending me an ear and a helping hand during my time in office.

I would also express my appreciations to other Consumer Care team members, especially Mr. Jose Maria Boronat – the head of this division and Mr. Joost Hungerink, who have shared useful information about the processes in the contact centers. Also thanks to the IT project team - Mr. Aad Zwinkels, Mr. Nico Mannaerts, and Mr. Koen Wissink, I have learned about the challenges in managing the cloud project and received valuable feedbacks to improve my framework.

Without the directions from my supervisors, Mr. Marten van Sinderen and Ms. Maria Iacob, I will not be able to finish this report. Although the travelling from Eindhoven to Enschede was not always pleasant, the meetings I had with them had given me a helpful guidance in selecting papers and reminding me about certain aspects that I missed. Last but not least, I would like to convey my utmost love and gratitude to my husband, Paulus, who has been so patient to always supporting me and my parents who are continuously praying and encouraging me. And to all my friends, whom I cannot mention here one by one, thank you for your supports and prays.

Sincerely, June 26, 2014

Diana

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1 – Introduction

This chapter provides an overview of the motivation underlying this research, followed by the research objectives. This is followed by the research approach and structure. Finally, the impact and relevance of this research to both the practical and theoretical development is outlined.

1.1 Problem statement

The gap between business expectations and actual information technology (IT) delivery is not uncommon. There is an increasingly perceived vision that cloud computing will be able to solve this gap by addressing business demands with faster, easier, and more flexible IT services. However, to achieve these high expectations, firms usually face significant obstacles while creating a holistic cloud strategy. This situation gives the motivation for this research to define a framework that will help the successful implementation of cloud solutions.

The gap between business expectations and IT delivery and the rising importance of cloud technology

Since the 20th century, IT has evolved rapidly and seems to bring promising revolutions in how businesses may carry out their processes. However, none of these technologies is perfect. In her paper, Rettig (2007) mentioned that IT cannot fully cope with the agility of business changes. The increasing complexities in enterprise software cause the risks and costs, due to the system changes, to increase as well. Instead of streamlining and simplifying business processes, IT has brought high uncertainties and risks. Year after year, many organizations are trying to prove the values of IT to the business strategy. However, the delays, cost overruns, and difficulties to integrate various systems have widened the gap between IT and business needs.

More often than not, surveys have reported and still continue to show that many IT initiatives fail to deliver on the expected benefits, raising concerns that the expenditures do not deliver sufficient demonstrable value for money (Ward & Peppard, 2002). Some examples caused by this incoherent strategy are the missing business opportunities due to the unsupportive technology investments, ineffective integration of systems, poor quality and productivity of IT, misuse of resources, and uneconomical investments.

Cloud computing, a revolution that brings computing service as a utility, is perceived to have the potential to make IT more attractive. There are high expectations from businesses and IT that cloud computing will solve many problems which are a result of traditional IT. Based on a survey performed by Forrester Research (2012) with 327 enterprise infrastructure executives, there is a strong belief from the business that cloud, with its 'cheaper services', offers higher availability, faster delivery, and other flexibilities. In addition to that, expenditure on IT can be lowered and the same size of resources can be redirected to support other core business activities, turning IT which was previously seen as a cost sink and liabilities into a key competitive advantage (Garrison, Kim, & Wakefield, 2012).

The interests toward cloud computing have resulted in a peak of inflated expectations. Gartner predicts its wide adoption will still occur in a time stamp of two to five years (Martens, Pöppelbuß, & Teuteberg, 2011).

The lack of consensus about cloud adoption strategies

Despite its alluring benefits, many organizations face obstacles while trying to make the implementation of cloud computing successful. Some of these obstacles, as surveyed by Forrester Research (2012), include the difficulties to transform the highly interconnected and mission-critical legacy applications into cloud computing, the technical requirements to maintaining the legacy systems and the concerns that the service level attainments of cloud are lower than the ones of internal infrastructure. Géczy, Izumi, and Hasida (2012) also mention that organizations need to carefully manage three main aspects that are a result of the transformation to cloud environments, i.e. secure environment, controls to data and system, and legislative issue. The other relevant aspects are related to the responsibility and accountability of each party, cost calculation, and organization change (Zardani & Bahsoon, 2011; Khajeh-Hosseini, Greenwood, Smith, & Sommerville, 2012). The number of concerns is still increasing as cloud services evolve over time.

To handle these challenges, a comprehensive cloud strategy is therefore needed to clearly approximate what benefits the business can get from the cloud and how to ensure and enable its seamless delivery. However, these open issues, such as how to ensure the cloud computing service delivers its promises and provides lasting benefits to the business, the best use of cloud and risk handling and controls, have been debated in many boardrooms but none has provided the consensus (Speed, 2011).

Concerning the aforementioned situation, in this thesis, a strategy for adopting cloud computing from the perspective of the enterprise architecture and the business fitness will be considered. Defining a robust and scalable architecture is pivotal to the success of cloud computing implementations because it provides a means of communication and coordination between the cloud service providers and the users (Rimal et al., 2011). Besides the technical capabilities, the architecture should also meet the intended business objectives. Therefore, this thesis intends to create a framework that provides a better understanding of the critical architecture strategy and business strategy decisions, offering a necessary guidance in making the changes more controllable and manageable.

The complexities of inter-organizational coordination associated with the implementation of cloud computing

In their paper, Garrison, Kim, & Wakefield (2012) mention that organizations should invest not only in technical capabilities but also in managerial and relational capabilities. The ability to coordinate the activities for implementing as well as for developing a positive relationship with vendors are critical to the organizations to achieve greater benefits of cloud technology. The lack of this ability may result in an inadequate understanding between the involving parties about the expected scope, span, and implementation of services. The current practice of cloud adoption is still seen as lacking of

rigorous and systematic guidance to identify and negotiate the requirements against the cloud computing providers (Zardani & Bahsoon, 2011).

Coordination will be more problematic whenever the cloud is used not only for internal enhancements but also in the interactions with other suppliers. Cloud computing can serve as a pooled of shared resources from which different parties can consume a service (Leukel, Kirn, & Schlegel, 2011). Likewise, the nature of typical inter-organizational systems and the intentions to improve the cooperation among the companies can be a subject to risks of adversarial conflict, depending on the level and the nature of interdependence among them (Kumar & Van Dissel, 1996). While companies use common resources, such as sharing networks and common applications, but are otherwise independent, the potential of conflicts among these parties are relatively low compared to the relationship with a higher level of interdependencies. Therefore, it is important to recognize the structure and level of inter-organizational interaction using the cloud as a service.

While most of cloud computing literature focuses on its benefits and implementation, only a few works have started to recognize the importance of managing inter-organizational relationships. Both the cloud provider and the focal firm of the inter-organizational relationship should convince the users that cloud will directly enhance the overall IT performance and the effectiveness of the existing business processes. These relational aspects will be accommodated as a part of change management process within the cloud computing adoption framework proposed in this thesis.

1.2 Research objectives

To sum up the motivations underlying this research: cautious consideration should help decide whether or not the cloud computing solution should be adopted, how to make the implementation deliver its expected values should be considered and, subsequently, how to govern the overall operations. These questions should be addressed from the perspective of business fitness.

Therefore, the research objective of this thesis is defined as the following:

> ***This thesis aims to propose a framework for cloud adoption which is reusable and addresses the full cycle, starting from the initiation planning until the project delivery from both the enterprise architecture and business point of view.***

Based on this objective, the following research questions are formulated:

- **RQ1: Which methodological frameworks can best provide a basis for the concept of cloud computing adoption?**
  The adoption of cloud computing will have tactically, as well as strategically, impact on the Enterprise Architecture (Raj & Periasamy, 2011). Therefore, the changes on the existing IT infrastructure need to be managed carefully. TOGAF as the foremost framework for generic Enterprise Architecture will be used as a starting point to define the process-based approach for cloud-enabled architecture. Besides the technical architecture, cloud computing should also be incorporated to business and IT strategies. For this reason, a cloud adoption strategy by Isom and

Holley (2012), which has strongly emphasized on cloud investment decision making and IT strategy, will be incorporated into the TOGAF framework. To model the enterprise architecture concepts of this suggested framework, the modeling framework and language, ArchiMate, is chosen.

- **RQ2: How can a business migrate from an as-is to a to-be cloud-enabled architecture by using a business model-driven approach?**
  This question reflects the first half of a full lifecycle framework for cloud adoption that concerns the business strategy, the requirements management and the changes on the design of enterprise architecture. To justify that the transformation in the architecture will bring demonstrable values to a business, a business model-driven approach proposed by Iacob et al. (2012) will be used. This approach relates the TOGAF enterprise architecture framework to a business model canvas and provides sufficient guidance for the migration to the desired situation by using the motivations provided by the improved business model.

- **RQ3: How should the to-be cloud-enabled architecture be delivered?**
  The answer to this question is found in the second half of the full framework that focuses on the implementation and migration effort. For this, several aspects need to be scrutinized as reflected in the below questions.
  a) **How can the change process be managed, especially when cloud computing is used as a pool of shared resources accessed by multiple parties?**
     A change management plan, that considers the complexities in the technical level as well as the relational level with the involving parties within a cloud implementation, will be formulated.
  b) **Which key aspects should be prepared and managed for the implementation of cloud computing?**
     The key building blocks for implementing a cloud, comprising of the network setup until the integration testing, will be discussed in further detail. The modeling of this implementation phase will use the extension of ArchiMate proposed by Jonkers et al (2010).
  c) **How could it be ensured that the cloud computing implementation will deliver the promised benefits without putting the business at risk?**
     The implementation governance, containing activities such as the identification of deployment resources and the implementation review, needs to be conducted in order to ensure compliance towards the defined architecture and the organization's standard. During this phase, the risks identified while developing the to-be architecture are also monitored and assessed to ensure that mitigation actions are in place and applied while tailoring the implementation.

1.3 Approach and Structure

For the production and presentation of this thesis, an accepted common framework – Design Science Research Methodology (DSRM) by Peffers et al. (2008) is used. The steps within this framework, as highlighted in Figure 1, will be performed in order to answer the aforementioned research questions.

- **Problem identification and motivation**. The implementation of cloud computing is considered as a groundbreaking change that will significantly affect the system processing, will require large amounts of investment and cause changes in the way of working. A set of planning and strategy from either the technological, financial or relational perspective is therefore prerequisite to anticipate the challenges and outcomes of cloud computing. This becomes a strong motivation for this thesis to elaborate not only on the architectural perspective but also on the business strategy.
- **Define the objectives for a solution.** Several research problems, as listed in Section 1.2, are formulated and used as the direction and representation of the intended objectives of this research.
- **Design and development.** Concepts from various literatures, such as business models, business cases, enterprise architecture, TOGAF and cloud strategy, are reviewed and combined into a comprehensive workflow in order to lead a smooth transition to cloud computing in an organization. This workflow prescribes a step-wise approach from business planning until its implementation planning, within which there are also specific plans to manage the resistances to changes and to identify the critical risks.
- **Demonstration.** This framework will then be applied to the case of implementing a cloud-based contact distribution in Philips Consumer Lifestyle (CL). To gather a deeper understanding on the hurdles of ongoing processes and the drivers to implement the cloud computing solution, the semi-structured interviews with the management team of Philips CL and IT division were conducted. Several documents, such as the business vision for 2020, the contracts with current contact center outsourcers and the architecture landscape of the existing systems were collected and analyzed to fulfill the required inputs and expected outputs from this framework.
- **Evaluation.** The efficacy of this framework will be evaluated along with its application within the case. The feedback from IT and business practitioners in Philips CL will be obtained to develop further insights into the usefulness and weaknesses of this framework.
- **Communication.** The design and realization of this framework will be documented within the thesis report. Some information is restricted and therefore not available to the public.

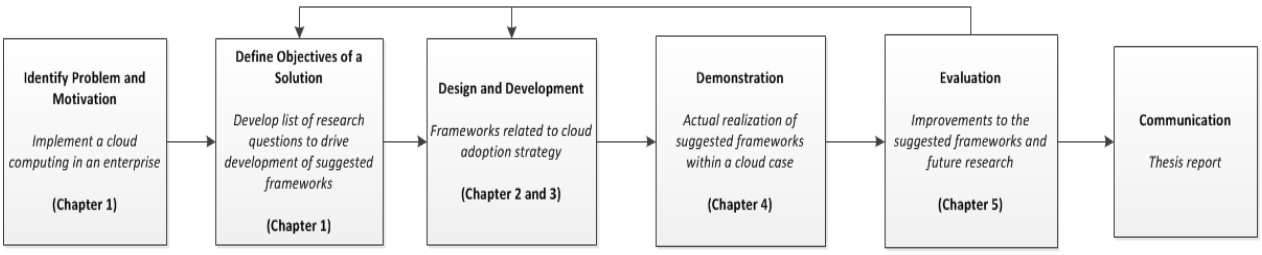

Figure 1 Research Methodology

1.4 Impact and Relevancy

This research delivers a comprehensive framework that is intended to offer a step-wise approach for a successful cloud computing adoption. It guides the making of a business model and plan until its implementation, and aims to ensure that sustainable business benefits can actually be realized when

the cloud solution is rolled-over. This framework is expected to give a notable contribution to both the practical purpose and theoretical impact.

- Practical impact
  This framework helps organizations in making sound choices regarding the cloud adoption in the inter-organizational context. It starts with an initial planning that identifies the business goals and values to the respective stakeholders, and concludes with an implementation plan and governance. This end-to-end flow is expected to enable a transition from the business strategy into a concrete delivery that IT can actually realize.

- Theoretical impact
  From the theoretical perspective, we expect that the suggested framework provides the subsequent contributions:
  1. Though numerous books and papers are already discussing the successful implementation of cloud computing, few literatures have tried to combine the enterprise architecture concepts with business strategies like the business model and strategic change management. This research tries to complement TOGAF using practical approaches that will align IT initiatives with business strategies.
  2. This framework incorporates various scientific literature, such as the modeling of EA, BM, risk governance, change management and cloud adoption strategy, making it more structured and comprehensive.
  3. This end-to-end cycle of the cloud adoption strategy is implemented in a real case, giving more opportunities to foresee how this framework can actually accommodate the needs for a workable cloud strategy in an organization.
  4. This cloud adoption lifecycle also includes an approach to manage the change processes, assisting an organization in planning efficient coordination among participating parties within the inter-organizational context.
  5. This research also attempts to create a risk management approach by advancing the requirement levels within the motivational model to the risk and control levels.

2 – Theoretical Foundation

As we aim to propose a holistic framework that is a combination of TOGAF and cloud adoption strategy by Isom and Holley (2012)*, we will motivate our choice on these two concepts by briefly introducing the scientific literature that supports them. To prevent the conceptual discussion become overly extensive, the literature works described in this chapter are selected based on their relevancy to formulate answers to the research questions. As figured in Table 1, the selected literature sources are grouped into two main parts: the first part covers the frameworks or concepts for generic IT projects, while the second part specifically discusses the cloud computing.*

Research Question	The Generic Concepts/Frameworks	The Specific Concepts about Cloud
RQ1 – Frameworks for the concept of cloud adoption strategy	2.1.2 Enterprise Architecture Framework - TOGAF 2.1.3 EA Modeling Framework - ArchiMate	2.3.1 The cloud adoption strategy
RQ2 - How can a business migrate from an as-is to a to-be cloud-enabled architecture by using a business model-driven approach?	2.1.2 Enterprise Architecture Framework - TOGAF (Phase B,C,D) 2.1.3 EA Modeling Framework - ArchiMate (Motivational model extension) 2.1.4 Relating EA changes to business model 2.2.1 Business model-driven approach 2.2.2 Business case concept	2.3.4 Architectural requirements for cloud 2.3.2 Business values of cloud 2.3.3 Cost-Benefit analysis for cloud
RQ3 - How should the to-be cloud-enabled architecture be delivered?		
a) How can the change process be managed, especially when cloud computing is used as a pool of shared resources accessed by multiple parties?	a) 2.1.2 Enterprise Architecture Framework - TOGAF 2.2.3 Change management approach 2.2.4 Determinants of Inter-organizational System Adoption	
b) Which key aspects should be prepared and managed for the implementation of cloud computing?	b) 2.1.2 Enterprise Architecture Framework - TOGAF (Phase E and F) 2.1.3 EA Modeling Framework - ArchiMate (Implementation and migration extension)	2.3.4 Architectural requirements for cloud 2.3.5 SLA for cloud
c) How could it be ensured that the cloud computing implementation will deliver the promised benefits without putting the business at risk?	c) 2.1.2 Enterprise Architecture Framework - TOGAF (Phase G and H) 2.2.5 IT Risk Management	2.3.6 IT Risk Management in Cloud

Table 1 Research Questions and Selected Literature

2.1 The generic concepts surrounding Enterprise Architecture (EA)

In this part, we first discuss the state of the art in EA concept with respect to its definition, the frameworks, the meta-model, and its relationship with business models.

2.1.1 The introduction of EA

The term of EA has been widely discussed within IS-related field as a critical aspect from IT strategies. Mahmood (2011) defines EA as a method and organizing principle that guides attempts to align business critical mission with the EA including the execution plans. EA depicts a firm's systems and infrastructure in a macro (enterprise) level rather than a micro (individual) level and shows how they work together to achieve the goals and support the processes of the business (Iacob et al., 2012). Through an EA, we can gain an overall understanding of each IS-related component and the interaction between these components.

By having a deeper understanding on the ongoing systems and infrastructures, a firm can make a more controllable and manageable organizational changes, a better coherence between the actions and organizational resources, and a preventive action on overrun costs. In a strategic level, an EA optimizes the fragmented legacy of both automatic and manual processes into an integrated environment that can respond to the constantly changing needs of the business strategy (The Open Group, 2011). Therefore, a good enterprise architecture allows a firm to have a right between efficiency in its IT and business innovation.

A review or development on enterprise architecture is usually triggered by the needs of radical infrastructure changes caused by transformation in business needs. To identify which areas of change are required, a group of key users, commonly referred as the "stakeholders", needs to be involved to develop views of new architecture to achieve their concerns and requirements.

2.1.2 EA Frameworks – Why TOGAF?

A framework is a way of working that provides list of generic actions with common vocabularies through which individuals can use to solve certain problems (Mahmood, 2011). This set of methods or actions is necessary while designing a targeted state of the enterprise architecture, describing a set of building blocks required and how they can fit together (The Open Group, 2011). An architectural framework should include these important ingredients as follows:

- A set of processes or actions to be performed, including the constraints or guidelines.
- Guidelines or best practices for the execution of the processes.
- Techniques, such as the modeling approach, analysis or computation technique, to be used during the application of the processes.

There are various frameworks for enterprise architecture, such as Zachman's framework, RM-ODP, C4ISR/DoDAF, and TOGAF (Mahmood, 2011). Being developed through the collaboration efforts of more than 300 members from world's leading companies, TOGAF has comprehensively emphasized the importance of stakeholder concerns for EA development. It has been recognized for more than a decade as the foremost enterprise architecture (Iacob et al., 2012).

The very core aspect from TOGAF architectural framework is its Architectural Development Method (ADM), consisting of an interactive and step-wise process starts from the development until the implementation of enterprise architecture. There are ten phases within this ADM, as depicted in Figure 3, which can later be grouped into four main parts (Iacob et al., 2012).

- **To get the organizations committed and involved.** This part consists of two initial phases within ADM, i.e. the preliminary phase and phase A – Architecture Vision. Within the preliminary phase, the preparation works are conducted, such as defining an architecture capability, tailoring the architectural methods, and establishing a set of architectural principles. While in phase A, this is where the main stakeholders formulate the architectural vision with a high-level outline of the envisaged changes.
- **To get the architecture right.** This part covers the next three steps within ADM, namely phase B – the business architectures, the phase C – the information system architectures, and the phase D – the technology architectures. It concerns the identification of current state of the actual baseline and the future state of the targeted architecture.
- **To make the architecture work.** This part discusses the migration plans required for the implementation of the targeted architecture. The first step for this part is phase E, Opportunities and Solutions, wherein the analysis is conducted to identify the gaps and the required work packages. It is then followed with phase F, Migration Planning, wherein the identified work packages are prioritized and translated into a migration plan. Then, the compliance of this implementation plan to the architectural principle is assessed within phase G – Implementation Governance.
- **To keep the process running.** This is phase H – Change Management, in which the requirements during the architecture development cycles are managed, prioritized, and controlled. The new cycle of architecture development may be initiated whenever there are critical new requirements identified.

2.1.3 EA Modeling Frameworks – Why ArchiMate?

To create uniform and consistent architectural descriptions, a modeling language or technique is critical in order to define the practical concepts and relationships used within each phase of architectural domain, including the relationships among the domains. ArchiMate language and framework, with its rapid acceptance in industrial community recently, appears as an integrated approach that provides a uniform modeling representation for EA (Iacob et al., 2012). The following characteristics demonstrate how ArchiMate can be seen as a lightweight and appropriate language to model the EA.

- ArchiMate architecture framework is simple yet comprehensive, covering aspects from the technical infrastructure to business processes and products. It provides a good mechanism to structure the architecture domains, layers, and aspects.
- ArchiMate accommodates the emerging concepts of the service-oriented system, promoting a new organizing approach of services within an organization.
- ArchiMate is noticed as the only approach that fully complies with the definition of a modelling language, i.e. it has a formal meta-model, a concrete syntax (graphical notations), and semantic descriptions for each construct.

The core concept of ArchiMate consists of two main dimensions: *the layers* which represent the successive abstraction levels of enterprise architecture, and *the aspects* which represent different concerns that need to be modeled within enterprise architecture.

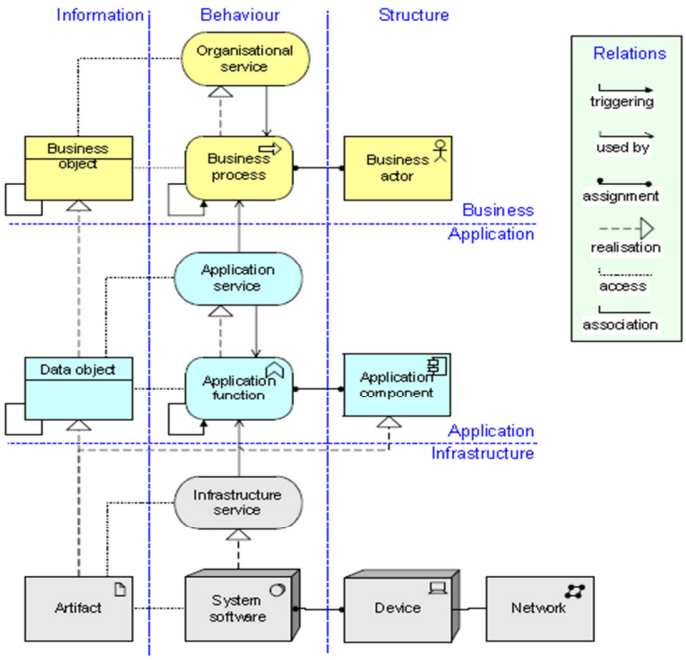

Figure 2 ArchiMate Metamodel (Iacob & Jonkers, 2006)

The aspect domain of ArchiMate Core is represented in Figure 2 as the vertical layer, consisting of these following aspects: 1) the structure aspect, also called active structure, represents the actors that may consist of people, systems, department, etc.; 2) the behavior aspect comprises the processes and services performed by the actors; 3) the information aspect, referred as passive structure, represents the objects of problem domain knowledge that are communicated among the actors through their behaviors.

Meanwhile, the layer dimension is the horizontal layer depicted in Figure 2, describing the differentiation of three main architectural layers that mainly fill in the views concerning the phase B, C, and D of the TOGAF ADM.

1. The ***business layer*** represents products or services provided to external consumers.
    - The structural aspect in this layer refers to the static structure of an organization, which can be either an active entity that performs certain behavior (*business actor*) or a passive entity that is manipulated by behavior (*business objects*). *Business role* can be attached to these actors to indicate what works are performed within an organization. The collective roles that perform collaborative behavior can be conceptualized as a *business collaboration* entity.
    - The behavioral part can be distinguished into an internal and external behavior of an organization. *Organizational service* is an externally visible behavior which represents what

functionalities are meaningful for the environment. Meanwhile, the internal behavior is the *business process* performed by one or more roles within an organization.

- The informational concept represents the products or services that a company offers to consumers in order to achieve the business objectives.

2. The ***application layer*** defines application services which are supported by the software.
   - The main structural part of this layer is the *application component,* representing complete software applications that provide certain functionalities to support the accomplishments of organizational services.
   - The behavioral aspect is quite similar with business layer behavior. However it represents a more precise internal behavior of application components to realize the services, as referred to *application service.* It is an externally visible unit of functionality, exposed through an application-to-application interface. *Application function* describes the internal behavior within the application component needed to realize certain application services.
   - The informational part is represented with the concept of *data object*, in the sense of UML, seen as the object view of related tables.
3. The ***technology layer*** offers underlying infrastructure services, such as processing, storage, and communication services, needed to support the upper layers.
   - The concept of *node* constructs the main structural concept of technology layer, which is the device. A device concept indicates a physical resource wherein the systems are deployed. Meanwhile, system software represents the software environment for certain types of components and data objects. The other main structural component is the communication infrastructure among nodes, realized with a *network*.
   - The behavioral concept, called as *infrastructure service,* represents internal behavior within the infrastructure component which can be classified into processing services, data storage, and communication services.
   - An *artifact* is the representation of piece of information which is produced or used during a software deployment process.

As mentioned earlier, this ArchiMate Core represents the actual architectural layer which is defined within the phase B, C, and D of TOGAF ADM. In its version 2.0, two extensions of ArchiMate are introduced to cover thoroughly the other ADM phases. The coverage of ArchiMate modeling toward the TOGAF ADM is presented in Figure 3.

- **Motivation extension** is to facilitate the identification of the goals, the requirements and their realization in the enterprise architecture. It recognizes the concepts of *stakeholders, drivers*, and *assessments*. Drivers represent the internal or external factors that influence the aims of the enterprise. Thorough understanding and analysis of the main strength, weaknesses, opportunities as well as the threats are needed. The other main component in this extension is the *requirement management* in which the goals from different stakeholders are accommodated and realized within the enterprise architecture.
- **Implementation and migration extension** includes plausible projects and work packages to identify, prioritize, and plan actions for the implementation of the targeted architecture. The

proposed extension aims to cover the main project management standards or best practices, such as the MSP, PRINCE, and PMBoK.

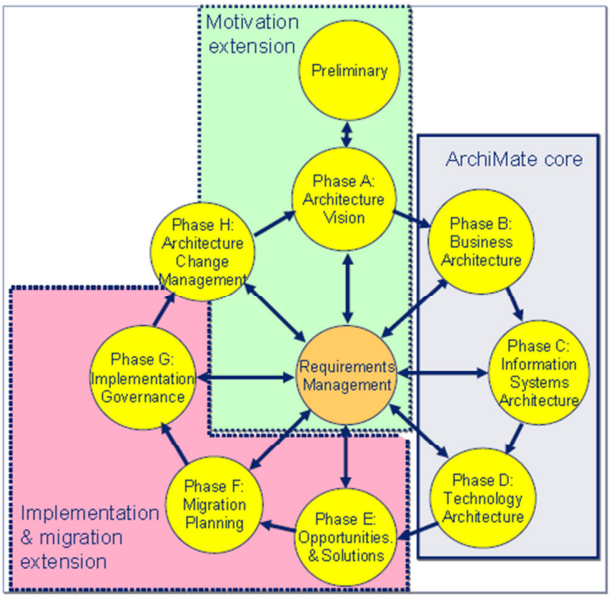

Figure 3 Relation between TOGAF and ArchiMate (Jonkers et al., 2010)

2.1.4 Relating EA changes to business values using Business-model Driven Approach

In today fast-changing and competitive business environment, an organization does not merely need an architecture that is technically easily integrated, flexible, modular, and scalable, but also require the whole IT landscape that enables the business to effectively manage the processes they work with to be highly adaptive with the challenges (Moshiri & Hill, 2011). Paradoxically with this expectation, many surveys have reported and still continue to show that many IT initiatives fail to deliver the expected benefits. Iacob et al. (2012) in their paper argue that such projects fail due to a technology push without a proper analysis of the problem in enterprise context. Questions such as "what values are expected from the project", "to whom these values are delivered?", "who will pay for it" are usually neglected though they are essential to clearly understand what the IT project can do.

Therefore, any new requirements for architectural changes should also be justified from the perspective of business fitness. An approach is required to relate the enterprise architecture changes to business values. For this, Iacob et al. (2012) has proposed a business-model driven approach in which three research objectives are formulated:

- To relate EA to business models.
- To propose a realistic cost/benefit analysis that relates the architecture-based cost analysis to business model-based revenue analysis.
- Using the analysis resulted from the relationship between EA and business model to justify the migration from an as-is to a to-be architecture.

The processes described in this business-model driven approach represent the step-wise approach for the development of enterprise architecture, especially the phase B, C, and D. The outline of these processes is depicted in Figure 4 and described as follows:

1. Firstly, the baseline architecture including its cost analysis needs to be specified and reflects the current situation.
2. A corresponding baseline business model analyzing the costs and benefits of existing situation can then be derived from this architecture. This analysis may reveal drawbacks regarding the financial health of existing processes and trigger the intention to change the architecture.
3. The process begins with the design of a motivation model that delineates the drivers, goals, and requirements of the architecture change. It is also possible to indicate which parts of existing architecture require changes.
4. Referring to this motivation model, sequential analysis by following the phases B, C, and D of TOGAF is again carried out to specify in details the target architecture.
5. Chaining EA-based cost analysis with a BM-based cost and revenue analysis will once again be executed, this time for the target architecture.
6. This BM should be compared with the previous one for existing architecture in order to have more justifications whether or not a decision for changes are necessary or not. If BM for target architecture shows less profit increase, we should refer back to motivation model and reconsider the drivers and goals. This may lead to another options for target architecture, and thus re-iterate the processes again.

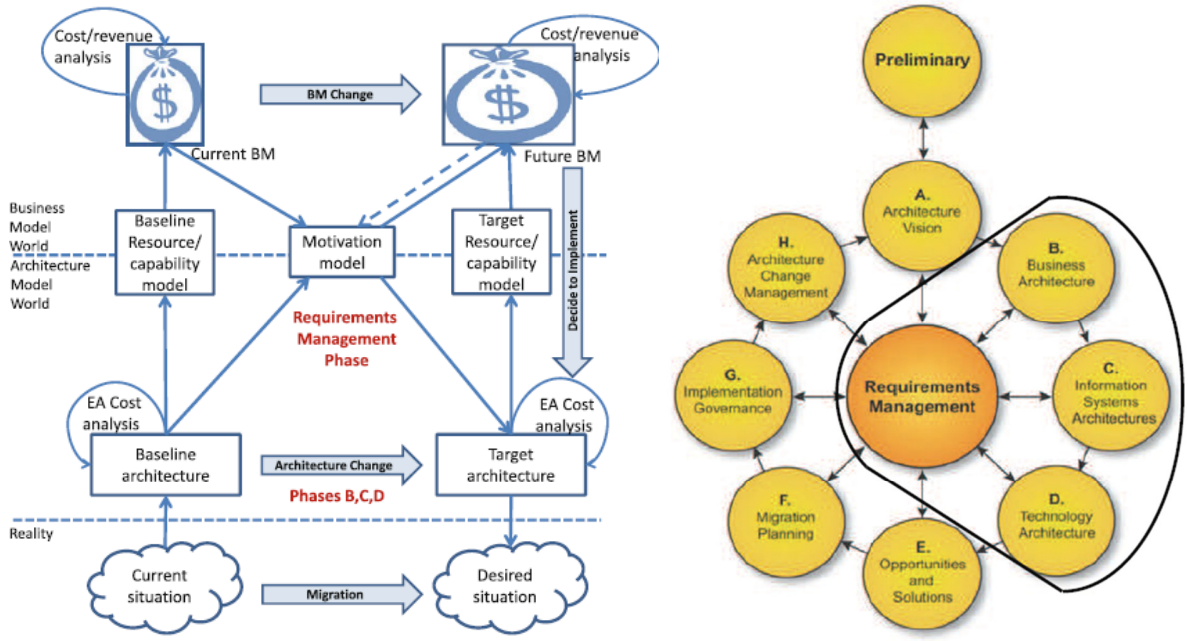

Figure 4 From enterprise architecture to business model and back (Iacob et al., 2012)

2.2 The generic concepts for typical IT investments

This part discusses the other supporting concepts that are relevant for successful implementation of enterprise systems. We specifically select literature that examines on how to recognize business values from typical IT investments and how to manage resistances from users towards the system implementation.

2.2.1 Business models literature review

Business model (BM) has attained wide attention of its importance to unveil economic value of IT project to firms. BM is perceived to be fundamental to help business and respective stakeholders comprehend, analyze, communicate and manage strategic choices (AlDebei & Avison, 2010; Ostelwalder, Pigneur, & Tucci, 2005). There are several functions to be fulfilled with the use of BM (Chesbrough, 2010):

- Articulation of value proposition, i.e. the value users can capture from an offering of implementation of certain technology.
- Identification of the market segments, i.e. users who will be benefitted with the implementation of certain technology and for what purpose.
- Definition of the structure of the value chain to create and deliver the offering, and complementary assets required to support the chain.
- Specification of a mechanism to generate revenue, i.e. how to make profit from the offering.
- Estimation of cost structure and profit potential.
- Description of how the firm positions itself among various parties, including the suppliers, consumers, substitutes, and competitors.
- Formulation of the competitive strategy through which the firm will gain advantages over rivals.

Although BM seems to be appealing and promising, its concept is still considered as underdeveloped and sometimes been misinterpreted as a replacement of corporate strategy, business case or business process (AlDebei & Avison, 2010). Though often used interchangeably, some researches have explicitly differentiated BM from business strategy. Business strategy is a way for firm to position itself against its rivals within the industry structure through the following strategies: cost leadership, differentiation and focus (Porter, 1980). Therefore, defining a business strategy requires more granular practices than designing a business model. Strategy analysis provides an essential step for designing a sustainable business model (Teece, 2010). Meanwhile a business process is a term to define process elements which unite to allow the provision of particular service (de Cesare, Lycett, & Paul, 2003). The youthfulness of BM as an emerging concept as well as the condition wherein diverse disciplines, such as business strategy, management, and technology are involved, have caused murkiness for BM concept. Nevertheless, BM still has a vital role in nowadays turbulent environment (AlDebei & Avison, 2010).

According to Meertens (2013) and Ostelwalder, Pigneur, & Tucci (2005), there are two major and well-accepted business modeling approaches which stand out toward others and are seen as having

sufficient formal foundation. The following paragraphs describe the key components of these two dominant approaches.

e3 value by Gordijn (2002). This conceptual modeling approach demonstrates values creation wherein business network is the central point. It aims to represent an integration of business and IT system which is already a distinct feature of e-business. Therefore the essences of e-business model and a deeper understanding of e-business system requirements and operation can be better communicated through e3 value. There are several concepts employed in this model:

1) Actor represents an independent economic entity who intends to make a profit or merely to provide a non-profit service.
2) Value object is valuable to at least one actor. These value objects which could be services, money, products, or even consumer experience are exchanged between actors.
3) Value port is used by an actor to show to its environment that it requires or provides certain value objects.
4) Value interface consists of inbound and outbound ports of an actor. It represents the value objects for which an actor is willing to exchange another value object through its port.
5) Value transfer connects two value ports from opposite directions of different actors with each other.
6) Value transaction is a set of value exchange between economic reciprocal pairs.

A business model is supposed to represent an ideal world wherein respective actors are able to capture values by being engaged in certain business transactions, and not to hold up all contingencies that might occur in the actual world (Wieringa & Gordijn, 2005).

Business model canvas (BMC) by Osterwalder (2004). BMC emphasizes more on resources required to create a value proposition. It employs four main areas that constitute essential issues within a company. These areas are then interpreted with nine-point decomposition characterizing the must-have resources.

- Product represents in what business the company is involved. It contains value proposition as one of the building blocks of business model, representing the bundle of products or services that are valuable to consumers.
- Consumer interface describes the following building blocks:
  - Target consumer defines the segments of consumer to which the company offers value.
  - Distribution channel is a means through which the company can reach and communicate with the consumers.
  - Relationship represents what kind of link the company establishes with its consumer segments.
- Infrastructure management shows the logistical issues which allow the company to perform transactions and interact within the network enterprise. It comprises three building blocks, i.e.
  - Key resources define an arrangement of critical assets ranging from physical, intellectual, human, until financial properties that are essential to create value to consumers.

- Key activities represent the most important actions the company should take in order to operate successfully.
- Key partnership is an array of networks the company has with its partners in order to make the business model work, to reduce risks, or to acquire necessary resources.

- Financial aspects delineate the mechanism to generate revenue. There are two building blocks entailed, i.e.
  - Cost structure describes all relevant costs that are necessary to operate the business model.
  - Revenue stream represents the way the company pursues to generate cash from each consumer segment.

Each of above approaches has its own advantages and limitations. On the one hand, e3 value provides rigorous modeling approach with well-defined notations contrasted to other more informal approaches. It helps not only for exploring business idea but also for assessing consequences or changes to existing business environment. However on the other hand, it lacks in marketing perspective to show how the entity can sustain its competitiveness within dynamic environment (Osterwalder, 2004). BMC is similarly not immune to limitations. Despite of its wide adoption by more firms and evident virtues of visualizing explicitly the underlying processes of a business model and its practice-oriented use, BMC ignores a notion of competitiveness, excluding the identification of key rivals and how they perform. It also does not set any priorities to the building blocks and thus causes ambiguity of where to start the analysis (Kraaijenbrink, 2013).

In the case of cloud-based contact center in Philips, the use of BMC is argued to be more applicable. It is partly due to its simplicity and easy-to-use approach by which non-academic audiences, in this case managerial level in Philips, will be able to easily grasp the main messages in a less sophisticated way. The other reason is that the work of this thesis is mainly based on an approach proposed by Iacob et al. (2012) in which Osterwalder's business model canvas is used and related to enterprise architecture specified in ArchiMate.

2.2.2 Business case literature review

Most organizations merely focus on how to implement the technology and neglect the realization of expected benefits. Consequently, most of these IT projects when they have finally been deployed are still viewed as insufficient to deliver value of money for business (Peppard, Ward, & Daniel, 2007). Then how to make IT project successful?

Ward and Pepper (2002) in their book mentioned that one of critical factors that distinguishes whether certain IT project will be successful or not is management capability to identify benefits that IT investments can deliver before and after they occur. Lack of understanding of how IS/IT investments contribute to business performance will cause difficulties in justifying the spending (Lin, Lin, & Tsao, 2005). Under- or over-exaggerated benefits at the onset may weaken the interest and commitment of management to the investment (Ross & Weill, 2002). There are five principles underpinning the benefit realization through IT (Peppard, Ward, & Daniel, 2007).

1. No inherent value is entailed in IT. Benefits are not resulted from the technology itself but from the use of IT assets by the users.
2. Benefits occur when technology allow people to perform their tasks in more effective or efficient ways.
3. IT and project staffs are not accountable for realizing benefits of IT investment. It is business managers and users who should take on this responsibility and make themselves more involved into the IT project.
4. IT project may produce either positive or negative outcome. It is responsibility of managements to avoid such negative outcomes and to maximize the positive ones.
5. There can be a time gap until the investment yielding some benefits. Therefore, the benefit realization should be continuously performed though the implementation is completed.

To explore which alternatives offer the greatest values yet with acceptable costs, a business case is needed and has to be made comprehensive and robust enough in order to obtain funding approval. Peppard et al. (2007) expands the role of business case to the following extent:

1. Allow priorities to be set among different IT investment options for resources and funds
2. Identify a benefit realization plan to ensure the changes resulted from IT investment will deliver the expected values.
3. Sustain commitment from management to the IT investment
4. Create a basis for evaluating whether the expected benefits are actually fulfilled.

Rather than just focusing on the expected costs and benefits of the IT investment, Peppard, Ward, and Daniel (2007) describe different approaches in evaluating a business case, i.e.

1. Not only financial but also non-financial benefits are recognized
2. Measures are applied to all benefits including subjective or qualitative ones
3. Each benefit should be supported with sufficient evidence
4. An owner is assigned to each benefit to ensure its realization
5. Both the IT and the business changes are explicitly linked to each benefit

A six-step approach described in their paper to building a more rigorous and robust business case will be described in the following sections.

Define investment objectives as well as business drivers. To enable senior management make a decision concerning the IT investment, a business case should convincingly mention current hurdles facing the organization, namely the business drivers. The business case should clearly state how the investment can address some or all business drivers and allow organization to achieve its investment objectives.

Identify benefits, measures and owners. After having all relevant stakeholders agree on the investment objectives, management must then recognize what benefits that will be provided to specific groups or users when the IT project meets the overall outcomes. These benefits might vary

among different groups and therefore it is unnecessary to have all stakeholders agree to each of them.

Structure the benefits. Rather than simply listing all relevant benefits as in most business cases, Peppard, Ward, and Daniel (2007) suggest to use a framework to structure the benefits which in turn encouraging more rigorous discussion and evidence gathering. The suggested framework differentiates the benefits into two main factors: **1)** the types of business change that enable the benefit realization, and 2) the degree of explicitness to which certain benefit can be supported with tangible measurement or evidence.

Identify organizational changes enabling benefits. Identifying the changes is necessary for determining to which extent the IT investment can provide impacts to ongoing processes. There are three classifications for determining the change extent:

a. Do new things - new IT investment allows organization to do something in new ways which previously were not possible.
b. Do things better - the continuing operations can be performed better than that prior the investment.
c. Stop doing things – organization can omit unnecessary operations that contribute less to business performance.

Determine the explicit value of each benefit. Each identified benefit can then be classified in accordance to the ability to assign a value based on information obtained or known before the investment is realized. There are four categories for the degree of value explicitness:

a. *Observable benefits* – the value of certain benefits can merely be justified by observation, opinion, and therefore are often categorized as qualitative, intangible, or subjective.
b. *Measurable benefits* – the value can be assessed with an identified measure in place, such as organizational performance measurement indicators (KPIs). If such measures are not available, the benefit owner should decide the proper effort and method to value the benefits. However if the methods are too complex or not worthwhile, the benefits can be more suitable assigned with subjective criteria.
c. *Quantifiable benefits* - Similar to measurable benefits, the relevant measures are also already in place. However in addition to this, the benefit owner can extrapolate the magnitude of the benefits to future business. Therefore the evidence for quantifiable benefits should also be more rigorous and can be obtained through these approaches: 1) modeling or simulation, 2) benchmarking, 3) use pilot implementation.
d. *Financial benefits* – the value can be calculated for an overall financial benefit, return of investment, or payback. Sufficient evidence should be available and can be verified.

Identify costs and risks. Besides the benefits, a business case should also contain all relevant costs and associated risks. The costs are often underestimated. Mostly costs related to IT implementation

and not those associated with business changes when the system goes live are reported. This therefore results to significant cost overrun when the IT investment is deployed.

Besides above six-step approach by Peppard, Ward, and Daniel (2007), Harvard Business School Press (2010) also proposes a process for defining a business case. Meertens (2013) in his dissertation thesis has compared these two business case approaches and highlighted which components are mentioned by HBSP and not by Ward and Pepper.

1. **The inclusion of alternatives.** HBSP emphasizes that having analysis on alternatives is critical to have a more holistic overview of upcoming opportunities rather than just latching on one or two sound-good ideas. The only alternative mentioned by Peppard, Ward, and Daniel (2007) is the (non-) financial consequences that might occur when the proposed idea is not implemented.
2. **The creation of implementation plan, including the estimated time frame.** This plan is expected to display how the progress can be traced and evaluated. Besides lists of actions, due dates, and in-charge personnel, a good implementation plan should also contain the following items: primary milestones, resources required, dates when benefits can be realized, impacts to expenses and revenue, and finally how to demonstrate that the expected results have been realized.

2.2.3 Change management literature review

Change management, in term of handling and controlling the new requirements in the enterprise architecture, has been discussed in the phase H of the TOGAF ADM. However, a change management process is not solely related to the architectural changes but also to the business process and cultural changes in an organization. A change management is essential to align the business changes with an organization's people and culture (Nah, Lau, & Kuang, 2001). Tailoring a new system to users should be cautiously handled. The uncertainty due to this change process may bring fear to users which may become the biggest impediment to a successful use of new system (Kumar & Crook, 1999). The resistances are potentially to be higher when the new system is used not only for internal purpose but also for coordinating inter-organizational processes. Therefore in this section, we will discuss the generic approach for a change management and how to manage the changes within inter-organizational context.

The importance of change management has been widely recognized, not only in IS-related field but also in the other fields such as organizational theory, economic, etc. However not many of these research works explicitly describe the key steps and a strategic framework for change management. Most of them discuss mainly about the key success factors, the needs for change, or type of resistances. That is why in this thesis, in which a step-wise approach is formulated and proposed, a paper by Aladwani (2001) that discusses an integrated and process-oriented approach for a change management of ERP implementation is used as a theoretical background. The steps mentioned in this approach are parsimonious yet comprehensive and applicable to other typical IT projects. As of May 2014, this approach has been cited by 423 papers from different fields. In general, there are three main phases within this framework.

a) **Knowledge formulation**. This is the phase where influential and relevant parties are identified and evaluated for their attitude and responses to system implementation. This identification is intended to answer the following questions:
   a) Who are the resisting individuals or groups?
   b) What do they expect or need from the system?
   c) What are their perceived beliefs or values?
   d) What are the benefits that make them interested?

   These fundamental questions may assist in determining the sources of resistances to system implementation.

b) **Strategy implementation.** To influence the users to adopt the system, there are several suggested strategies.
   a) Communication is a key to affect the users' attitudes and beliefs toward the new system. Informing clearly the potential benefits to the users is considered as an effective communication strategy that can bring more effective awareness for the system implementation. The other communication strategy is to inform the users how the system will actually work.
   b) Low-cost strategy can be a good reason why the users should support the adoption of the system. If the management can convince the users that the adoption cost and effort would be minimal and it is an opportunity to enhance their performance, then they will foster good feelings toward accepting the system.
   c) Highlighting the high quality offered by new system could also affect the adoption attitude. This high quality can be characterized with a more user-friendly, robust, and highly-available system.
   d) Giving a hands-on training is another important strategy for a successful system implementation. This will help the users adjust themselves to the changes and experience the functionalities introduced by the new system.
   e) Convincing the group leaders to support the implementation process will secure their valuable commitment.
   f) Introducing the system at the right time is critical. The organization should ensure that sufficient preparation has been conducted in order to prevent unexpected negative outcomes.
   g) Strong commitment from top management is prominent for the success of overall system implementation process. This commitment will help in securing necessary conditions to ensure that the system will realize its long-term success.

c) Status evaluation. This is the phase to monitor continuously the progress of change management efforts. It is important to ensure that timely feedback and evaluation are in place to provide correct responses to the emerging issues.

2.2.4 Determinants of Inter-organizational system adoption literature review

The strategy for a change management needs to be more comprehensive while the users of a new system are not just the internal individual users but the external individual companies. Organizational issues with these companies in term of coordination and communication in the partnership make the arrangement more sophisticated. From the economic perspective, the collaborations in inter-organizational system (IOS) are established for having cost sharing, pooling of risks, increasing resource utilization, and other plausible motives. Nevertheless, IOS is subject to risks of adversarial conflicts and behavior (Kumar & Van Dissel, 1996). Therefore, it is important to understand the factors that may cause conflicts and hinder the successful implementation of IOS, as a part of knowledge formulation while formulating the right strategy for a change management.

Within their paper, Kumar and Van Dissel (1996) describe three types of interdependence-based topology for IOS.

- Pooled information resource IOS. In this type, common IT/IS resources is shared through an inter-organizational coordination, such as common databases, common communication networks, and common applications. The primary drivers for this cooperation are the economies of scales and the cost-risk sharing. The partners involved in this type could either be competitors or non-competitors within an industry.
- Value/supply-chain IOS. Here the IOS acts as a pipeline that connects the involving parties along the value/supply chain. This type represents a sequential interdependence between adjacent partners.
- Networked IOS. This type entails reciprocal interdependencies between partners which usually occur for a finite time for the development of certain projects or products. This type tends to use the IT/IS resources intensively to allow information and communication sharing throughout the network.

Each of these types has its own coordination mechanisms, the potentials for conflicts, and different determinants to implement the IOS. In relation to the selected validation case discussed in this thesis, that is the cloud computing for contact center operation, the analysis on the coordination in IOS will be focused more on the pooled information resource type. In this case, the interdependence structure is a typical one-to-one relationship or buyer-seller system. The initiative to implement cloud as a IOS comes mainly from the focal firm that acts as a hub with respective partners.

Wilson & Vlosky (1998) analyze the willingness to adopt IOS from the perspective of buyer-seller relationship. In their paper, they mention that the initiative to implement IOS is usually the impetus from focal firms (the buyers) and in turn causes the suppliers (the sellers) to change the way they operate. Having an integrated system across its business processes will help the focal firm to deliver more value in term of a better quality, service, and time efficiency. Meanwhile, in many cases, the suppliers are not in the same enthusiasm level due to the fact that this IOS is usually used only by particular customers. The explanations over the factors that determine the acceptance of IOS are as the following.

- **Performance satisfaction** is a measure of how the suppliers feel satisfied with the delivery of expected benefits from the IOS. When the suppliers perceive that the IOS will belittle the benefits they currently receive, the conflict will likely to occur and may affect the commitment for the change and speed of adaptation.
- **Power** is related to a power shift between exchange partners due to the existence of IOS. Buyers are perceived to have more power to enforce the IOS implementation. If the suppliers are less cooperative in adopting IOS, the buyers will seek the other alternative suppliers to fulfill their needs. The use of IOS is also identified to cause less switching costs that the link between supplier and buyer is easier to be transferred to alternative suppliers.
- While power determinant is usually possessed by the buyers, the seller can play its strategic role, how it is strategically important to focal firm and IOS relationship and its position is difficult to be replaced by the others. This is referred to as **importance of the partner.**
- **Comparison level of alternatives** is a degree to which one supplier is dependent on the other. A low comparison level means that there are not so many comparable partner alternatives, thus causing a high dependency on one partner.

These factors are then used within a relationship model and result to the following most common dependent variable.

- **Commitment.** A strong commitment implies a desire to continue the buyer-seller relationship, and a willingness to work toward its continuance in the future.
- **Trust** is perceived as the binding element within a productive buyer-seller relationship. One party believes that there is a mutual relationship that each party will act in the best interest of others and fulfill its obligations.
- **Non-transferable investments** are the specific investments made to accommodate the other partner's needs, such as specialized training, or certain technologies or equipment.

2.2.5 IT Risk Management

In many organizations, IT risks are usually simply referred to operational risks of IT assets (e.g. the hardware, software, telecommunication, networking, etc.) and it is the responsibility of IT department to handle them. According to Goldstein, Chernobai, & Benaroch (2011), IT operational risks can be defined as any threat which may lead to the improper access, modification, theft, destruction, or lack of availability of IT assets. However, since IT has been the integral part of key enablers of business strategic, the risks associated with the use, operation, adoption of certain IT systems within an enterprise should also be considered as part of business risks (ISACA, 2009). Organizations have become increasingly dependent on the technology, and thus they become more vulnerable to the risks of IT failure.

In this section, the literature concerning IT risk will be mainly taken from practical guidance, journals published by ISACA. With more than 115,000 members from IS-related fields worldwide, ISACA has been recognized as a leading global organization for information governance, control, security and audit professionals. Its risk guidance and standards are followed by practitioners worldwide. With its strong emphasis on the actual practices and issues and with the support from its professional

constituents, we believe that the ISACA journal will provide a reliable theoretical background for this thesis.

IT risk management is a part of IT Governance. Within COBIT 4.1 published by IT Governance Institute (2007), IT governance is defined as "the set of responsibilities and practices exercised by the board and executive management with the goal of providing strategic direction, ensuring that objectives are achieved and ascertaining that risks are managed appropriately". From this definition, value, risk, and controls constitutes the core concept of IT governance within an enterprise. There are five focus areas within IT governance, as presented in Figure 5.

- **Strategic alignment** – is about the link between business and IT plans that define, maintain, and validate the IT value proposition, and align the IT operations with enterprise operations.
- **Value delivery –** is about tailoring the value proposition within the IT delivery cycle to ensure that the promised benefits are delivered and in line with the business strategy, focusing on optimizing costs and enhancing the intrinsic value of IT.
- **Resource management –** is about optimizing the investment and properly managing the critical IT resources, i.e. the applications, information, people, and infrastructure.
- **Risk management –** is about a clear understanding of the risk appetite within an enterprise, compliance to the requirements, transparency of the significant risks, and embedding of responsibilities to manage risk into the organization.
- **Performance measurement –** is about the tracking and monitoring over the strategy implementation, project completion, process performance, resource usage, and service delivery.

The first three focus areas are related to the realization of business value resulted from IT investments, i.e. how they can be aligned with business strategic, how they can maximize the benefits to business, and how the IT resources are used reasonably. These areas have been fairly covered within previous literature review. Meanwhile, the focus area - performance measurement is related to the monitoring over the measurable objectives of IT service delivery to ensure that it delivers the priorities and criteria set by the business. This continual monitoring can be found as a part of phase H – Change Management in TOGAF ADM which goal is to ensure that the implemented architecture actually achieves its original target business value and the improvements are identified in order to trigger changes to the architecture in a cohesive way. To this point, the area that has not been discussed is the risk management. Therefore, this section will primarily discuss about how to detect risks that need to be addressed in order to enable better business goals achievement.

In order to identify the relevant risks among all that are likely to go wrong within IT project, ISACA (2009) has developed a method for risk scenarios. There are two different mechanisms used in this method. The method overview can be found in Figure 5.

- A top-down approach. An analysis of the most probable IT risk scenarios is started from the high-level business objectives. If the risks have certain impacts to the real value drivers of the organization, a relevant risk scenario will further be developed.

- A bottom-up approach. A generic list of risks is used to develop a set of more concrete scenarios in conjunction with the situation in organization.

These two approaches are complementary, rather than substitutive, and should be used simultaneously. The identified risk scenarios are later be analyzed further for their frequency and impacts to business. It is important to consider the following factors that influence the nature of the risks:

- Environmental factor can be divided into internal or external factors – whether the organization has control over them or not.
- Capabilities show how good the enterprise handles the IT-related projects, i.e.
  1. IT risk management capabilities – how mature the organization in performing the risk management.
  2. IT capabilities – to what extent is the enterprise perform the IT process.
  3. IT-related business capabilities – to what extent is the value management activity aligned with the IT process.

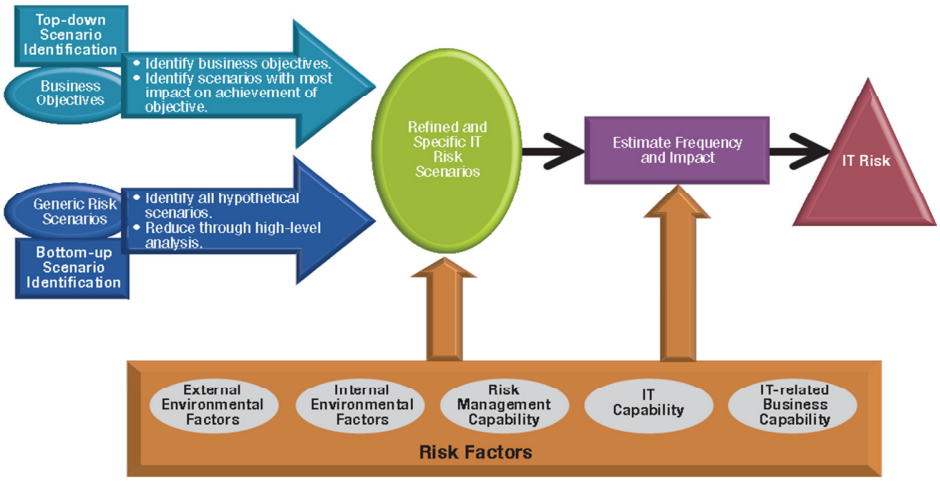

Figure 5 IT Risk Scenario Development (ISACA, 2009)

2.3 The specific concepts about cloud computing

For a long time it was necessary for a company to introduce various local IT resources in order to allow the access to applications and data inside the enterprise. The cloud computing concept changes this assumption by categorizing the functions of the software and hardware into services which can be provided to the enterprise by a multitude of different vendors over the internet (Laudon, Laudon, & Schoder, 2010). Figure 6 gives an overview of the different cloud types:

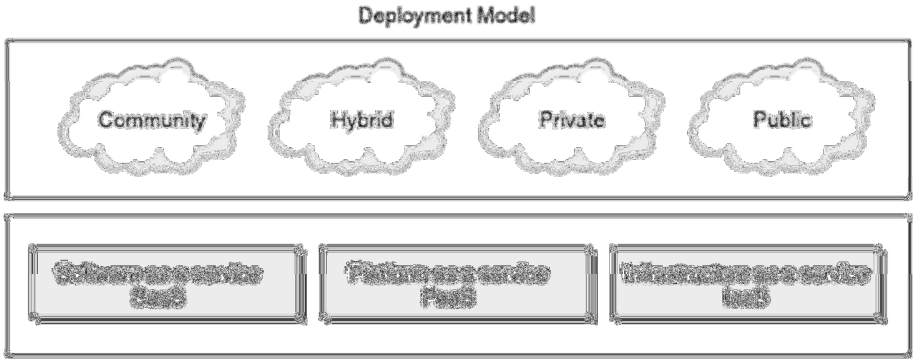

Figure 6 Cloud specifications (Jamsa, 2013)

The first column deals with the ownership and the provision type of the cloud. Cloud computing offers different deployment approaches, starting from private cloud which is operated by third party solely for a single organization either located in premise or off premise, community cloud that is jointly constructed and shared among several organizations, public cloud which is used for general public consumers and third-party provider fully owns the cloud, and hybrid cloud which is a combination of two or more other cloud types (community, private, or public) (Dillon, Wu, & Chang, 2010; Jamsa, 2013).

The second column shows different services which can be provided over the cloud. There are *Software-as-a-Service* (SaaS) that offers applications through hosted environment and can be accessed by different users through network; *Platform-as-a-Service* (PaaS) which allows cloud consumers to develop services and applications in a hosted development platform; and *Infrastructure-as-a-Service* (IaaS) wherein cloud consumers can utilize the IT infrastructure such as storage, network, and other fundamental computing resources (Dillon, Wu, & Chang, 2010; Jamsa, 2013).

2.3.1 The Cloud Adoption Strategy

Cloud computing has brought a radical shift by transforming IT services into a commoditized service and delivered in a manner similar to utilities. However, in the same time, the decision makers also face challenges in assessing the feasibility to adopt a cloud solution in their organizations and how to implement it successfully (Khajeh-Hosseini, Greenwood, Smith, & Sommerville, 2012). Several frameworks or approaches have been suggested in IS-related literature for cloud computing. The following paragraphs will introduce and elaborate the processes, tools, or techniques used in these frameworks. Thereafter, a comparative analysis will be performed to find the most suitable approach that meets the research objectives of this thesis.

2.3.1.1 The existing cloud adoption frameworks

From the search on Google scholar, there are three articles selected that aim to guide and assist the decision makers in selecting and implementing a cloud solution. All of these articles are published after 2010, indicating that the topics surrounding the cloud strategy are still relatively an infant compared to the implementation strategies of other IT systems.

- **A goal-oriented requirements engineering approach** for cloud adoption by Zardani and Bahsoon (2011). The objective of this approach is to help the users in screening, matching, and negotiating their requirements towards the cloud service's provision and also to manage the tradeoffs concerning the matches and mismatches of the requirements. The processes of this requirement engineering for cloud can be seen in Figure 7 and are described as the followings.
  1. **Acquire and specify goals**. Goal is defined as a target that must be achieved by the system. There are three categorizations for goal definition: 1) the strategic goals – concerned with the survival of business, 2) high level or core goals – are the main motivations to adopt a cloud solution, and 3) operational goals – are the more specific requirements such as the password protection, encryption mechanism, etc. These goals will then be prioritized by the key stakeholders.
  2. **Assess the features of cloud service provider**. This is when the search for potential cloud providers is started. Several considerations in this phase are the total cost ownership against the budget, the cloud provider's reputation, and whether the cloud solution satisfies the expected goals.
  3. **Perform matching**. The matching process involves the information gathering and analysis to examine whether the cloud services meet the goals. The cloud service can be considered as satisfactory if the satisfied goals are within the acceptable range.
  4. **Analyze mismatches and manage risks**. The mismatch between goals and cloud services is carefully analyzed to explore the tradeoffs and manage the risks. A risk management is necessary to help in identifying and handling the risks prior to their conversion to threats.
  5. **Cloud service provider selection**. The most appropriate provider is selected based on the analysis on value, cost, and risks.

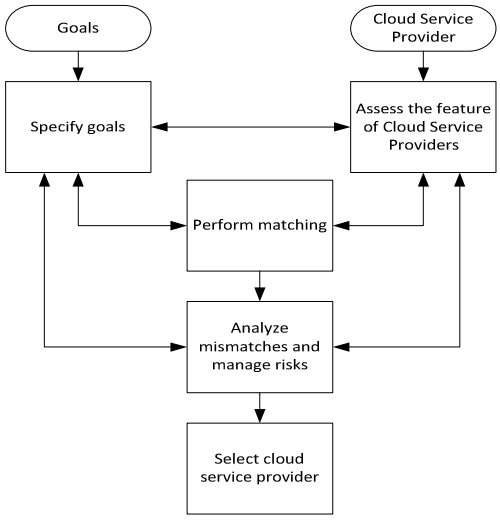

Figure 7 Cloud adoption approach by Zardani and Bahsoon (2011)

- **Cloud adoption toolkit** by Khajeh-Hosseini et al. (2012). A conceptual framework for organizing the decision making including the supporting tools to do the analysis is elaborated. There are five main steps within this framework, as shown in Figure 8.
    1. **Technology suitability analysis.** This phase is to ensure that the technical fit of cloud services support the desired technological characteristics. A simple checklist is defined for this analysis and consists of the following characteristics: the desired elasticity, communications, processing, accessibility, availability, security requirements, data confidentiality, and regulatory requirements.
    2. **Cost modeling and energy consumption analysis.** This phase supports the decision making with the accurate estimation over the costs and energy consumption associated with the use of cloud computing. The output of this phase could also support the system architects in designing the appropriate IT infrastructure in term of the operational costs and energy consumption.
    3. **Stakeholder impact analysis.** This is to assess the organizational fit whether the impacted organization can cope with the potential impacts caused by the cloud services in term of practicalities (time, resources, capabilities), social factors (values, satisfaction, status), and political factors (fairness of benefit distribution, risks, etc.).
    4. **Responsibility modeling.** This is about the assessment of operational feasibilities by creating a set of responsibilities and mapping them with the activities to realize the non-functional characteristics of the system. This is also to identify and determine the strategic dependencies between organizations.
    5. **Requirements and implementation.** This is when the actual implementation takes place.

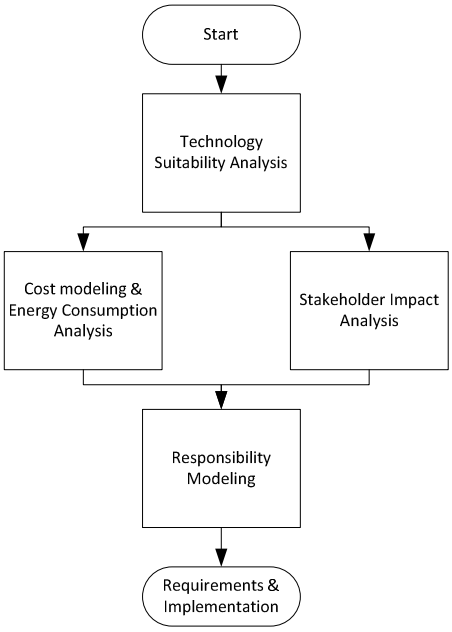

Figure 8 Cloud Adoption Toolkit by Khajeh-Hosseini et al. (2012)

- **Cloud adoption strategy** by Isom and Holley (2012). This strategy comprises six phases of adoption lifecycle, as shown in Figure 9, starting from the initial phase until the governance of continuous operations.
    1. **Initial planning.** In this phase, a high-level analysis exploring the business objectives and how adopting a cloud can fit with the business strategy is executed. There are several key outputs from this phase, i.e. the business model in which the current capabilities and values are explored to find the necessary improvements, a high level plan of projects including the project owners, and the expected business outcomes to be realized in a due time.
    2. **Enterprise capabilities and cloud vision.** The focus of this phase is to provide an understanding of the overarching abilities needed to support the cloud implementation. Several key work artifacts from this phase are the vision statement of cloud adoption; adoption pattern; a business case which provides information about plausible costs and benefits, value propositions and ROI for cloud; and a governance model.
    3. **Target architecture and cloud enablers.** In this phase, the requirements influencing the cloud adoption decisions are explored in greater details. There are three areas relevant for the updates in the existing EA in relation to the cloud adoption: 1) the business architecture, 2) the information system, and 3) technology and infrastructure architecture.
    4. **Gap analysis and transition planning.** Gap analysis is necessary to help the comparison of company's actual performance with its potentials and thus to know the shortfalls of current situation. A transition plan is the preparation for a change and for this, a sufficient understanding on the change management needs is essential to achieving the benefits. The key deliverables for this phase are a change management plan which addresses how to organize the people and the organization from its current state to the future state, and a cloud adoption roadmap which provides a list of actions for realizing the cloud adoption strategy.
    5. **Implementation planning.** This is the final phase of cloud adoption strategy in which an arrangement with the cloud provider is made and contract is signed to commence the necessary works. The key activities of this phase are the SLA arrangement and the formulation of the integration requirements.
    6. **Governance.** This is a continuous activity which underlines the whole processes of cloud adoption. The governance is expected to provide a strategic direction which defines how the cloud adoption will be performed, managed and controlled.

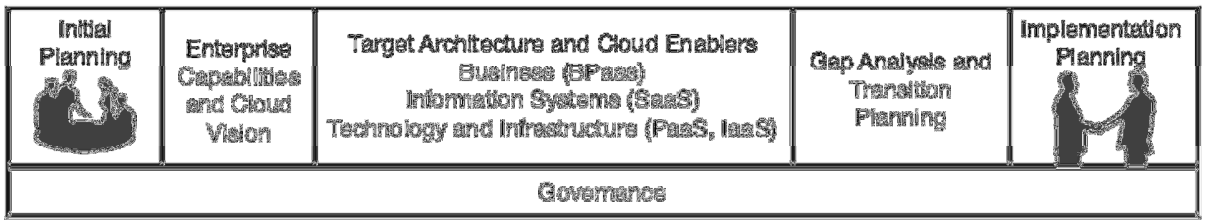

Figure 9 Cloud adoption strategy (Isom & Holley, 2012)

2.3.1.2 Comparative analysis among the existing frameworks

In this part, a brief comparative analysis is performed in order to determine which of these existing frameworks suitably meets the research objectives outlined in Section 1.2. One of the main criteria used in this comparison is the alignment with TOGAF ADM framework and process-based with a lifecycle approach. Meanwhile, the other four important criteria are referred to the characteristics of a scientific method by Bhattacherjee (2012). Here is the list of criteria for the evaluation.

- **Alignment with TOGAF ADM**. The processes defined in the framework should reflect the strategic and technological impacts to the changes in the enterprise architecture.
- **Process-based with a lifecycle approach.** This criterion demands that the framework should apply a feedback loop in order to show a continuous and dynamic refinement process.
- **Replicability**. The same framework applied independently by others will produce similar, though not identical, results.
- **Precision.** The theoretical concepts used in the framework should have such precision so that others can measure the theory and test the concept.
- **Falsifiability.** The concept defined in the framework can be disproven or tested.
- **Parsimonious.** The framework entails the logically most economical or simplest explanations.

Model / Criteria	Zardani and Bahsoon (2011)	Khajeh-Hosseini et al. (2012)	Isom and Holley (2012)
Alignment with TOGAF ADM	Partially	Partially	Yes
Process-based with a lifecycle approach	Yes	No	Yes
Replicability	Yes	Yes	Yes
Precision	Less precise	Yes	Yes
Falsifiability	Yes	Yes	Yes
Parsimonious	Yes	Yes	Yes

Table 2 The Comparative Analysis of the existing frameworks

From the comparison reflected in Table 2, the strategy proposed by Isom and Holley (2012) is considered as the most appropriate reference framework for the analysis of this thesis. The approaches by Zardani and Bahsoon (2011) and Khajeh-Hosseini et al. (2012) are applicable only for the decision making process while setting the vision of cloud adoption, i.e. the identification of scope, expectations, stakeholders, and to obtain a budget approval for the cloud investment. There is no further explanation on how to tailor the cloud computing into the enterprise architecture.

For the remaining criteria, the approach by Zardani and Bahsoon (2011) provides a practical and parsimonious guidance in eliciting the requirements, the goals, and performing the matching with the cloud services. The step-by-step processes within this approach are sequential and iterative. However, the explanation of each step is less precise because it does not specify the tools or methods that can be used to support the analysis, such as what methods are available to measure the satisfaction score. Compared to the approach by Zardani and Bahsoon (2011), Khajeh-Hosseini et al. (2012) provide a more precise approach, specifying the step-by-step method, the checklist table,

and tools to model the cost. However, it does not cover a continuous monitoring or feedback loop within its framework.

Besides that the cloud adoption strategy by Isom and Holley (2012) meets almost all the criteria in the comparative analysis, it also provides a balanced mix between the cloud investment decision making and the technical strategy and incorporates the business values into the enterprise architecture. However, this does not mean that this strategy is unflawed. It will still be incorporated with other literature, mainly the TOGAF ADM framework, in order to strengthen and enrich the argumentation surrounding it.

2.3.2 Business Value of Integrating Cloud into Enterprise Architecture

Cloud computing has received greater hypes due to the increasing need for having data processing, storage in a scalable and elastic scale. One of the appealing features offered by cloud computing is its pay-as-you-go approach which is advocated as a more efficient model for service provision (Zardani & Bahsoon, 2011).

The opportunities of cloud solutions are numerous and far-reaching. Cloud computing can provide the needed flexibility due to the scalability of its resources. This also helps to reduce the fixed costs of an enterprise. Furthermore, the resource utilization inside a company can be enhanced making the overall enterprise more efficient. The operations of a company can be made more stable since the peaks demands on the services of enterprise can be easily adjusted for. Large scale investments in hard- and software are also not necessary anymore which helps to prevent high working capital upfront (Hugos & Hulitzky, 2011).

These opportunities can be realized greatly if a company incorporates the cloud strategy within its EA to drive a better business and IT alignment and therefore to enable a sufficient consideration of internal and external expertise before the changes are executed. This convergence of cloud and EA will provide a value of driving the portfolio planning in a strategic perspective and directing the changes towards the enterprise goals (Isom & Holley, 2012). Further benefits of this convergence are as the following.

1. Having business agility by allowing the company to predict and respond to market dynamics better and pressures from environment rapidly with more optimal effectiveness.
2. Facilitating federation within a company by leveraging a cloud solution to a broader set of users instead of just serving one department. The standardized practices, the regulatory requirements and restrictions can be propagated through the cloud solution to the entire company while at the same time each department can still retain its autonomy.
3. Having an improved collaboration through the cross-collaborative business solutions that add more tangible business values.
4. Sustaining trust and reliance on the EA resources concerning the cloud purposes.

2.3.3 Cost-Benefit Analysis for Cloud

Calculating the costs for cloud is not an easy task. A meaningful assessment on the benefits as well as the costs should encompass the short and long-term view (ISACA, 2012). The costs of cloud

computing are beyond the obvious hardware and software costs. Many organizations fail to realize the anticipated benefits of cloud computing because they are lack in analyzing their decision carefully - certain cost types are frequently overlooked. To identify the majority items of possible costs starting from the startup until the whole lifecycle of the cloud artifact, we will analyze the concept of Total Cost Ownership (TCO).

TCO is a well-known approach for assessing the effectiveness of IT expenditure (David, Schuff, & St Louis, 2002). It includes all the maintaining and owning activities of IT artifact which can later be divided into two main sets of cost factors, i.e. the acquisition costs and administration costs, as pictured in Figure 10. The acquisition costs relate to the upfront purchase of hardware and software. The rest lies in the administration costs. The control costs are related to specific components installed in order to either maintain a centralized system, such as self-monitoring systems, or replace the existing hardware or software to the standardized ones. These control costs do not necessarily mean to be actually incurred. Meanwhile, the operational costs are associated with the activities to run and maintain the systems.

Acquisition Costs	Administration Costs	
	Control	Operations
• Hardware • Software	• Implementation and maintenance of centralization • Implementation and maintenance of standardization	• support • evaluation • installation/ upgrades • training • downtime • futz • auditing • viruses • power consumption

Figure 10 Categories of TCO Factors (David, Schuff, & St Louis, 2002)

With almost similar structure of cost factors, ISACA (2012) has also classified the costs in cloud computing into three main types: start-up (upfront investment) costs, operational (recurring) costs, and termination or change costs. The following points describe the most common items of each cost type in cloud computing.

- **Upfront costs** consist of the initial investment required to setup the cloud:
  1) Technical readiness: the costs to accommodate the network installation or to upgrade certain components required for the connectivity to cloud,
  2) Implementation and integration: the professional services needed to manage the transition to cloud and integrate it with either the in-house or other cloud services.
  3) Configuration/customization: the costs to configure customer-based SaaS application

4) Training: the resources required to manage the cloud vendors and services
5) Organizational change: the processes required to accommodate the cloud-specific needs, such as internal audit, change management, monitoring, etc.

- **Recurring costs** are related to the routine fee and supports to maintain the use of cloud services:
  1) Subscription fees: the agreed-on periodic fee for the subscription to cloud services
  2) Change management: the costs incurred when requesting system changes
  3) Vendor management: the costs related to routine monitoring on cloud service provider activities, SLA, and other evaluation.
  4) Cloud coordination: the costs to manage the coordination between clouds
  5) End-user support and administration: the costs that are still retained in the customer
  6) Risk mitigation: the efforts required to reduce the risks to acceptable level
  7) Downsize/upsize: the costs related to upscale or downscale the computing resources
- **Termination costs** occur when the organization tries to revert to premise systems or change to other cloud service providers, such as cost to extract or sanitize the data, penalties of early termination, reallocation of IT resources and people, etc.

2.3.4 Architectural requirements for Cloud

Cloud computing allows organizations to expand their resources as services, paying as they are needed. In order to optimize the advantage of a cloud computing, the interfaces and architectures should allow a strong interoperability and accessibility to reach out the computing resources. The other important aspects that are critical for the architecture of a cloud computing are the security, scalability, availability, data migration, service level agreement, transparency, and many more (Rimal et al., 2011).

Within their paper, Rimal et al. (2011) classifies these aspects into three main groups of requirements: for end-users, enterprises that use the cloud, and the cloud provider itself. These requirements will be discussed briefly in the following points and incorporated with other supporting literature.

a) **Provider requirements.** From the service provider's perspective, the key concerns are related to the efforts to make the cost model attractive, such as the necessity to have highly efficient service architecture and a well-organized and secure data storage mechanism. To fulfill these requirements, Service-oriented architecture (SOA) approach can provide a sort of architectural discipline that can help to leverage the cloud computing into a more effective and efficient IT infrastructure (Linthicum, 2009). These are the key requirements from the providers in which some of the attributes from SOA will also be described:
   - **Service-centric issues.** The cloud services should be *autonomic, self-describing*, and *efficient* in the distributed composition. By being autonomic, the design of the cloud systems should enable a dynamic adaptation to the environmental changes with less human intervention. The self-describing service interface contains the information and functionalities which are reusable and loose coupled. With this loosely coupled and efficient composition, the interaction with multi applications and collaboration would be easier. The transactions processed within these cloud services should conform to *ACID* properties – *A (Atomic)* that the transaction is completely done or never half done; *C (Consistent)* that the database data

integrity constraints are consistent from one state to another state; *I (Isolation)* that the data processing is not visible to other transaction requests until it is completed; and *D (Durable)* that while the transaction is completed so does the update (Britton & Bye, 2004).

- **Interoperability.** This focuses mainly on the creation of an open data format or open protocol (API) to allow easy and secure interface, migration and integration of different clouds with different providers.
- **Quality of service.** The certain level of service attainment is established in order to guarantee a sufficient performance and availability, as well as the other quality aspects such as the security, dependability, reliability, etc.
- **Fault tolerance.** The faults can be isolated only to the falling components and prevent the other services affected. For this, proper tools and mechanism such as a certain application for self-healing and self-diagnosis are necessary.
- The other requirements that require careful treatments are the **data management and storage** to ensure the data replication across geographic distances along with its availability and durability, **virtualization management** to handle the virtual machines on the top of its operating system, **scalability** to deal with a large set of data operation in cloud, and lastly the **load balancing** to have a self-regulating mechanism to monitor the workload property within the cloud.

b) **Enterprise requirements.** While the enterprises pay for the services they use, they need to carefully discuss these matters with the cloud service providers:
   - **Security.** The move to the cloud services raises concerns in regards to user privacy protection and security of user's interaction.
   - **Cloudonomics.** This term refers to the pay-as-you-go model. The concern is related to the lack of cost transparency.
   - **Data governance.** Having the data moved to outside of the organization boundary may violate geographical or political issues and raise the vulnerability on data disclosure or loss.
   - **Data migration.** With the lack of standardization and under the increasing requirements from a variety of applications, the capability to distribute information in web services in a cost-efficient manner is still a challenging problem.
   - **Third party engagement.** To manage the offerings of the cloud services, there are needs to build a robust communication plan with the involving providers and to ensure the continuity of the cloud service engagement and legal implication.
   - **Transferable skills.** Along with the technological dissemination, the technology supports and skills should also be available to help the adaptation and stability of the use of cloud systems.

c) **User requirements.** The major issues coming from the end users are **the privacy –** how to ensure the sensitive data stored in cloud protected from misuse, **the service level agreement** – whether the cloud service provider is able to deliver the services accordingly with the pre-defined agreements, **the adaptability and learning –** the supports to make the users feel acquainted with the cloud systems, and **the user experience** – to provide insights to users that can help them to understand the capacity, usability, desirability of the applications.

2.3.5 Service Level Agreements (SLA) for Cloud Computing

A set of quality criteria including the defined scope and provision of cloud resources needs to be specified within SLAs before the cloud customers transfer their infrastructure to cloud. These SLAs define the trust and quality of services the cloud service providers should provide, including the obligations and actions taken while any violations occur (Alhamad, Dillon, & Chang, 2010). The opportunities and benefits of cloud can only be achieved if the provisioning of services is specified under clear term and conditions. These conditions must be manageable for the cloud service providers and negotiable with the customers in order to ensure that the services meet the expected requirements (Wieder et al., 2011).

The research concerning SLAs, such as the Quality of Service (QoS) metric, template, frameworks has been widely conducted by the researchers, mainly for service-oriented related architecture. However, the same research for cloud computing are not available in the same amount. SLA metrics from such architecture and technologies are not directly suitable for cloud because its nature and resources being delivered are different. Several key characteristics of SLA are defined within the paper by Wieder et al. (2011):

- The key properties that should be documented within the SLAs are as the following:
  - A clear description about the service
  - The level of expected performance of the service
  - The service parameters to be monitored and the format of monitoring exports
  - Penalties when the service requirements are not achieved
- Functional and non-functional requirements for cloud customers. These requirements set the expectations toward the cloud services and should be fulfilled by the providers. The non-functional requirements can be the source for criteria in SLAs, such as:
  - Availability – the probability that the cloud services are available in the specific time of utilities.
  - Scalability – the specific resources are provided in order to facilitate the ease of scaling up and down.
  - A clear cost calculation method – since the billing is based on the utilization of the cloud services, a certain mechanism should be established in order to allow the customers trace their use.
  - The configuration of service – the cloud services can be configured in a flexible manner in order to minimize the system changes performed by the customers.
  - Security and privacy – the sufficient protection over the critical data by the cloud service providers.

Cloud Standards Customer Council (2012) provides a practical guide to cloud computing by listing what to be expected and what to be aware while discussing the SLAs with providers. This guidance is a collaborative effort by the practitioners and academicians and thus provides sufficient customer-focused experiences. The following steps are the prescriptive series of actions that should be considered and taken by the cloud customers:

1. **Understand the roles and responsibilities of the involving parties.** The roles and responsibilities of the cloud consumers, providers, carriers, etc. should be explained and stated clearly in cloud SLAs.
2. **Evaluate the business level policies.** The business strategy and policies should be considered while establishing the SLAs since there are interdependencies between the cloud services and the aspects of business.
3. **Understand the service and deployment model differences.** The levels of cloud resources and services should be understood based on the cloud service model whether it is the Infrastructure as a Service (IaaS), Platform as a Service (PaaS), or Software as a Service (SaaS). Each service model has its own SLA considerations that should be carefully understood by the cloud customers.
4. **Identify the critical performance objectives.** The performance objectives of cloud computing usually include availability, transaction rate, response time, and processing speed, etc. These objectives should be auditable and measurable in providing levels of comfort concerning the cloud services.
5. **Evaluate the security and privacy requirements.** Compared to traditional computing, the risks in term of data security and privacy are considered higher and thus should be cautiously managed.
6. **Identify the service management requirements.** Transparent and extensible systems for monitoring the cloud services are critical to meeting the expected performances. Some key considerations in service management are the reporting, metering, rapid provisioning, upgrading, and auditing of the cloud services.
7. **Prepare for the service failure management.** The preventive and corrective actions should be prepared in order to anticipate that the expected service deliveries do not occur.
8. **Understand the disaster recovery plan.** This is part of the business continuity plan which mainly focuses on the technology processes for the IT components (hardware, software, network, etc.). The levels of detail of this disaster recovery plan should be justified from the business objectives and the criticality of the cloud services.
9. **Define an effective management process.** The needs to have effective management process can be fulfilled through the routine meetings, coordination, and escalation mechanism to ensure that any identified problems are handled properly.
10. **Understand the exit process.** While the expectations are not achieved or due to other factors the service cannot be continued, both the cloud customers and providers should refer back to the agreed SLAs that define the details of exit procedures. These exit processes should ensure that the business continuity will not be disrupted, such as the consumer data can be preserved and transferred to other clouds.

2.3.6 IT risk management in Cloud

The unique thing about the cloud is that it has transitioned IT organization from focusing on managing operation to optimizing IT as service value chain with the coordination with external providers. However, many of the users of cloud service have overseen the importance of having proper governance, specifying the decision rights and accountability to handle a number of risks and

uncertainties during the transition to cloud. They assume that the responsibilities of handling the security are completely in the hand of the cloud provider (Kirkpatrick, 2011).

Insufficient understanding on this will severely cause coordination problems: how resources should be allocated, how a partner will likely to behave and take decision, or how to handle information (Kale & Singh, 2009). Therefore a clear governance strategy should be established in order to gain the optimum benefit from cloud.

Despite its benefits, there are also trade-offs depending on the services being engaged. Some of them that need to be cautiously managed are (Speed, 2011):

- **Flexibility.** Having a cloud forces the organization to adapt itself with the way the services are served. For example, the operation systems that support the use of cloud in user's computer station should conform to the technical requirements as demanded by the cloud provider.
- **Security.** In the cloud, an organization will not have much visibility, as what they might traditionally have, to know how much tightly their systems are monitored, who gains the access, and with whom the processing and storage are shared.
- **Reliability and availability.** Though cloud is seen more reliable, visibility is still also an issue that sufficient information about the causes of outages of cloud service is not delivered to customers.

Hoffman & Woods (2010) highlight the other limitations of cloud as the following.

- **Interoperability and lock-in.** Every cloud provider offers its unique and often a proprietary technology, causing ongoing challenges to have interoperability and portability among different services. For example, contact data in Salesforce CRM does not offer direct interface with Google Mail. In a premise model, infrastructure and supporting systems can be controlled anytime by the organizations. While in the cloud, they are locked in to a provider.
- **Absence of well-defined service level agreement** with the cloud providers. Cloud service has been commoditized and results in pricing pressures and deemphasizing on specific enterprise requirements.
- **Performance instability.** Cloud service is prone to variability in the service performance and availability due to loads. Having certain concurrent number of users may cause performance decrease.
- **Latency and network limits.** When the use of large volumes of data is intensified, the speed of data transfer is decreasing and results in an increasing bottleneck. Therefore, a cloud is not a viable option for immediate processing of large amounts of data which results are sent over the network.
- **No scalable storage.** Adding more servers to enhance the capacity is just not enough. It requires additional architecture for processing, storage, and memory. Scalable storage with an API, likewise the SQL, is still lack in the cloud.

3 – The Proposed Framework

After assessing the current state of knowledge surrounding IT projects, EA, and cloud, this chapter will describe how these existing approaches will be compared to each other and compiled into a comprehensive framework for a cloud adoption. Firstly, the review will be conducted to find the similarities and differences between the TOGAF ADM framework and cloud adoption strategy by Isom & Holley (2012), a necessary step toward the goal of this thesis. To complement the general framework, there are two systematic approaches that we create to specify in what order and how the information are derived and transformed for: 1) the cloud change management process, which discusses the dynamics of inter-organizational relationship, and 2) the cloud risk management, which identifies, analyzes, and manages the potential threats.

3.1 Formulation of a full lifecycle framework for cloud adoption

In order to formulate a proper framework, we start with the identification of essential attributes that should be provided within an enterprise architecture framework and whether the chosen framework – the TOGAF ADM cycles – satisfies the defined attributes or not. Then, we elaborate the alignment between the TOGAF ADM cycles and the selected cloud adoption strategy and we finally formulate a customized business and enterprise framework.

3.1.1 Identifying the requirements for an architecture framework

According to Leist and Zellner (2006), there are five constitutive attributes that should exist within an architecture framework:

1) Meta model – a set of linguistic representations and rules,
2) Procedure model – a set of procedural guidance,
3) Technique/modelling technique – an approach to design the components,
4) Role – for the management and development of the architecture, and
5) Specified resulting documents.

Within the same paper, Leist and Zellner (2006) have reviewed some of reputable architecture frameworks, one of which is TOGAF framework. According to their review result, none of these frameworks meets all the required constitutive elements. Though TOGAF has provided an extensive set of procedural guidance including the different inputs and outputs for every phase in ADM cycle, there is no meta model specified to assure a consistent use of linguistic components. The outputs are often merely a list of principles or guidelines without the specified documents. A role description, stating who should be involved and be in charged in each step, is also missing. Moreover, the principles and guidances presented in TOGAF are intended to be a generally applicable process, not specifically tailored into a certain application field (Buckl et al., 2009).

To address the drawbacks of TOGAF, a variety of IS-field literature is therefore required and will be used in accordance to the discussed context. After performing the literature review in chapter 2, the following literatures and methods are chosen to equip the supporting concepts in TOGAF:

- For the meta model, the ArchiMate open standard is chosen to provide the consistency of models that describe the key components in the enterprise architecture including their relationships.
- For the procedural guidance and specified documents, the generic concepts in TOGAF will be adapted into a tailored method that accomodates the specific characteristics and processes of cloud computing. After performing the comparative analysis of existing cloud strategies in Section 2.3.1.2, the cloud adoption strategy by Isom & Holley (2012) is considered to fit best with TOGAF ADM framework.

3.1.2 The alignment between TOGAF ADM Cycles and the cloud adoption strategy

Since a thorough explanation on how to bridge the TOGAF framework with ArchiMate modeling language has been performed by Iacob et al. (2012), this section will mainly discuss the comparison between TOGAF framework and the cloud adoption strategy by Isom & Holley (2012). Table 3 displays the mapping between these two concepts and the explanations are given in the following points.

TOGAF ADM Framework / The cloud adoption strategy	The preliminary phase	A. Architecture vision	B. Business Architecture	C. Information System Architecture	D. Technology Architecture	E. Opportunities and Solutions	F. Migration Planning	G. Implementation Governance	H. Architecture Change Management
Initial planning		√							
Enterprise capabilities and cloud vision		√							
Target architecture and cloud enablers			√	√	√				
Gap analysis and transition planning						√			
Implementation planning							√		
Governance		√	√	√	√	√	√	√	√

Table 3 Mapping between TOGAF ADM and the cloud adoption strategy

- **The preliminary phase** in TOGAF defines the very-early preparation and initial actions required even before starting to draw the scope of a new architecture. It determines the organizational model for architecture development – where, what, why, who, and how to develop a new architecture in accordance to the organization's standard. This phase is missing in the cloud adoption strategy by Isom & Holley (2012), in which the initial step is

directly about the context for enterprise cloud adoption rather than the general vision or frameworks within an organization. Therefore, in the suggested framework, this preliminary phase is still retained as a required process to comprehend better the general operational and policies in an organization.

- **Phase A - Architecture vision** in TOGAF describes the information about the scope of new architecture, the identification of relevant stakeholders, the creation of architecture vision, and the required approvals before the architecture development is started. These high-level explorations toward the business strategy and goals are addressed in the cloud adoption strategy, especially in these phases:
  1. **Initial planning –** is about envisioning new opportunities when cloud computing is implemented, the description of expected benefits, including the determination of respective stakeholders and understanding the capabilities of potential vendors.
  2. **Enterprise capabilities and cloud vision –** is to provide an understanding of overarching abilities needed to support the implementation of cloud, such as developing the business case and ROI inputs to estimate the required budget, assessing the adoption maturity level, and selecting the cloud provider.
- **Phases B to D** in TOGAF are about the development of business architecture, information system architecture, and technology architecture**.** The similar three-layered architecture is also mentioned in the cloud adoption strategy, especially in the phase for target architecture and cloud enablers.
- **Phase E – The opportunities and solution phase** is about the initial steps required for the creation of implementation and migration plan which is specified in the phase F of TOGAF. It considers the technical gaps between the target and baseline EA and it logically compiles them into work packages. Isom and Holley (2012) also recognized the importance of these steps and reflect them within the existence of gap analysis for identifying the shortfalls between the actual and potential performance, and the creation of a change management plan.
- **Phase F – Migration planning** is about creating a more detailed plan for the actual implementation and migration from the existing architecture to the to-be architecture. In relation with the cloud adoption, these implementation arrangements are made by the cloud providers. Therefore reviewing the desired requirements from the targeted architecture is essential to provide an input for vendor's SLA arrangement, the cloud setup including the network configuration, and the integration requirements for the interoperability with other clouds.
- **Phase G - Implementation governance and Phase H – Architecture change management** in TOGAF define the architectural oversight by ensuring that the delivery of transition plan complies with the defined architecture and providing a cohesively continual monitoring over the changes to the architecture. The governance area addressed by Isom and Holley (2012) is about deriving decision rights and responsibilities, executing the decisions, creating accountabilities, and management. This governance approach is pervasive, covering from the strategic direction until the execution phase or the whole processes within the cloud adoption strategy. To prevent confusion, we will not create a specific phase for cloud

governance but will embed its concept to each step within the suggested framework. Then, for the continuance of the EA maintenance, we adopt phase G and H of TOGAF, including their steps and deliverables in order to guide the deployment and monitoring of the architecture in a structured and controllable manner.

3.1.3 The proposed framework for a cloud adoption strategy from EA perspective

From the high-level mapping displayed in Table 3, the frameworks seem well aligned. Each phase of the cloud adoption strategy serves the similar objectives defined in TOGAF ADM cycle. However, when we explore in greater details about the key inputs, steps, and outputs, the alignment of these two frameworks is not a clear cut task. Due to the high generality of TOGAF principles, they are less applicable to a particular situation. Within its extensive methodology, TOGAF only provides a simple content framework without specifying the used techniques or instructions that describe the outputs (Leist & Zellner, 2006). An enterprise that tries to establish an EA approach in accordance to TOGAF 9 tends to face problems cause by its highly generic models (Buckl et al., 2009).

To address these problems, Buckl et al. (2009) propose a *pattern-based approach* for EA management. Within this approach, the proven or generic solutions, called as *pattern,* are collected from literature and practice to address the typical problems of current EA approaches, such as too abstract guidelines, lack of operating guidance, etc. The collection of these patterns is called EA management pattern catalog in which light-weight and enterprise-specific approaches based on best practices are gathered. The use of this pattern catalogue will help to sketch an exemplary EA management tasks and provide guidance to address the specific EA-related concerns.

Following this pattern-based approach, in the following subsequent points, we will define each step within the proposed cloud adoption framework by combining the cloud strategy from Isom and Holley (2012) and TOGAF 9 from The Open Group (2011). Each step will be complemented with the existing as well as some new proposed approaches in order to guide the needed inputs, the steps to be executed, and the outputs to be delivered, which might also serve as inputs for the next steps of the strategy. The overview of this cloud strategy along with the supporting approaches can be found in Table 4 and Figure 11.

Phase 1: The preliminary phase. The typical tasks for this phase are the collections of the documents and related information about the current way of working and formal procedures for the daily operation of existing EA, the understanding of the business strategy and intents, and the identification of the involving partners in the EA changes.

Phase 2 to 4: From the initial planning until the targeted architecture. We will follow the approach proposed by Iacob et al. (2012) to assess whether the EA changes bring values to the business and what impacts they have to the existing business model. This approach will be incorporated into the steps and deliverables suggested by Isom and Holley (2012). The sequence of this analysis is as follows:

- **Phase 2: Initial planning:**
  1. Start from the understanding of existing EA.

2. Specify the corresponding business model – following the approach proposed by Meertens (2013) that consists of the identification of involving roles, activities, and quantification of the current operational costs.
3. Identify the requirements and motivations to migrate to cloud.

- **Phase 3: Understanding existing capabilities and cloud vision –** following the business case concept by Peppard, Ward, and Daniel (2007) and Harvard Business School Press (2010) in which several key concepts are delineated:
  1. Identify the alternatives in order to have a more holistic overview of upcoming opportunities.
  2. Identify and structure the benefits based on the degree of impact and explicitness.
  3. Calculate the required budget and the expected ROI to finance the EA changes.
  4. Estimate the timeframe.
  5. Analyze the potential risks. The approach for identifying the risks along with the impact and the suggested controls is specified in Section 3.3. Within this approach, the motivational model from phase 2 is used as one of the sources to identify the deviation of cloud services from the intended requirements.
- **Phase 4: Targeted architecture**
  1. Produce a concrete targeted architecture that accommodates the cloud vision and business requirements.
  2. Identify the impact of architectural changes on the business model.

To supply a formal meta-model and the graphical notation for the baseline and targeted architecture including the motivation model, the architecture modeling language – ArchiMate will be used. Meanwhile, the graphical notation for the business model will refer to business model canvas by Osterwalder (2004).

Phase 5: Gap analysis and transition planning. The gap analysis, also called as shortfall analysis, helps the organization to compare its current capabilities with its potential. Some principles proposed by Isom & Holley (2012) to be incorporated in the cloud adoption strategy are as follows:

1. The identification of what has been done well in the IT operation and where improvements can be applied as the preparation to ensure a better and more successful cloud adoption. We will analyze these discrepancies from two perspectives:
   - Project arrangement - what are the common shortfalls identified from the similar project occurring in the organization and the observation from the ongoing project.
   - Technological domain - to specify the transition plan – how the baseline EA can be gradually migrated to the target EA. For this purpose, the approach and EA language modeling – the ArchiMate implementation and migration extension proposed by Jonkers et al. (2004) will be applied.
2. The arrangement of beneficial contracts, supplier (vendor) management, and outsourcing concerns.

These two perspectives are necessary as a part of change management process that aims to continuously align the people and culture of the involving parties with the business and process changes. The step-wise approach for a change management will be specified in Section 3.2.

Phase 6: Implementation planning. This is the final phase before the actual implementation. By referring to the actual project deliverables of cloud implementation in Philips Healthcare and the whitepapers published by the cloud providers, the key things that should be cautiously managed for delivering the actual cloud services are the network configuration from local sites to cloud data center, the integration arrangements for the inter-cloud communication, and the specification of SLAs for defining the agreed services and performance. The pre-defined requirements in the motivational model will be used further as a source for the SLAs arrangement. The steps for establishing proper SLAs will follow the guidance from Cloud Standards Customer Council (2012) as described in Section 2.3.5.

Phase 7: Implementation governance. The level of details addressed in this phase depends on the actual architecture implementation efforts and should be adapted to the situation. The essential principle within this phase is to monitor the compliance of the implementation efforts to the established architecture governance and to ensure that sufficient controls have been applied to reduce the risks into an acceptable level. The result of these monitoring activities is documented within a post-implementation review and a lesson learnt list, as an input for further improvements in future projects.

Phase 8: Architecture change management. After the cloud services have been actually delivered, the monitoring will continuously occur to ensure that the EA achieves the targeted business values and objectives and also to adapt the EA with the new development in the cloud technologies or standards. As a part of the phases, the drivers for architecture change are assessed in order to identify whether the changes are intended to enhance/create new capabilities or to correct the existing ones. The significance of these required changes will later determine the necessity to have EA redesign efforts.

3.1.4 Roles and associated responsibilities definition

As mentioned by Leist & Zellner (2006), an architectural framework needs to specify the participating roles. Within their book, Isom and Holley (2012) also highlight the importance of defining clear roles and responsibilities. They describe EA governance as a specification of the decision rights and accountability framework in order to encourage a desirable behavior in using EA. It is important to determine who owns the responsibility to authorize the fund release, to approve strategic decisions, etc.

Compared to traditional computing, cloud computing with its on-demand service has consequently caused the IT operation organization to become more service-driven. IT role is now seen as a service organization which is responsible for achieving the client-oriented focus and for enabling the strategic relationship between IT and business users. Through practices contributed by its cross-IT working team, existing contents, and documents, there are several IT service roles (including their descriptions) defined by Cisco within its publication (Clark, Reddy, & Walton, 2011). The brief

descriptions of these service roles, together with the incorporation of another white paper from VMWare by Lees (2012), are as follows:

- **Service executive** is responsible for determining the cloud strategy in order to enable the business functions, and is a trusted counterpart and advisor for the business stakeholders. This role facilitates the discussion of top-level budget and resource or skills allocation, and holds the accountability for the overall cloud operation and the business users' experience for cloud services. This role is usually held by a member of senior IT personnel and reports to a business executive officer.
- **Service owner** is accountable for ensuring that the end-to-end service delivers the expected value to users, monitoring the service level attainment for the provider's cloud service offerings, prioritizing options and budget with the providers, and assessing the needs for new capabilities.
- **Service lifecycle management or service portfolio management** has a function to optimize the cloud services across the lifecycle stages by proactively identifying the potential or demands coming from the business functions, and to ensure that the service targets are achieved. This role is accountable to the service owner.
- **Service offering management** has a function to drive the quality, value, costs, and use of the cloud service offerings by managing the SLAs and optimizing the costs. This role is also accountable to the service owner.
- **Business relationship management** functions as an account manager who is responsible to build or maintain communication and coordination with one or more end-user organizations. It gathers and understands the needs and requirements from the business users. This role works closely with the service owner to ensure that an excellent service is delivered.
- **System/Technology architecture** is accountable to translate the cloud services into an end-to-end architecture, ranging from business architecture to the technical or underlying infrastructure architecture. It ensures that the targeted architecture will provide system qualities, such as agility, scalability, performance, availability, etc.
- **Service roadmap management** has a function to manage and monitor the program and projects across the service deliveries. It develops a plan for delivering the projects that align with the expected performances and IT-business goals.

These roles will be assigned to each phase of cloud strategy and will be specified for their authority using RACI chart – whether they are *responsible, accountable, consulted or informed.* The justification of the authorities of each role is based on the guidance provided in the whitepaper publication by Cisco and VMWare, and the consultation with the member of Philips architect team.

- Responsible means that the person or role is responsible for ensuring that the tasks are fulfilled.
- Accountable means that the person or role is responsible for actually doing or completing the tasks (approver).

- Consulted means that the person or role whose opinions are sought and treated as subject matter expert.
- Informed means that the person or role that needs to be continuously kept informed of the status of tasks.

For the strategic phases, the *service executive* is accountable for the whole cloud project success. It endorses the preliminary steps, the initial planning, and the setting of cloud vision. Meanwhile, the *service owner* plays an active role to evaluate the overall service strategy and manage its alignment with the business objectives. *Business relationship management* comes as a counterpart for the business users and works closely with them to identify their needs. Based on this needs identification, the service level and objectives are then identified and used as the recommendations for the service strategy changes and planning. To perform its tasks, the business relationship management needs a close collaboration and consultation with the *service/technology architect* in order to get insights about the existing underlying systems.

When a high-level plan and vision has been set, the *system/technology architect* continues the project by designing a new architecture that supports the agreed service requirements. To develop the overall architecture, the architect works together with the service owner as the approver, and also with the service team – *service lifecycle, service offering, and service roadmap*, to get the inputs about the roadmap feasibility and impacts.

The *service lifecycle management* will manage the service portfolio, including the criteria to approve or reject the service delivery, and assess the necessity for service changes. The *service offering management* will integrate the capabilities of cloud services and delivery roadmap across the business functions and will ensure that the cloud vendor will deliver the expected service levels. It is responsible to design, build, and test the solution changes. It drives the overall service offering and cost optimization and plans the changes or negotiation with the business and providers if required. For the overall success of all the projects within the service roadmap, the *service roadmap management* is accountable for developing and executing the implementation planning. During the preparation and execution of the cloud implementation, the *business users* play a critical role to ensure that the change management will be executed properly by ensuring that sufficient remediation efforts, such as training, socialization, etc., have been prepared and conducted to reduce user resistances, and the business user also actively involves within the service testing phase.

While the implementation has taken place, the *business user management* takes responsibilities to validate the service architecture with the business needs and objectives and proposes recommendations for the service improvements. To optimize the services to further extent, all the service roles have the responsibilities to identify updates or changes from the business and technology demands and to notify the required changes to the rest of the team for further assessments.

The Framework for cloud adoption strategy from EA perspective	Techniques/Literature approach	The input documents	Activities	The output documents	The meta model	Roles (RACI authority) R - Responsible; A – Accountable; C – Consulted; I – Informed
The preliminary steps	TOGAF 9 - Section 6.4	○ Business strategy. ○ Major frameworks operating in the business. ○ Governance and legal frameworks. ○ Partnership and contract agreements. ○ Architectural principles.	1. Scope the enterprise organization impacted: - Obtain and understand the business strategy. - Obtain and understand the partnership and contract agreements. 2. Confirm and collect the existing governance and support frameworks. 3. Define and establish the EA team. 4. Identify the architecture principles. 5. Tailor the framework.	The tailored framework for cloud adoption.	-	Service executive (R&A). Service owner (R). System/Technology architect (R).
Perform initial planning	○ Meertens (2013): to define the business model of ongoing situation. ○ Iacob et al. (2012): to relate the as-is EA with business model and vice versa. ○ To define the criteria for vendor selection and gather information about the vendor capabilities.	○ The tailored framework for cloud adoption.	1. Start from the understanding of the baseline EA. 2. Specify the corresponding business model: - Identify the roles, - recognize relations, - identify the activities, and - quantify the current operational costs. 3. Identify the requirements and motivations to migrate to cloud. 4. Establish vendor selection criteria. 5. Define the high level plan.	○ Motivation model. ○ Baseline architecture. ○ Business Model. ○ High level plan of the project. ○ Vendor selection criteria.	○ ArchiMate Core. ○ ArchiMate – the motivation extension. ○ The business model canvas by Osterwalder (2004).	Service executive (A). Service owner (R). Business relationship manager (R). System/Technology architect (C). Business users (C).
Understanding existing capabilities and cloud vision	○ Peppard, Ward, & Daniel (2007) and HBSP (2010): to create a business case. ○ TCO approach: to calculate the total costs for cloud computing. ○ Risk assessment approach (Section 3.3).	○ Motivation model. ○ Baseline architecture. ○ Business Model. ○ High level plan of the project. ○ Vendor selection criteria.	1. Identify the alternatives. 2. Identify and structure the benefits. 3. Calculate the required budget and the expected ROI. 4. Estimate the timeframe. 5. Analyze the potential risks.	○ Business case. ○ Risk management plan.	-	Service executive (R&A). Service owner (R). Business relationship manager (R). System/Technology architect (C). Business users (C).
Target architecture and cloud enablers	○ Iacob et al. (2012): to relate the targeted EA with the new business model and vice versa.	○ Business case.	1. Produce a concrete targeted architecture. 2. Identify the new values offered in the corresponding business model.	○ Targeted architecture. ○ Targeted business model.	○ ArchiMate Core. ○ The business model canvas by Osterwalder (2004).	Service owner (A). Business relationship manager (C). Service lifecycle management (C). Service offering management (C). System/Technology architect (R). Service roadmap management (C).
Gap analysis and transition planning	○ Jonkers et al. (2010): to create the work packages and transition plan. ○ Change management approach (Section 3.2).	○ Targeted architecture. ○ Targeted business model.	1. Perform gap analysis: - Identify shortfalls from project management perspective. - Identify gap from technology domain. 2. Establish change management plan: - Knowledge formulation – understand the determinants to adopt a cloud solution. - Strategy implementation.	○ Implementation and migration model. ○ Inter-organizational change management plan.	○ ArchiMate – the implementation and migration extension.	For the gap analysis: Service owner (I&C). Business relationship manager (C). System/Technology architect (C). Service lifecycle management (R). Service offering management (R). Service roadmap management (R). For the inter-organizational change management plan: Business user management (R). Business users (R).
[move to next page] Implementation planning	○ Isom & Holley (2012) ○ Cloud Standards Customer Council (2012): to guide the SLAs creation.	○ Motivation model. ○ Implementation and migration model. ○ Inter-organizational change	1. Identify and plan the setup efforts. 2. Develop integration requirements. 3. Define the SLAs: - Understand the roles and	○ Cloud setup. ○ Integration requirements. ○ Vendor's SLAs.	○ ArchiMate – the implementation and migration extension.	Service owner (C&A). System/Technology architect (I). Service lifecycle management (R). Service offering management (R).

The Framework for cloud adoption strategy from EA perspective	Techniques/Literature approach	The input documents	Activities	The output documents	The meta model	Roles (RACI authority) R - Responsible; A – Accountable; C – Consulted; I – Informed
		management. ○ Targeted architecture.	responsibilities. - Evaluate the business level policies. - Understand the service and deployment model differences. - Identify the critical performance objectives. - Evaluate the security and privacy requirements. - Identify the service management requirements. - Prepare the service failure management. - Understand the recovery plan. - Establish an effective management process. - Create the exit process.			Service roadmap management (R). Business users (I&C).
Implementation governance	○ TOGAF Section 15.4.	○ Cloud setup. ○ Integration requirements. ○ Vendor's SLAs.	1. Confirm the scope and priorities for cloud deployment. 2. Identify the required deployment resources and skills. 3. Guide the development of solutions deployment. 4. Perform EA compliance reviews. 5. Implement business and IT operations. 6. Perform post-implementation review.	○ Updated risk management. ○ Post-implementation review. ○ Architecture compliance assessment.	-	Service executive (I&C). Service owner (R&A). Business relationship manager (R). Service lifecycle management (R). Service offering management (R). System/Technology architect (C). Service roadmap management (C&I).
Architecture change management	○ TOGAF Section 16.4.	○ Updated risk management. ○ Post-implementation review. ○ Architecture compliance assessment.	1. Establish value realization process. 2. Deploy monitoring tools. 3. Manage risks. 4. Provide analysis for architecture change management. 5. Develop change requirements to meet performance targets. 6. Manage governance process. 7. Activate the process to implement change.	○ Architecture updates.	-	Service executive (I&R). Service owner (C). Business relationship manager (R). Service lifecycle management (R). System/Technology architect (R). Service offering management (R). Service roadmap management (R). Business user (C).

Table 4 The proposed step-wise framework for cloud adoption

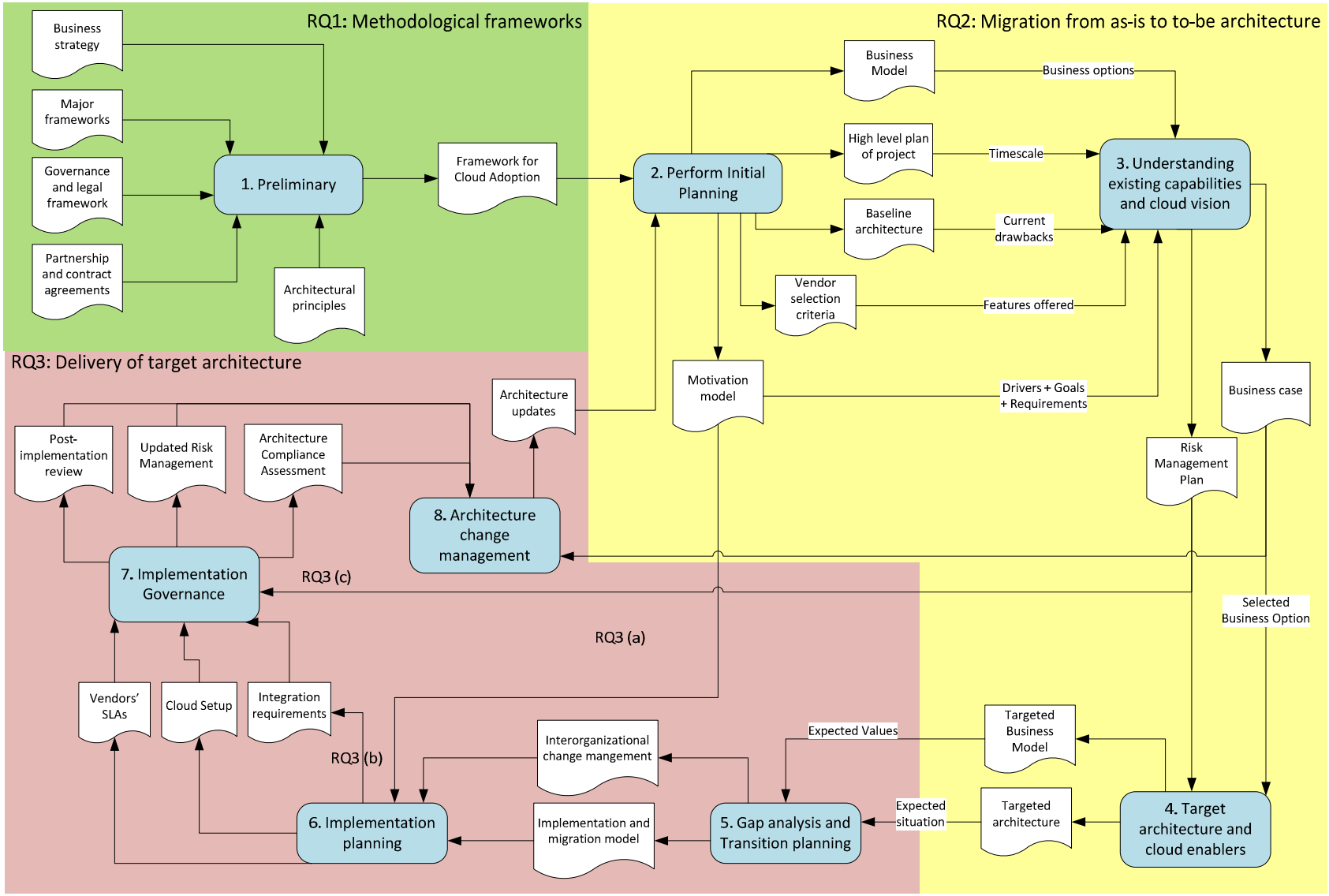

Figure 11 Framework for Cloud Adoption

3.2 The approach for a cloud change management in inter-organizational context

This framework is derived from three main literature sources described in chapter 2: a generic change management framework from Aladwani (2001), the impacts of IOS to buyer-seller relationship by Wilson and Vlosky (1998), and the determinants to adopt a cloud solution by Lumsden and Gutierrez (2013). The process-oriented suggested by Aladwani (2001) consists of three main steps as depicted in Figure 12:

a) **Knowledge formulation**. In this phase, the relevant parties with whom the focal firm will use the cloud computing are identified. It is important to identify the interdependency among these transaction partners and the drivers that influence them to adopt a cloud. Lack of understanding on the relationship structure would lead to the risks of conflicts or increasing level of ambiguity (Kumar & Van Dissel, 1996). To gather the necessary knowledge about these parties, the determinants mentioned by Wilson and Vlosky (1998) and Lumsden and Gutierrez (2013) will be used as a basis and compared to each other, as described in Table 5. These determinants will then be explored further in the context of a cloud as an inter-organizational system.
   1. **Power of the focal firm** – "*How dependent are the transaction partners on the focal firm?*" This factor demonstrates how the focal firm, as a buyer, owns influential power to enforce the implementation of cloud. Lumsden and Gutierrez (2013) refer this factor as a trading partner pressure. The focal firm is perceived to have a strong power if:
      a) The focal firm has a prominent position within the partners' portfolio, due to its company size, brand awareness, or else.
      b) The transaction volume with the focal firm is quite significant for the partner's revenue. Losing business agreement with the focal firm may cause a considerable reduction in the partner's profit.
   2. **Importance of the transaction partners** – "*How critical are these parties for the focal firm*?" Though the focal firm has more influences to enforce the implementation of cloud, the pressure to the transaction partners should be carefully managed in order to prevent tension or resentment that will disrupt the relationship in the future. The partners are perceived as important by the focal firm if:
      1. The partner has a considerable size to provide products or services to the focal firm which are indicated by
         - The product or service that the focal firm purchases from transactional partners represents a significant portion of its total purchase.
         - The quality of focal firm products or services is heavily affected by the transaction partners' performance.
      2. The partner has already been a long-term strategic companion with the focal firm as indicated by the number of years the relationship has been built.
      3. The transaction partner has heavily invested in specialized or sophisticated technology resources which are not owned by other partners.
   3. **External Pressure** – "*How dependent is one partner on the other*?" When the products are undifferentiated and standardized, or signified by a little difference between suppliers, the focal firm will easily find an equivalent product (Porter, 1980). This condition makes a tight

competition and motivates the partner to copy the leaders (Gibbs & Kraemer, 2004). Therefore, in order to know to what extent the transaction partner tends to follow the external pressure, we need to understand how competitive the market is, who the market leader is, and how the adoption of cloud may help to improve its image.

4. **Perceived benefit** – "*What benefits can they get*?" When the transaction partners perceive that they will get as many benefits as the focal firm gets, they will be more enthusiast to adopt the cloud computing.
5. **Organizational compatibility** – "*How much effort do they need to invest?*" Lack of compatibility to the existing values and processes may hinder a smooth adoption of cloud computing, resulting in difficulties for organizational changes.
6. **Facilitating condition -** "*What supports do these parties need?*" In an inter-organizational system, the focal firm acts as the main coordinator that promotes a commitment and support and sends a positive signal of confidence to the transaction partners. The supports involve the establishment of necessary plans to handle the complexities occurred prior and during the actual deployment of the new system.
7. **Anxiety** – "*What are their concerns*?" This is an additional determinant suggested in this framework. Within the theory of User Acceptance of Information Technology (UTAUT) by Venkatesh (2003), anxiety is described as one of the indirect determinants that influence individual behavior toward a new system. It is an evoking anxious resulted from an emotional reaction towards a certain system. In the inter-organizational context especially where the market is very competitive and the involving parties are competing with each other, cloud computing is somewhat threatening to the partners. With a centralized and standardized system in cloud, the switching cost to another partner will become lower and thus may increase the fear of losing market share or profit.

The proposed determinants	Wilson and Vlosky (1998)	Lumsden & Gutierrez (2013)
Power of the focal firm	Power/dependence	Trading partner pressure
Importance of the transaction partner	Importance of the partner	Firm size, technology readiness
External pressure	Comparison level of alternatives	Competitive pressure
Perceived benefit	Performance	Relative advantage
Organizational compatibility	Power/dependence (Focal firm) - Importance of the partner (Seller)	Compatibility
Facilitating condition	-	Top management support, complexity
Anxiety	-	-

Table 5 Factors influencing the adoption of IT system from different concepts

b) **Strategy implementation.** After having a sufficient understanding about how the involving parties may respond to cloud implementation, a change management strategy should be cautiously developed in order to effectively address the potential resistances and difficulties in the implementation. The strategy comprises of a list of actions, such as communication and coordination, hand-on training, etc. that need to be carried out by the management continuously throughout the entire lifecycle of cloud adoption. This strategy should emphasize the importance of having a strong collaboration among the parties, quality, and a strong willingness to have an integrated system.

c) **Status evaluation.** The realization of change management strategy should positively enhance the commitment and trust within the inter-organizational relationship, resulting in a more favorable awareness, feelings, and adoption intention. The outcome of this change management strategy should be evaluated by the management in a continuous manner and should ensure that appropriate actions are taken in order to prevent negative impacts resulted from a cloud implementation.

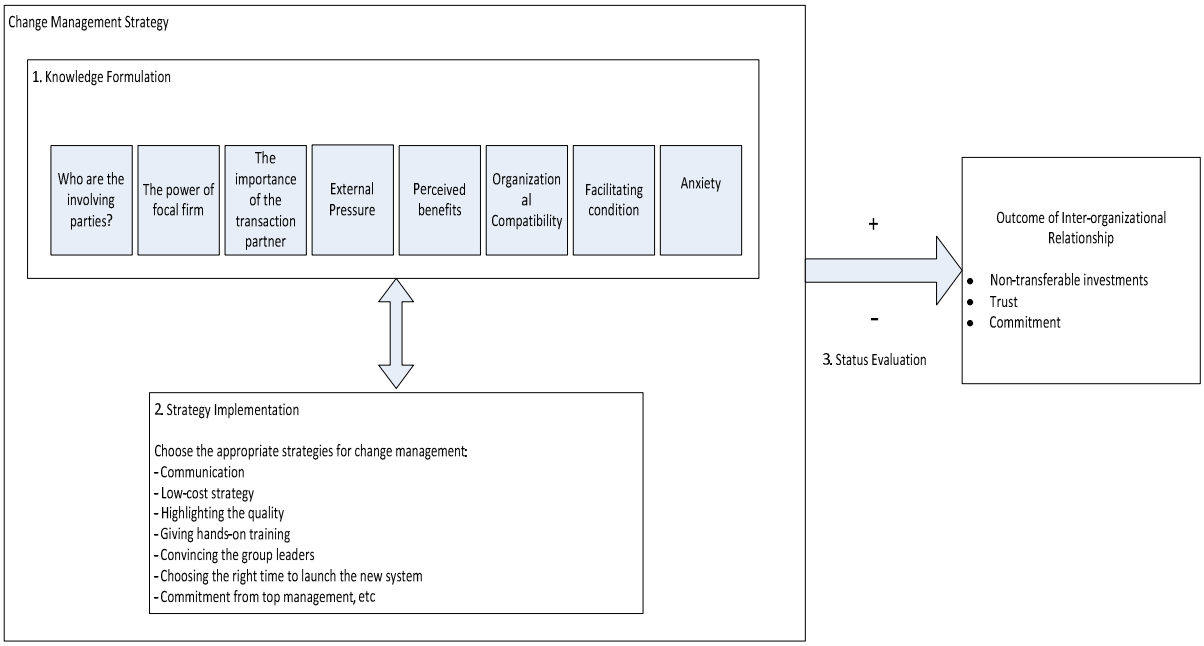

Figure 12 Change Management Framework for Cloud in Inter-organizational context

3.3 The approach for a cloud risk management

A governance framework needs to be built and used in order to ensure that accountability controls are established and performed during the adoption and the use of cloud. To create this framework, the approach for IT-risk scenario development from ISACA, as described earlier in chapter 2, will be used. Figure 13 displays the overview of this suggested risk management approach.

- Top-down approach - where the risk identification is started from the understanding of the business and project context. The information gathered during the initial planning phase of cloud adoption strategy is proposed to be used as the inputs for this top-down approach, such as:
  - The way of developing and managing the high-level project plan.
  - The shortfalls identified during vendor selection phase, and
  - The motivational model that can be used as a reference to analyze potential risks impacting the business objectives or expected requirements from a cloud application.
- Bottom-up approach - where a list of generic risks published by professional community or researchers is used for defining a set of plausible risks. For the purpose of this research, a cloud risk intelligent map from Deloitte (2010) is used as a reference material. Deloitte, as one of big-four accounting firms, has provided an extensive and pervasive nature of potential risks associated with a cloud computing. This map is not intended as an exhaustive list of risks and therefore requires a cautious justification when customizing it accordingly with the actual cases or risks that impact the organization.
- When a list of risks has been generated, the next step is to have an analysis of the likelihood and magnitude of the identified risks. This analysis should take into account various aspects, such as the actions that management has taken and the capabilities of involved personnel and vendors, the inherent risks of the cloud itself, and the communication weaknesses within the organization.

  The magnitude or impact could be assessed using these criteria, adapted from NIST publication by Stonebumer, Goguen, and Feringa (2002) and TOGAF 9 (The Open Group, 2011) Section 31.4:
  - **High:** the risk will cause a serious financial loss, leading to a loss in productivity and no return on investment.
  - **Medium:** the risk will cause a minor financial loss and reduce the return on investment.
  - **Low:** the risk will cause a minimal impact on business functions.

  While the frequency or likelihood can be indicated as follows:

  - **High:** the risk is likely or frequently to occur.
  - **Medium:** the risk only occurs occasionally or several times.
  - **Low:** the risk is remotely possible and would probably occur not more than once.

  Using the rationale explained by NIST, the risk exposure can be measured by multiplying the ratings assigned to risk likelihood and impact, for example:

  - The rating assigned to likelihood criteria is 1.0 for high, 0.5 for medium, and 0.1 for low.
  - The value assigned to each impact level is 100 for high, 50 for medium, and 10 for low.

  The risk profile matrix is showed in Table 6 from which the risk impact scale can then be justified: High risk (>50 to 100), Medium risk (>10 to 50), and Low risk (>1 to 10).

Risks Likelihood	Impact Low (10)	Medium (50)	High (100)
High (1.0)	Low (10*1 = 10)	Medium (50*1 = 50)	High (100*1 = 100)
Medium (0.5)	Low (10*0.5 = 5)	Medium (50*0.5 = 25)	Medium (100*0.5 = 50)
Low (0.1)	Low (10*0.1 = 1)	Low (50*0.1 = 5)	Low (100*0.1 = 10)

Table 6 Risk profile matrix (Stonebumer, Goguen, & Feringa, 2002)

- After defining the risk profiles, certain responses are needed so that the residual of these risks are still within the acceptable levels. There are four types of response which can be applied accordingly with the risk level and prioritization (ISACA, 2009):
  - Risk avoidance means that certain actions are taken in order to prevent the occurrence of the risks.
  - Risk reduction in which detective and corrective actions are conducted to reduce the impact or frequency of the risks.
  - Risk sharing means reducing the impact or likelihood by sharing the risks with other parties, such as the insurance, outsourcers, etc.
  - Risk acceptance implies that no actions are intentionally taken to particular risk and loss is accepted when it occurs.

  These responses are then addressed and formulated into control objectives and practices from which the principles and policies can then be established.

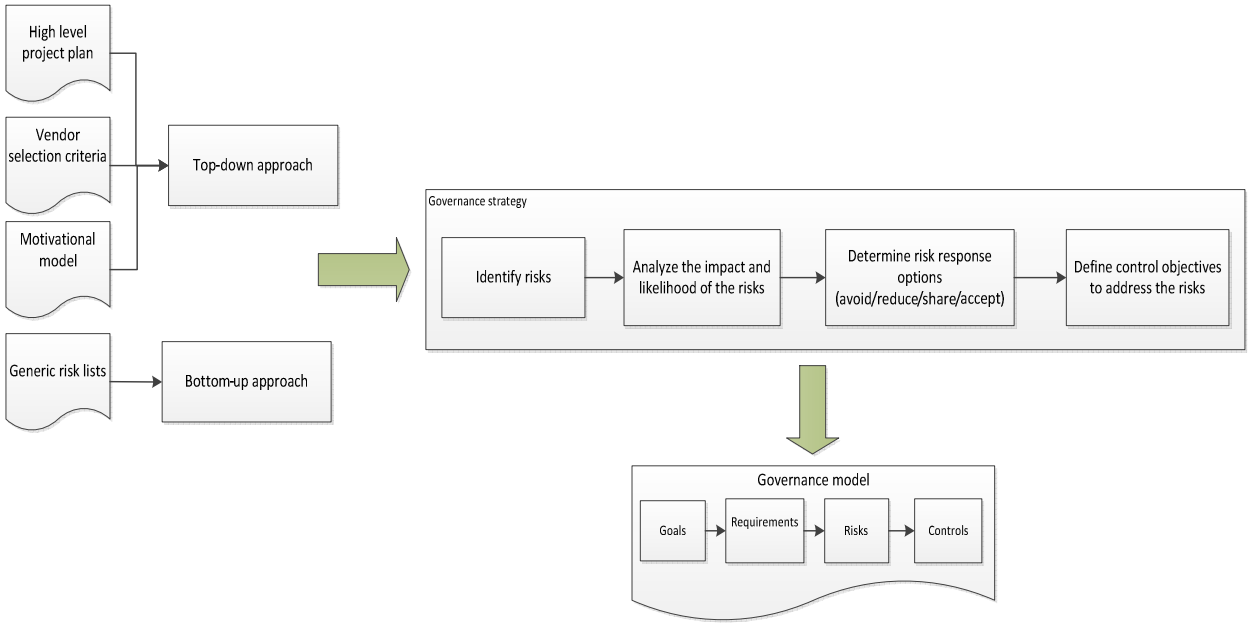

Figure 13 A cloud risk management approach

4 – The Application of the Framework

This chapter describes the actual case in Philips Consumer Lifestyle (CL), where we apply the framework described in the earlier chapter. First, Section 4.1 examines the organizational context surrounding the decision to implement a cloud solution. This is followed by the initial planning in Section 4.2 that consists of investigation over the baseline BM and architecture, including the expectations toward the cloud application. The financial capabilities as well as the vision of how to govern the cloud implementation are described in Section 4.3. Then, the following sections provide the realization phases of a cloud application: targeted architecture in Section 4.4, gap analysis and transition planning in Section 4.5, implementation planning in Section 4.6, and post-implementation review in Section 4.7.

4.1 Preliminary – Introduction to the case

This phase contains the initiation activities, intended to understand the business directives and to review the organizational context in relation to the enterprise architecture. The analysis in this phase will ensure that the suggested framework in the previous chapter is applicable to the case and in line with the existing principles in the company.

4.1.1 Scope the enterprise organization impacted

In this step, we obtain the business strategy of Philips CL in order to identify which internal core units are mostly affected by the cloud solution and to achieve the most value from the work. In order to identify the extended (external) units who will also be affected, we obtain the agreements with respective vendors.

4.1.1.1 Obtain the business strategy of Philips CL

CONFIDENTIAL ***(part of company strategy)***

4.1.1.2 Obtain the partnership and contract agreements

Currently, Philips CL has engaged six main outsourcers located in 15 different locations around the globe for its contact center operation. They handle consumer calls and care on a world-wide basis. As of December 2013, SITEL - the leading contact center outsourcers based in US handles approximately 49.6% of Philips CL total interactions with consumers. It has been in partnership with Philips CL since 1998.

These outsourcers are responsible to deliver the provision of necessary facilities for the operation (ex. office space, furniture, peripherals, software, data storage, network equipment, etc.), the people (call agents, supervisors, analyst teams), and the other supporting services such as consultation, business analyst, reporting, training, and work process preparation.

In general, Philips CL is responsible to provide these outsourcers with any necessary documents concerning the technical, legal, and other regulatory requirements related to its products. It is also a part of Philips CL responsibilities to manage one or more agreements with the assigned telecom carriers for telephone network and connectivity from sites to Philips Global Network (PGN). The

details of responsibilities of these outsourcers and Philips CL are described within the contract agreement and statement of work. The contract with each outsourcer is renewed annually.

4.1.2 Confirm and collect the existing governance and support frameworks

In order to understand how the organization manages the governance of its daily IT operation, we obtain some major project and architecture frameworks that are currently in use in Philips CL.

4.1.2.1 Major project and architecture frameworks in Philips CL

Within its vision, Philips IT has strongly emphasized the needs to transform its underlying infrastructure into an enabling element for the acceleration of its business growth. For fulfilling its vision, Philips has aimed to streamline and integrate its massive systems into one integrated landscape. In order to avoid this massive integration from becoming an unnecessary diversity and chaos, Philips IT has adopted some best practices and frameworks, and has applied them within its IT strategy.

One of the best practices adopted in term of enterprise architecture is TOGAF (Philips, 2012). Several components from TOGAF used within Philips are:

- Architecture capability framework that defines the job profiles and skills of the architectural team members.
- Architecture development method that is used as the architectural process.
- Architecture content framework that is used together with the business capabilities and other TMForum Framework approach for defining a meta-model for enterprise architecture.
- Enterprise continuum that is used to define the architecture repository structure.

The other best practices used in Philips to support its strategic decision process for enterprise architecture are:

- Business Capability Map is a simple means that partition business into understandable components which are later grouped accordingly with different categories, for example competency areas, differentiating areas, investment level, etc.
- Customer Value Prototyping is a methodology used for bringing together all respective stakeholders, from business, architecture, and IT with a solution provider, in a collaborative prototyping environment.

Meanwhile, for its project delivery process, Philips has adopted an Agile and Output-based approach. This approach supports the implementation of a new system with a stable team, stable budget, stable release and stable testing way of working. There are two main processes within this Agile delivery, namely the core processes and the supporting processes. The core processes consist of the following activities:

- Capability management. This process provides, reviews, and maintains stable teams with the required competencies for each product log.

- Solution development. This process develops a solution by breaking down the demands into product logs and releases the planning and products in frequent iterations.
- Solution deployment. In this process, the investigation is started to plan and deliver the project deployments using the scrum methodology.

Meanwhile, in the supporting processes, there are several surrounding activities that are critical for the decision making process by providing the analysis of the following matters:

- Estimation, measurement, and partner performance. The capacity to deliver the project is estimated using the reference data and lessons learnt from the similar projects in the past. Then, the outcome of each project log will be measured in three phases: during the execution, in a quarterly basis after the deliverable completion, and in a semi-annually basis.
- Financial flow. This is where the financial aspects, especially the budget for the teams, charging and payment process, are analyzed in line with the corporate accounting rules and controls.
- Release and transition management. The objectives of this process are to validate the quality of deliveries and to ensure a smooth transition into a stable production environment.

4.1.2.2 The governance and legal frameworks

As reported within its internal portal, Philips has established and maintained its IT Delivery Risks and Compliance Management program. This program ensures that the projects and processes within Philips IT systems comply with the internal, external, and regulatory requirements. One of the apparent compliance domains in Philips is the legislation of Sarbanes-Oxley Act of 2002 (SOx). There are various compliance documents and approvals required for the operation and management of critical applications in relation to the financial reporting. Besides SOx, the other compliance domains are the FDA (medical devices), PCI/DDS (credit card processing), security, data retention, data privacy, and software licenses.

As a consequence of these compliance lists, several relevant documents and requirements need to be prepared, tested, and approved. Business Impact Assessment (BIA) is a document that assesses the security compliance in term of data confidentiality, integrity, and availability. The assessment is performed by the IT project team along with the business owner and under the validation of the security and risks team. As the inputs for this BIA, it is prerequisite to complete first the Privacy Impact Assessment (PIA) document in order to detect the potential risks that breach consumer privacy.

4.1.3 Identify the architecture principles

CONFIDENTIAL *(part of company strategy)*

4.1.4 Tailored framework for cloud adoption

From the major frameworks and architectural principles that are currently used in Philips, it is apparent that the IT management has adequately prepared its IT vision and strategy for the purpose of fulfilling its promise of world class IT enabling growth. Since TOGAF is also used as a reference for the architectural framework, the suggested cloud adoption framework in this thesis is in line with the existing ways of working in Philips IT. Therefore, the results of this thesis are expected to

complement the generic frameworks being used in Philips by specifying the critical components and the unique nature of a cloud solution.

The background information obtained in this phase will also be used as valuable inputs for the next phases:

- Envisions of new opportunities, values, and how cloud may accelerate the strategic directions will be based on the understanding of business strategies. The cloud adoption is treated as a strategic choice to achieve the business objectives rather than just a technology choice.
- The key deliverables of the governance and legal compliance, i.e. the BIA and PIA, will be the inputs for risks assessment.
- The partnership and contract arrangements will contribute to the understanding of the dependency and relationship structure between Philips CL and its contact center partners.
- The compliance of the targeted architecture of the cloud adoption will be checked against the key architectural principles.

4.2 Perform initial planning

In this phase, the exploration of current process is performed by specifying the baseline architecture and the corresponding business model. Such analysis is necessary to reveal the current problems, such as which systems or platforms constrain the business agility or where is the bottleneck for the new capabilities, and therefore, triggering the migration to cloud. The envisioning of new opportunities and capabilities for a new cloud-enabled architecture is captured within the design of a so-called *motivational model*. While the expectations have been established, it is important to select vendors with synergistic strategies and adequate experiences, and later followed with a high level plan for realizing the business outcomes.

4.2.1 Start from the understanding of the baseline EA

The contact centers of Philips CL are currently located in dispersed locations around the globe and completely handled by various outsourcers. These outsourcers manage their own systems, causing redundant technologies and application of different platforms in the operationalization of contact centers. This situation causes difficulties for Philips management to rigorously monitor the overall performance of contact handling and to distribute calls across the globe.

This as-is situation is documented using ArchiMate language in Figure 15. This as-is figure is described in terms of main business processes, application services, and the supporting network infrastructure and devices. The interviews with relevant personnel, such as the senior manager of Philips Call Center team, the technical architect of Siebel CRM, and the IT contact person of contact center outsourcers, including the reviews of several vendor whitepapers are performed in order to gain a sufficient understanding of the existing systems.

4.2.1.1 Business architecture

There are three main actors who perform activities within the business processes of contact center, i.e. the consumers, the call agents, and Philips Call Center Management Team. To these actors, the contact center provides the following workflow of relevant business processes:

a) **Contact handling service.** The main service of contact centers is to be the first point for consumers to interact with the company. How these contact centers deal with incoming calls, emails, chats, etc. will prominently determine whether the excellent service experiences or the poor ones are delivered to consumers. The excellent service now accounts for higher impacts on consumer loyalty rather than the competitive price of the products. The business processes which constitute the contact handling service are as follows:.
   - *Receive contact from consumers*. An agent who is routed with a contact will welcome the consumers.
   - *Verify the contacts*. An agent will ask the consumer's name and check whether the detail already exists or not.
   - *Create a service request (SR)*. Every case of the consumer contacts will be documented in a service request and recorded in Siebel CRM. SRs for chat and email will be created automatically in CRM while the SRs for other contact types, such as social media and call, are manually recorded by the call agents.
   - *Respond to consumer inquiry*. Agent will respond to the case accordingly with the procedures of respective product.
   - In the case of emergency or other complexities concerning the product technical features or commercial issues, the call agents can escalate the problem to the supervisors, the product specialists, or the commercial back liner in contact center site.
   - *Update the SR status*. Agents are instructed to put the details about the responses given to consumer in SR and set its resolution code.
b) **Reporting service.** All data about the SR records and the agents are available and can be retrieved using either the pre-defined or user-defined report template in Cognos – Business Intelligent Application. The actors who can access this application are the Philips Call Center team and the outsourcers' resource planner staff.
c) **Planning service.** The staffing is planned and scheduled to ensure that enough call agents are available to handle the incoming contacts from consumers. For making this planning sufficient, the resource planner needs historical data about how many minutes of calls, emails, etc. are handled in a certain period. In the case of Philips, this historical data is accessed via Cognos – Business Intelligent Application.
d) **Invoicing service.** In this step, Philips will receive monthly invoices from the outsourcers containing charges over the agent fee and services given in relation with the contact handling.

4.2.1.2 Information architecture

At a high level, the following processes describe different types of applications used, including the functionalities to support the contact center operation:

a) **Contact routing**. Currently, different applications are used for supporting the multi-channel communications with consumers. These disintegrated applications cause difficulties in tracing the agents' availability and serving consumers seamlessly across different contact channels.

Moreover, the agents have to open multiple interfaces to handle incoming contacts and cause significant inefficiencies.

b) **Social media routing.** The social media listener application is used to monitor, analyze and give responses to conversations that mention the company name or products in social media. The automatic interfacing between this social media listener and Siebel CRM is not yet in place, and thus the creation of SR is still performed manually.

c) **Email and chat routing.** The marketing and support pages, called "Philips on-line", consist of various communication means to interact with consumers besides the voice-based call, such as the chatting features from Livecom application, the Mail Relay System (MRS), and the forums. The web-based service allows these different types of media to be routed into Siebel CRM and the SR will be created automatically.

d) **Voice-based call routing.** Calls coming from PSTN phone will be routed to local trunks and come to contact center sites. At this moment, the applications used in contact center sites have not been integrated yet to Siebel CRM, and therefore, the SR is still manually created by the agents. Main components within contact center application for processing the calls are as the following:
   1. IVR (Interactive Voice Recognition): to prompt the calls and let the consumers choose different types of help they need, whether the self-service or directly speaking to an agent.
   2. ACD (Automatic Call Distribution): to route the calls to appropriate agents accordingly with the programmed rules and put the calls in a queue if the agents are not available.

e) **Consumer data search.** Agents will check whether the caller's personal details have been recorded in Philips systems or not. Consumers may register their details while calling the agents or through MyPhilips or online shop. These consumer details will be consolidated and cleansed within the data warehouse application, called the consumer data factory, and can be withdrawn via 360-view application which is plugged in Siebel CRM.

f) **Consumer administration.** If the contact already exists, the agent may confirm or ask additional information. While the caller is not associated with any records in the system, a new contact will be created in Siebel CRM.

g) **Service request (SR) administration.** By using the service request view in CRM Siebel, the agent can retrieve the existing SRs associated with the caller or create a new one. SR begins when the agent starts a new case for a telephone call, email, fax, or other means and ends when its status is updated as "case closed".

h) **Report generator.** The contact center outsourcers deliver the agreed reports in a regular manner to Philips' management. Besides these reports, the management can also retrieve the historical data from the Cognos application, such as the SR records, the timestamps, agents, location, etc.

i) **Workforce management (WFM).** This is one of the most critical operational functions in the contact center. It calculates and schedules the number of agents to handle the incoming calls with minimum delays. Each outsourcer uses its own WFM solution, such as SITEL is using Blue-pumpkin WFM.

j) **Agent fee calculation.** The outsourcers will invoice Philips in monthly basis for the actual costs incurred during the operation. Starting from when the agents commence the interaction with consumers and until the after-call activities are finished, the billable time is automatically recorded by the Siebel CRM and Cognos reporting system. This stamped time per contact center will be multiplied with the agreed rate in each country.

4.2.1.3 Technical architecture

This section identifies the infrastructural architecture which supports the existing main systems. The blue-colored nodes in Figure 15 reflect the infrastructures handled by the contact center outsourcers, while the green ones are managed internally by Philips.

a) At a high level, the architecture for Siebel CRM consists of:
   - **Web servers.** These web servers identify the incoming requests from web clients. The main components contained in a web server are the virtual directories, Siebel Web Server Extension (SWSE), and the configuration file.
     - The virtual directories will receive the inbound requests and forward these to SWSE.
     - The plug-in for SWSE receives and parses the inbound HTTP requests from web clients. It also includes a load balancing module for routing the requests to application object manager components (AOM) running on Siebel application servers.
     - To communicate with Siebel application servers, a single configuration file, called "eapps.cfg", contains a connect string, such as connectivity information, login and security settings for each Siebel application.
   - **Application servers.** These servers execute tasks that are related to the processing of business data. These tasks will be run in one of the following processing modes, i.e. the interactive processing wherein tasks will be started and ended automatically in response to user requests, the background processing and batch processing. The components resided in the application servers will perform specific functions or jobs; for example AOM will create and process data at user interface layer until data layer, synchronization manager, enterprise integration managers, etc.
   - **Database servers.** These are where the data are stored in a predefined database schema. The data manager component within the AOM will control access to database server.

b) The other critical infrastructures to support the contact center operation are handled independently by the outsourcers. Besides the system software for IVR-ACD, WFM, and invoicing, these are the other essential elements required in sites:
   - **Web clients.** The Siebel web clients run in the agents' client computer and allow them to access the information managed by Siebel application. Using the thin-client approach, the users will connect via Citrix and only the user interface layer of Siebel CRM runs on the browser-based clients.
   - **Private Branch Exchange (PBX).** This telephone system allows multiple incoming calls connected to the IVR. It directs the calls to the right agent, and also routes outgoing calls to outside callers.

- **VoIP Gateway.** This device converts the telephony traffic into an IP transmission over the data network. It can be used in two ways – to convert the incoming calls from PSTN or telephone lines to VoIP/SIP (Session Initiation Protocol), and to connect the traditional PBX or phone system to IP network.
- **Media server.** This delivers multimedia processing features, such as voice recording, transcoding, transcription, music on hold, etc.

c) **Philips online servers.** These servers contain sets of system software to support the media communication (except the voice-based call) and the consumer data analysis.

d) **Citrix farms.** These Citrix farms provide remote access to the users located in dispersed locations. Currently there are 17 Citrix servers in operation and configured for approximately 1400 users, i.e. 700 concurrent users in production environment, 50 users in QA and development environment, and 100 users for training purpose. Citrix farms contain Citrix access gateway that allows secure remote access to the virtual applications.

e) **Email server.** The communication server component will process the inbound and outbound of email messages. The connectivity between Siebel application servers and email servers is supported by SSL or TLS encryption. The Post Office Protocol (POP) is used to retrieve and download the email messages.

f) **Cognos server.** IBM Cognos Business Intelligent provides a Java-based query execution mode which offers the capabilities to meet query complexities and high data volume. Its connectivity to Siebel CRM is set up with a dynamic query mode, accessing Siebel library through an adapter which defines the connection parameters. As defined within the contractual work statement, the data source from Cognos are also used as an indicator to measure the performance of contact center outsourcers, such as the percentage of SR resolved, forecast accuracy, and service level for responding the calls or emails.

g) **Networks.** This infrastructure is responsible to enable the communication between the decentralized contact centers and Siebel data centers located in Philips DC, Strijp - Eindhoven in the Netherlands.

- Siebel Secure Network (SSN) has the function to connect the contact center sites to Citrix farms and Siebel web servers.
- Then, the access from Siebel web servers to Siebel application servers and databases is managed through the Philips Global Network (PGN).

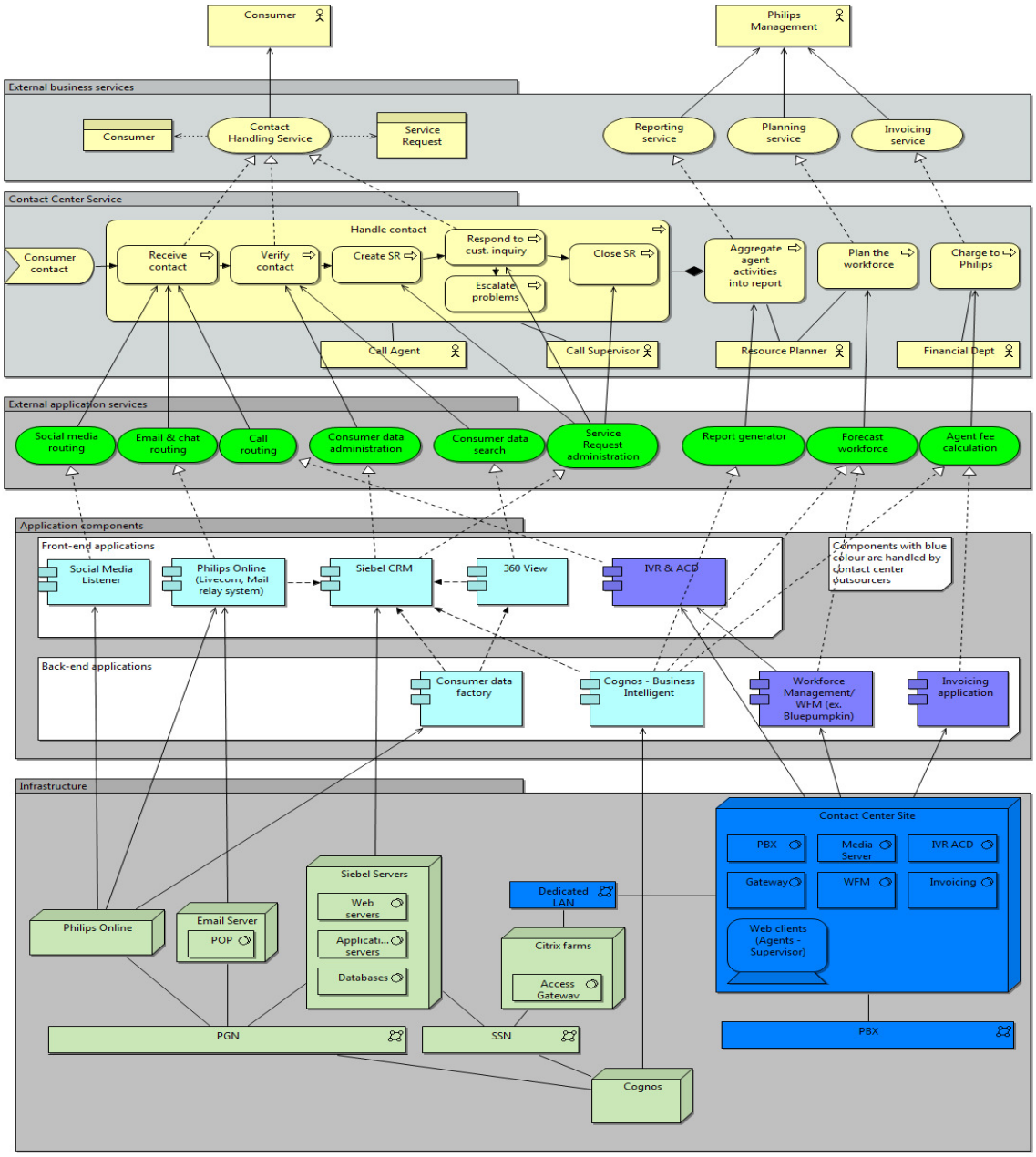

Figure 14 As-is Architecture

4.2.2 Specify the corresponding business model

Using the business modeling method by Meertens (2013), the value propositions to consumers including the supporting resources and the key activities are identified and analyzed through the four steps described in Section 4.2.2.1 until 4.2.2.4.

4.2.2.1 Identify roles

The values brought by a cloud solution will be perceived differently by the stakeholders, depending on their needs to the processes (Isom & Holley, 2012). How these stakeholders perceive the values

will determine whether or not they would support the cloud transformation. Therefore, it is important to recognize the needs and roles of these stakeholders.

To identify the key stakeholders, we refer to an approach proposed by Sharp, Finkelstein, & Galal (1999) that classifies the stakeholders into four baseline groups: users, technology providers/developers, legislators, and decision makers. The nature of each group within the contact center operation in Philips CL is explored below and displayed in Table 7.

1. **Users.** There are two types of user to whom cloud contact center application will have direct impacts:
   - The first one is the primary users who are likely to frequently use the services of contact center operation. They are the call agents and the supervisors in contact center sites and the consumers. These users are considered as an external party to Philips.
   - The secondary users are those who occasionally use the system through an intermediary. In this case, Philips management is the secondary user who has no direct access to the systems used in sites but is responsible to ensure that the overall services are performed properly and satisfy consumer´s needs.
2. **Service/technology providers.** Philips Consumer Lifestyle has engaged several third parties to provide service and technology supports for its contact centers:
   - **Call-agent service.** The outsourcers, such as SITEL, Teleperformance, PCCW, NCR, Beeline, HCL Infosystems, provide number of agents and contact routing applications. They are assigned to ensure that skillful agents and sufficient routing systems are available to properly handle the calls or emails.
   - **Third-party application developers.** For example, Siebel CRM application from Oracle, Cognos Business Intelligent from IBM, chat application from Livecom, etc.
   - **Telecommunication network.** The companies like British Telecom are involved to ensure high reliability and availability of IP network services.
   - **Philips internal IT support. Except for the maintenance activities that reside in contact center sites,** the maintenance activities of the ongoing applications and infrastructure, such as servers, network monitoring, etc. are still handled by Philips internal IT.
3. **Legislators.** These are either the official or professional bodies that produce certain guidelines or standards for the operation of the contact center. For instance, the confidentiality standards of sensitive consumer data, such as payment account, have been defined by Payment Card Industry (PCI) security standard council. These standards should be applied into the contact center operation and systems. The other critical laws, especially when implementing a cloud contact center, are related to data location, ownership and security.
4. **Decision-makers.** This kind of stakeholder includes the financial controller and Philips Global Call Center management who are responsible to determine the decisions concerning the implementation of cloud contact center.

Stakeholders	Internal	External
Users	Philips Global Call Center team.	Outsourced call agents.

		Consumers: • Upper-segment household. • Young professionals.
Service/Technology provider:	Philips IT internal support.	• Third-party developers, i.e. Siebel CRM, Cognos, Livecom, etc. • Call-agent outsourcers. • Telecommunication network providers.
Legislator:	N/A	EU law on cloud computing. PCI security councils.
Decision-maker:	• Financial controller. • Philips Global Call Center management.	N/A

Table 7 List of stakeholders

4.2.2.2 Recognize relations

Table 8 describes the relations between the aforementioned stakeholders. This role-relation table positions the Philips Global Call Center management as a central point that interacts with all other roles. Its primary role is to ensure that all necessary functions in contact centers deliver an excellent service quality to consumers.

Within the existing operation, there is no direct relationship between the application developers and the Global Call Center management. The responsibility of contact center outsourcers is to select the relevant developers which deploy and maintain the routing systems used in the sites. Meanwhile, for the internal software in Philips, i.e. Siebel CRM and Cognos IBM, the responsibilities for the maintenance and administration are handled by Philips´ internal IT personnel. Therefore, the application developers are not mentioned in this role-relation matrix.

As indicated in the matrix, the contact center outsourcers have a significant role as the front line for consumer service. The bad performance of the contact centers will put the consumer loyalty at risk. Several essential technologies are therefore indispensable to support the operation of contact center, for instances automatic calls routing using ACD (Automatic Call Distribution), the reporting packages, the workforce management system for forecasting the number of required agents, and the voice processing using IVR (Interactive Voice Response). Besides these technologies, a dedicated and skillful agent is also a critical component in ensuring that the calls are handled by those who are specialized for certain company's product and services.

By having the contact center functions completely outsourced to service providers, the Global Call Center Team can therefore focus more on strategic level activities, such as monitoring the overall performance, finding more consumer-centric innovations, arranging the service delivery and payment, and also ensuring the compliance to regulations or guidelines.

For the remaining systems outside the contact center sites, the internal IT team is responsible to manage and monitor proper installation of Philips-owned applications and to configure correctly the

routers of Philips Global Network (PGN) that interconnect the computing facilities with contact center sites.

When the calls reach contact center sites, they are received in a private switching system provided by the telecommunication company, for instance the British Telecommunication (BT). This provider is also responsible to provide the communication means, for example the Multiprotocol Label Switching (MPLS)-based data transport services across the network.

The operation in the contact centers should comply with the laws enforced by the government of the countries in which they provide consumer services. The most common laws are related to consumer data protection to prevent illegal privacy exposure to unauthorized parties, such as PCI (Payment Card Industry) standard to prevent fraudulent transactions from unlawful exposure of credit card numbers, call recording guidelines, etc.

4.2.2.3 Specify activities

The activities in the contact center sites are mainly handled by the outsourcers or service providers. The agent scheduling, forecasting workload, calculating agent requirements, managing the technologies used in sites, and of course handling the communication with consumers, are some of the main activities performed by these outsourcers. The plan concerning the staffing and other critical issues surrounding the daily operation in sites will be routinely discussed with Philips Global Call Center management. In a frequent basis, the contact center providers will deliver standard reports from the operational level, such as incident report, sales report, etc.

As mentioned in the contract with these contact center providers, Philips Consumer Lifestyle is responsible to bear all costs and efforts in relation to the use of secure gateway and connections from the contact center sites to Siebel data center in Philips site. Philips is also responsible to provide both the knowledge-based solutions and consumer-related information accessible through the Siebel CRM and the business intelligent software. The overview of these activities can be found in Figure 16.

Consuming part/ Providing part	Consumers	Contact-center agent provider	Philips Global Call Center Team	Philips IT Support	Telecommunication provider	Legislator
Consumers	X	Show the feeling of either satisfaction or disappointment with the services.	Give trust and loyalty to the brand.	-	Pay for the non-toll free calls.	-
Contact center provider	As the front-line support to provide the necessary assistances for consumers in respect to the incoming calls, email, and social media channels.	X	Provide all means and actions required for the operation in contact centers, such as: • Supporting technologies (ACD, IVR, workforce management). • Training and work process preparation for the agents. • Periodic reports. • "Dedicated agents" depending on the products. • Managing the work force and agents' availability.	-	Give alert for the operational issues.	Adhere to the regulations.
Philips Global Call Center Team	Assure the excellent before and after-sales services in order to create the entire positive journey for consumers.	Pay for (the use of) operator services.	X	Pay for the internal IT costs.	Pay for the telecommunication services.	Adhere to the regulations.
Philips IT Support	-	Ensure a correct installation, upgrade and configuration of the software and network owned by Philips.	Provide supports for the overall consumer call system operation, such as Siebel CRM, Cognos-reporting tools, Livecom - chatting tools.	X	-	-
Telecommunication provider	-	Solve issues with respect to the telephone network services.	Provide secure network services to interconnect computing facilities between Philips and its contact-center provider.	-	X	-
Legislator	Ensure consumer data protection from misuse.	-	Enforce laws with respect to consumer data protection.	-	-	X

Table 8 Role-relation matrix

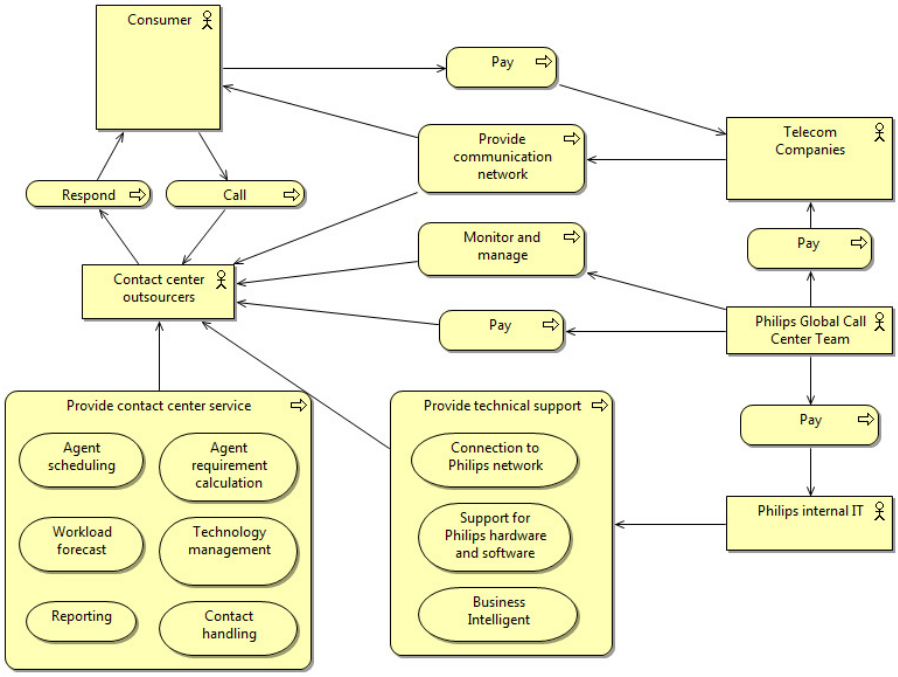

Figure 15 Visualization of roles and relations in contact center

4.2.2.4 *Quantify model*

It is important to understand the cost structure in a contact center, as it will help to justify the strategic decisions, processes or technological changes and to determine their impacts on the overall operational costs. In analyzing the costs, we use the statistic result published by Strategic Contract (Bocklund & Hinton, 2008), an independent consulting firm that uses comprehensive modeling tools to analyze the cost distribution in contact center. This white paper is also recommended by the resource planner from SITEL, one of the outsourcers for Philips contact centers. The actual proportion used by this outsourcer to justify the price of agent service cannot be disclosed here due to confidentiality issue. Therefore, the survey result from this white paper is used as a baseline to quantify the overall costs in contact center.

Labor appears as the highest cost according to these reports, occupying almost three-fourths or around 70% of total costs in contact center (Holman, Batt, & Holtgrewe, 2007; Reynolds, 2010). The decisions about staffing and workforce planning are therefore fundamental for the operation of contact center.

There are three representative sizes of contact center – small, medium, and large – mentioned in this white paper. The size of the contact centers for Philips Consumer Lifestyle can be categorized as large because more than 350 call agents are hired and located in 22 dispersed areas. The cost structure for a large-size contact center is described in Table 9.

Cost structure	Description	Cost proportion
1. Variable labor	Loaded costs for the call agents and supervisors.	72%
2. Fixed labor	Loaded costs for the management and operational analysts.	6.4%
3. Technology support labor	Loaded costs for the IT and telecommunication staffs.	2.7 %
4. Technology	IT and Telecom technology depreciation and maintenance costs.	5.9 %
5. Telecom/networking	Voice network per minute, cell phones, and support for voice and data network infrastructure across sites.	3.9 %
6. Facilities	Rent, maintenance, and utilities.	3.8 %
7. Miscellaneous overhead	Travel, back-charge for other departmental services.	5.3 %

Table 9 Cost distribution for a large-size Contact Center (Bocklund & Hinton, 2008)

Except for the telecom/networking item, all the cost items mentioned in Table 9 are reflected in the price charged by the outsourcers. This charged fee is approximately **96%** of the total costs. In average, the charged fee per minute for billable activities in the contact center is around € 0.78 and specifically for chatting is € 0.39. This fee is then multiplied with the actual total minutes of each billable activity during 2013, retrieved from Cognos – the Business Intelligent application. The result of this cost calculation is shown in Table 10 – **CONFIDENTIAL *(financial sensitive data)*.**

The remaining item (**3.9%** from total cost) represents the telecom/networking cost. Here we distinguish voice-related network from data network. Voice network is related to the telephony costs in dealing with local or international call tariff, while data network is related to the connectivity between the contact center sites to Siebel data center.

- For the telephony cost, we use the annual cost analysis provided by British Telecom (BT), one of the telecommunication providers for Philips Consumer Lifestyle, to estimate the total cost.
- Meanwhile for the data connectivity cost, it is rather difficult to trace directly into vendor invoice or analysis. This is because the invoice covers the costs not only for contact-center related operation but also for other operations within internal Philips. Therefore, we calculate the data connectivity using a linear ratio, i.e. 3.9% for the total telecom/networking costs compared to 96 % for the total contact center site costs.

$$Total\ data\ connectivity\ cost = \left(\frac{3.9}{96}\right) * \ total\ contact\ center\ site\ cost\ -\ total\ telephony\ cost$$

The approach to capture the total costs in contact center is summarized in Figure 17.

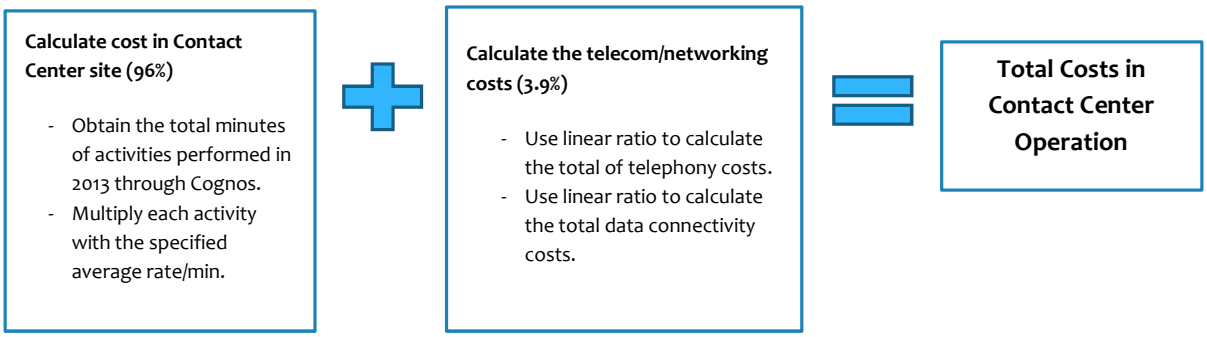

Figure 16 Procedure to calculate cost in Philips contact center

Table 10 Costs in Philips Contact Center **(CONFIDENTIAL)**

4.2.2.5 Specify the current business model

Using the information about the baseline EA in Section 4.2.1, the corresponding key activities, key resources and main value proposition can be extracted and modeled using ArchiMate, as depicted in Figure 18.

- The key activities are derived from the main business and application service layer in the as-is EA.
- The key resources consist of three main assets: 1) the *actors* who operate, plan and supervise the contact center operation; 2) the *essential information* about consumer profile and cases as recorded in service requests; and 3) the *software resources.*
- The key baseline values of contact center service are to satisfy consumers by providing satisfactory responses to their queries and to ensure the availability of the agents. To achieve these values, the *contact handling service* and the *planning service* are required.

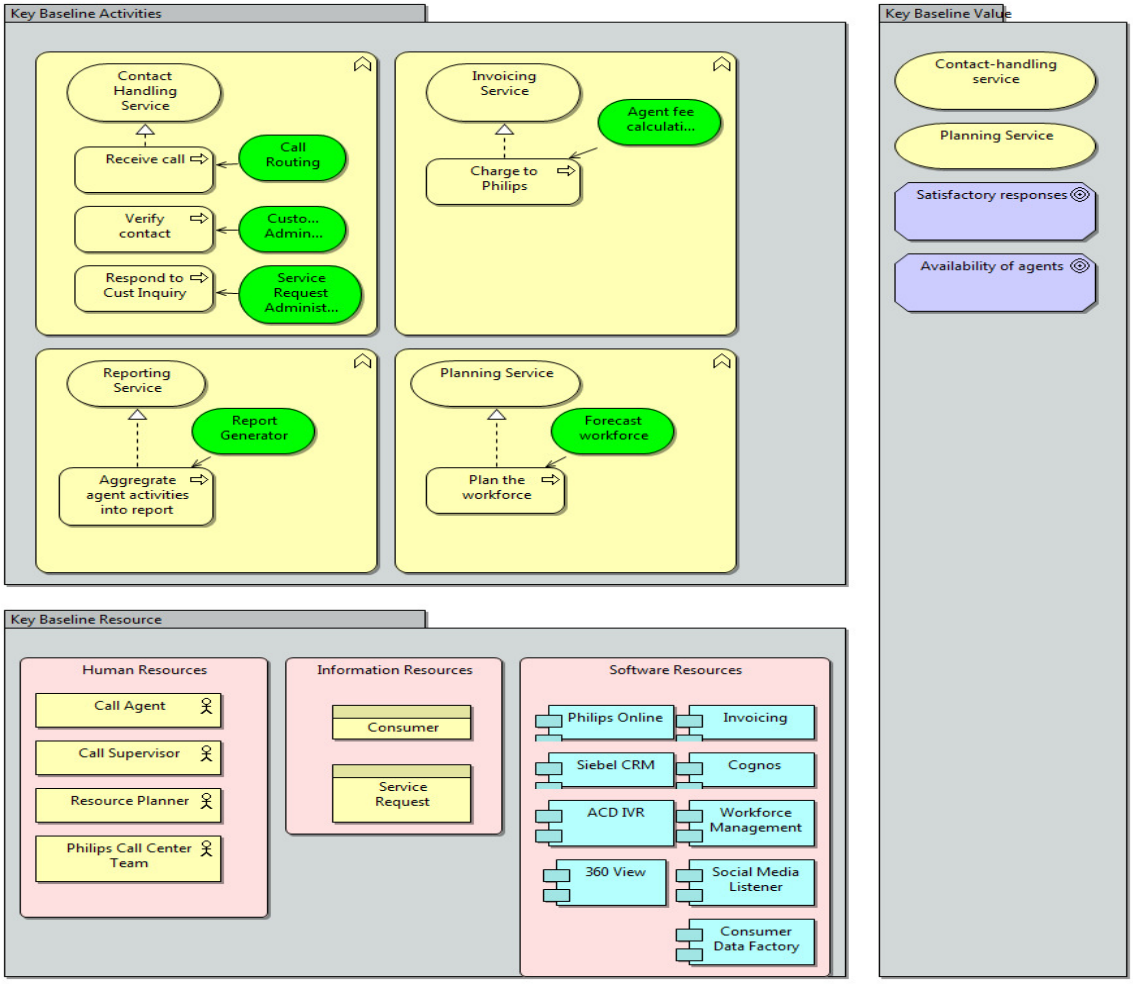

Figure 17 Baseline resource-capability model of Contact Center

Based on this baseline resource-capability model and the information gathered from the step 1 to4 of Meertens' (2013) approach, we fill in the following business model canvas, as seen in Figure 19.

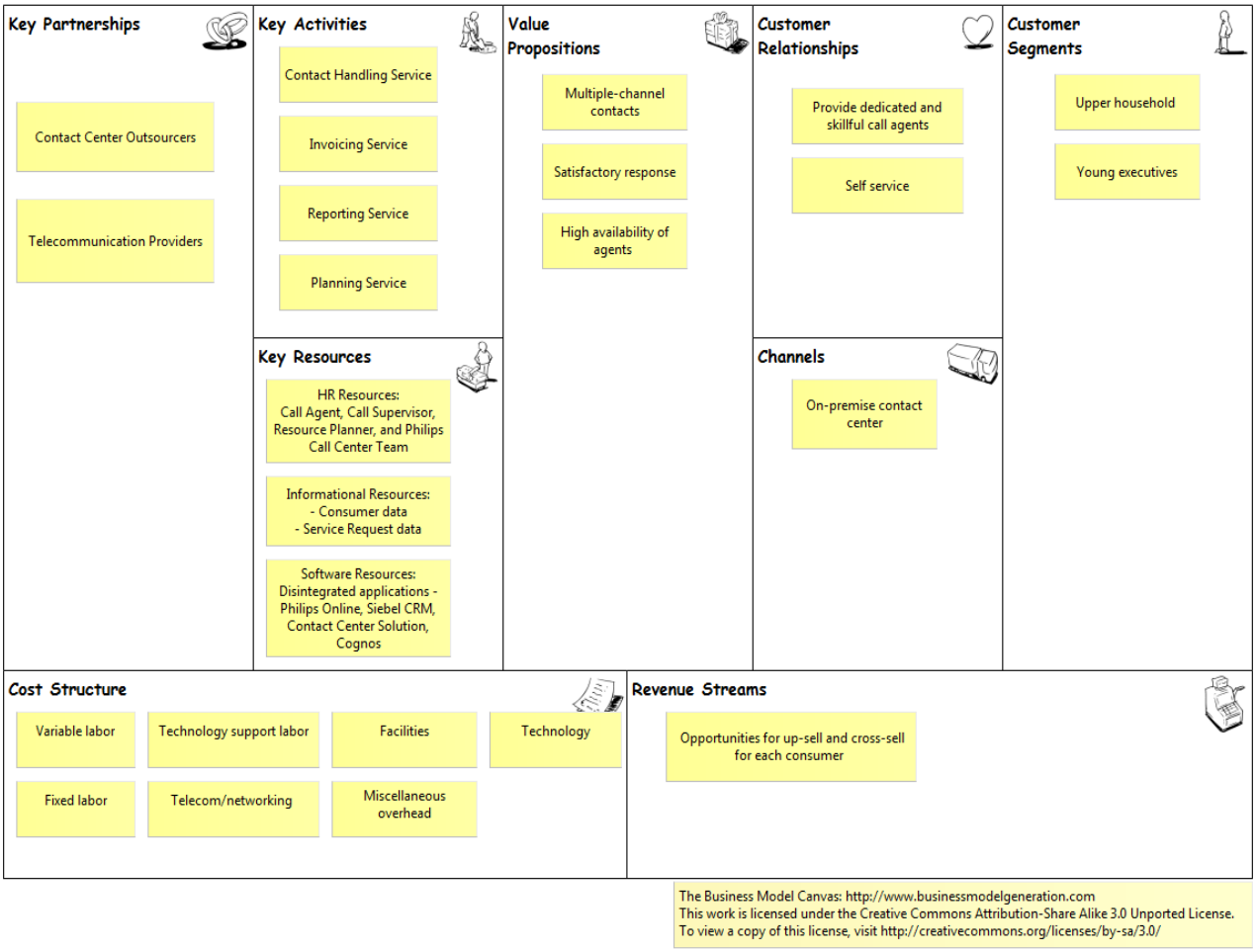

Figure 18 Baseline Business Model

4.2.3 Identify the drivers and expected requirements to migrate to cloud

The cloud contact distribution is increasingly gaining its popularity, while the premise-based contact center is gradually losing its momentum. On-premise contact center, which was basically designed for point-to-point client-server interaction, is no longer sufficient to cope with dynamic business environment. Interaction with consumers by means of traditional, labor-intensive modes for handling phone, email, or chat has become more complex with Omni-channel operations which require more integrated, scalable, and agile solutions.

At this time, the contact centers in Philips Consumer Lifestyle are supported with premise-based systems operated by different outsourcers, covering different geographical regions. This situation has caused some challenges to the existing operations:

1. High operational costs.
2. Complexities in managing the performance of various providers, resulting in the possibility of having inconsistent service quality to the consumers.
3. Increasing demand for 24/7 service delivery to the consumers all over the world.

4. Difficulties in fully utilizing and managing redundant IVRs and ACDs scattered across diverse locations.
5. Lack of visibility to the performance of the agents.

Besides the hurdles, an initiative to implement cloud-based contact distribution also comes from the Consumer Care Vision 2020 that primarily aims to create an excellent consumer journey and bring the absolute care solutions and processes to support consumers´ needs. To realize this, the transformation plan has been established. One of its initiatives is the seamless integration between Salesforce CRM services and the cloud-based contact center, combining phone, email, live chat, social, community support and knowledge management into one solution. This integration is expected to deliver a superior experience for consumers, as indicated by high accessible contact center for 24/7, faster response, higher quality for audio/video, more pro-active care, and also better security.

These drivers and goals are then translated into functional and non-functional requirements and matched with the functionality catalogue provided by the cloud application provider, in this case the Interactive Intelligence, to see whether the requirements are currently available or not in the cloud product. The details of the mapping from the drivers to the requirements are outlined in Appendix A – Motivational Model for Cloud Contact Distribution **(CONFIDENTIAL)**.

4.2.4 Establish vendor selection criteria

The list of criteria in Table 11 denotes several key considerations for the management while selecting the right cloud provider. Understanding the profile and capabilities of potential providers up front will enable the organization to migrate to the cloud solution with more confidence. The following criteria are compiled from various research sources, such as the purchasing strategy by Cousins et al. (2008), white papers by Ovum and inContact (2012) and Genesys (2013), and also from the discussion with Philips management and the actual selection that has been conducted by Philips healthcare division in 2013.

Key items	Details	Description
Cost	Charging mechanism	This includes deal management, pricing and negotiation, and presales support.
	Total Cost Ownership	All costs spent during the lifecycle of the cloud initiation until its deployment and disposal.
Quality	Award/certification	This shows to what extent the provider has attained acknowledgements for its performance as well as its compliance to industry standard.
	Extensive technology features	Solution features & capabilities - these include routing and call management, IVR prompts, CTI, email contact management, web channel features;
	Security and compliance	This entails security measures for desktop, physical data center entry and transactions, and interaction (such as PCI compliance and IVR masking of sensitive information).
	Innovation and responsiveness	This indicates the providers' track record on how fast they adapt with changing technologies and introduce new functionalities.

Key items	Details	Description
	Monitoring tools	Analytics - these include capabilities for adding an analytics overlay on top of monitoring tools. Service creation environments for analytics tools to provide information and centralized management console.
Delivery	Service performance	Availability and robustness of the system – the uptime level and performance of delivered service.
	Integration and tools	Interoperability - integrations with other platforms, IVR compatibility, enterprise and CRM applications, desktop client operating systems, and off-the-shelf agent equipment such as phones and PCs.
	Business continuity	Reliability & scalability - this includes failover, redundancy, disaster recovery, multi tenancy & single tenancy, average deployment sizes, deployments in various size-bands, data centers and backup sites, and parameter driven configurations.
	Implementation and support	This emphasizes the accountability of the cloud provider to provide a complete solution, its experience and technical capabilities, and also to what extent it relies on other third-party outsourcers.
Flexibility	Customization	Adaptability and easiness to have additional features when addressing specific business needs.
Financial viability	Reputation (consumer reference)	Expertise and experience - this includes the vendor's expertise and experience in providing and managing cloud contact center solutions in the market.
	Financial performance	Financial performance - the vendor's wallet share, profitability and long term viability without having to lean on external investments.

Table 11 Vendor selection criteria

From the list above, there are two criteria considered by the management as more important than the others, namely the capability to **delivery** and offer **high-quality systems**. However due to limited time to perform the selection process thoroughly, Philips Consumer Lifestyle management decided to rely upon the decision proposal made by healthcare division in 2013 which has appointed Interactive Intelligent as the selected cloud provider for contact center application. Figure 20 describes the selection matrix performed by Philips Healthcare.

Within this matrix, Philips healthcare management has shortened the list of potential cloud providers into five main candidates and evaluated their performances accordingly with the defined criteria. Three of these candidates – IBM, Avaya, and Nortel – are then discarded even though their scores are in fact quite high. It is because IBM has the highest cost compared to other candidates, while Avaya and Nortel offer premise-based rather than on-demand contact center solution. Therefore, there are only two remaining candidates – British Telecom (BT) and Interactive Intelligence (ININ). From the head-to-head evaluation, ININ has outweighed BT for all defined criteria.

Figure 19 Selection matrix by Philips Healthcare (Katz, 2013) - **CONFIDENTIAL**

In order to gain more confidence on the performance of these two strongest candidates – ININ and BT, we have performed a complementary analysis by checking the publication or news in relation to their capabilities in delivering a high-quality cloud service for contact center:

- ININ has a stronger market position than BT. ININ is recognized by Gartner (2012) as one of the leading contact center solution providers. Meanwhile, BT is more well-known for its exceptional services in networking and telecommunication infrastructure instead of contact center solution.
- BT is relatively new for this cloud contact center market and therefore has less significant recognition for their performance.
- ININ has its own professional technical staffs and strongly invested in its R&D (19% of total sales) to develop its cloud-based contact center solution. BT, in the other hand, engages other contact center providers, such as Enghouse Interactive and Cisco, to jointly develop the cloud contact architecture and infrastructure.

To conclude, each of these two candidates has their own strengths. ININ has stronger capacities and experiences in delivering cloud-based contact service compared to BT. However, if BT can successfully merge its strength and expertise in networking with its cloud partners' capacities, the cloud service will be more powerful and reliable not only in terms of application functionalities but also in the infrastructure robustness.

4.2.5 Define the high level plan

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Figure 20 High level timeline for cloud contact center project **(CONFIDENTIAL)**

4.3 Understanding Existing Capabilities and Cloud Vision

This phase discusses which cloud model can be possibly coupled with the intended vision. The analysis is embodied within a business case, using the approaches by Peppard et al. (2007) and Harvard Business School Press (2010). Since the main drivers for cloud adoption have been discussed in motivation model in Section 4.2.3, the analysis within this business case will emphasize more on the alternative options, the predicted benefits, the estimated Return on Investment (ROI), the predicted timeframe, and also the risks.

4.3.1 Identify the business options

Based on the review over the scientific literature and the vendor white papers, there are three possible options to implement a cloud-based contact distribution, i.e.:

1. **Leverage functionalities from premise-based contact center solution to CRM service cloud**. With the virtue of web service, it is possible to have the integration between the existing systems and CRM service cloud through the API (Application Programming Interface). Therefore, rather than deploying a cloud contact center application, this option seeks the possibility to leverage the existing premise systems directly to CRM service cloud. The changes on the ongoing systems can

be imposed to a minimum level of operational disruptions. However, this option retains the same redundant and disintegrated systems and does not offer opportunities to route calls around the globe to optimize the economics of scale

2. **Hybrid approach to combine cloud contact center solution with premise-based infrastructure**. This option provides more possibilities to attain the merits of cloud services – scalability, agility, and flexibility – while maintaining security, reliability, and control offered by on-premise infrastructure.
3. **Full cloud approach - completely utilize features and infrastructures offered by cloud contact center provider**. For this option, the cloud contact center provider is fully responsible to host the dedicated equipment in its network area for delivering unified communications and also to maintain the software accessed over the cloud.

Since the key goal of this project is to assess the possibility for implementing a cloud-based platform for the integrated CRM and contact center solution, option 1 is automatically omitted. This option focuses merely on how to integrate the premise systems directly to Salesforce CRM without the cloud-based contact solution. This option may cause major complexities in integrating each premise system to Salesforce without giving further added value on cost efficiencies. Therefore, the overall analysis of the remaining sections will mainly focus on the option 2 and 3.

4.3.2 Identify and structure the expected benefits

The following benefits are compiled from various sources, mainly from vendor white papers and survey performed by independent consulting firms. Compared to premise-based systems, the cloud-based systems are apparently more flexible to be scaled down or up without the extensive upfront investment. However, moving to the cloud service can also be complex, time-consuming, and susceptible to the service or network outage. That is why the option to combine the best of cloud services and premise-based system appears and results in a hybrid model.

This benefit exploration for a cloud-based call distribution will cover both the full and the hybrid cloud. Using the benefit approach proposed by Peppard et al. (2007), the general view of these identified benefits is summarized in Table 12, including their measurement and classification.

D1. Lower capital expenditure. Dawson (2013) from Ovum consulting has performed a research that covered a five-year period of total cost ownership (TCO) for cloud-based contact center. This research reviewed different deployment sizes, ranging from small (50 agents), midrange (350 agents) until large-size center (750 agents). It showed that the cost of cloud contact center is one-quarter of the cost of premise-based system (2 million vs 8 million respectively).

D2. Having more resilient systems while disruption occurs. Compared to premise-based contact center, the cloud contact center offers less downtime, approximately 36% of improvement in uptime (Minkara, 2013). The research shows that more crucial monitoring and resilient technologies are far more likely to be implemented in a cloud-based contact center and thus, improve the system uptime.

D3. Increase agent productivity. With the cloud-based platform, the routing capabilities can be enhanced to further extent by matching the incoming contacts with the agent profiles, selecting only

the agent with the appropriate skills to address consumer needs. This capability may result in 8 – 22% improvement in first contact resolution (FCR) rates, contingent to the size of contact center size and the state-of-the-art level of technology adopted by the company (Teletech Company, 2013). For ensuring an excellent service to consumers, only the best-of-the-breed features will be selected for Philips contact center case. Therefore, we can expect 20% overall improvement in FCR rate.

D4. Increase utilization. The cloud contact center offers a greater flexibility in adding the number of user licenses as a response to particular circumstances which cause a substantial change in call volumes, for example during holiday season. A company can thus gear up or down to match with these demands and peaks without unnecessary upfront investment which might not constantly be used for months (Contact Babel, 2012).

D5. Increase consumer retention. Using the same web-based platform, the cloud contact center has more capabilities to be integrated with CRM cloud service and enables 360° unified view of consumer data, offering a greater level of responsiveness and effective service to consumers. Thus, it may deliver a better overall journey to consumers than the premise-based system.

D6. Reduce contact-abandon rate. With the intelligent routing, the cloud contact center also enjoys a greater accuracy in forwarding consumers' inquiries to the right agent with specific skills and language they need which in turn causing the increased consumer satisfaction and lowering consumer abandon rate (Teletech Company, 2013).

D7. Increase productivity of internal IT personnel. Having a cloud contact center will lessen 3-5% the number of full time equivalent (FTE) of internal IT workers. IT personnel can be allocated into more productive works that deliver more strategic values to business (Teletech Company, 2013).

D8. Increase agent retention rate. Through a number of improvements, including the simplification of accessing consumer information through one integrated solution as well as more flexibility for supporting the remote workers, the cloud contact center may help organizations in enhancing the agent retention rate.

D9. Enhance consistency and quality of system services to consumers. The cloud-based contact center will provide the same platform across the dispersed sites. All the sites automatically go through the same upgrade and enhancement cycles. This makes the company always stays on the current state of software (Dawson, 2013). Having the processes and infrastructure in a cloud solution also prevents unnecessary redundancy across multiple sites and increases a better accessibility for configuration, administration and performance checking (Contact Babel, 2012).

D10. Select the best-of-the-breed functionalities. A wider range of functionalities can be explored from a pay-as-you-go approach without high initial set-up costs. The cloud solution providers will also continually enhance and develop their services in order to be excellent within the competitive and dynamic cloud market. Therefore, a company can enjoy the latest technology with improved functionalities, services, and reduced costs. In effect, the functionalities from the existing operations, which are proven as lack of performance, can be omitted.

D11. Prevent redundant IVR and ACD. Instead of having geo-redundant sets of communication tools such as the IVR and ACD, the cloud contact center offers an opportunity to have one platform that centrally manages the calls queue and routing to agents. According to Bocklund and Hinton (2008), the technology cost for a large-size contact center, including the IT and telecommunication technology depreciation and maintenance, is up to 5.9 % of total cost. If the operation of IVR and ACD consumes around 30% of this technology cost, there will be a chance to save 2% (5.9% multiplied with 30%) from the existing total fee or around € 0.015/min charged by contact center outsourcers.

The benefit comparison between the full (FC) and hybrid cloud (HC)

By 2015, the analysts predict that 35% of the clients will choose hybrid cloud and this trend will continuously increase (Fujitsu, 2012). Over the next decade, the hybrid approach will be the most common use of cloud services. This is because the hybrid clouds are perceived as the most appropriate mix between the best of cloud services and premise infrastructure. Though full cloud may offer greater efficiencies by eliminating redundant premise infrastructure and therefore, have a better consistency for system performance, the disadvantages resulted from the service outage, the inconsistencies quality of network performance, and the loss of controls over valuable data are some of the biggest issues that trigger the increasing adoption of hybrid approach.

	Do new things	Do things better	Stop doing things
Financial Financial value can be calculated by applying a cost/price or other valid financial formula to a quantifiable benefit.		D1. Lower total cost ownership (TCO) ○ Pay-as-you-go approach instead of buying the software => 25% of premise-based system.	D11. Prevent redundant IVR and ACD => saving over € 0.015 /min. FC > HC
Quantifiable There is sufficient evidence to forecast (for the future) how much improvement/benefit should result from the changes.	D2. Having a more resilient infrastructure while disruption occurs => 36% of improvement in uptime HC > FC	D6. Reducing consumer abandon rate => 1.7% improvement.	D7. Eliminating the needs to have support from internal IT personnel => 3-5% FTE of IT personnel.
Measurable Although this aspect of performance (KPI) is currently measured, or an appropriate measure could be implemented, it is not possible to estimate how much performance will improve when changes are implemented.		D3. Increasing agent productivity ○ Higher first contact resolution (FCR) rates => 20% improvement. D4. Increasing utilization ○ Higher capacity and scalable to cover the calls worldwide. ○ System uptime and availability rate at 99.99 %.	
Observable By using agreed criteria, specific individuals or groups will use their experience or judgment to decide the extent the benefit will be realized.	D9. Enhancing consistency ○ Same platform all over multiple contact centers. ○ Real time update.	D5. Increasing consumer retention ○ Higher NPS achievement. D8. Increasing agent	

	Do new things	Do things better	Stop doing things
		retention ○ More satisfied agent. D10. Select the best-of-the-breed functionalities	

Table 12 Benefit Classification

4.3.3 Estimate the timescale

Up to this point, the feasibility studies on the plausible solutions and benefits as well as the vendor selection process have been discussed. In this section, we will mainly outline all the necessary actions that management will have to go through during the implementation phase when the cloud products, including the integration with other clouds or local services, are already well arranged and ready to be deployed.

By referring to various sources, including the implementation plan performed by Philips Healthcare while implementing the cloud contact center in 2013, the following list of activities in Table 13 estimates for the number of required days for the execution. This number of days counted in this timescale does not exactly reflect the effective hours but the allocated time range to do the activities.

Activities	Number of days
Preparation • Conduct preliminary review and meetings to assess the customer site readiness for the implementation of cloud services and identify any actions/items that need to be followed up.	2 - 5
Assessment • Review the current practices and systems in the sites to decide whether the premise infrastructure supports the compatibility with cloud services and seek for opportunities to improve the practices. • Start to create the blueprints for specifying the network design and check the availability of the required components, including the assessment of site LAN readiness, site MPLS configuration, and the telecom trunks.	10 – 15
Infrastructure setup • Deliver all the site-equipment on site and physically install all the main and backup power tools, racking, cable, etc., for LAN setup. • Install circuit and implement necessary integrations with existing setup.	30 – 60
Infrastructure testing • Perform testing to check the connectivity of the LAN, MPLS, and telecom trunk. • Perform call-flow testing to cloud data center. • Perform service failure simulation, such as unplug the connectivity, service overload, etc. • Maintain the issues log and ensure that the open issues have been	5

Activities	Number of days
properly followed up through to completion.	
Completion • Deliver training and socialization to local administrators and end-users. • Conduct post-installation survey to assess the service level attainment and processes needing improvements. • Prepare lesson learnt.	5
Total days	**52 – 90 working days (3 – 5 months)**

Table 13 Implementation Timescale

4.3.4 Calculate the required costs

The costs concerning the cloud implementation involve various elements beyond the recognizable hardware and software costs. Figure 22 describes the plausible cost items, categorized in two main types: the upfront (one-time or start-up) costs and the recurring (operational) cost. This figure shows the estimation for hybrid cloud by referring to these sources: the price agreement between ININ and Philips HealthCare for the software license purchase and cloud-related equipment, and other vendor whitepapers.

Meanwhile, the information for the total costs in full cloud contact center is less obvious. Full cloud may be less expensive because it eliminates the existence of on-site hardware and thus reduces the up-front costs. However, for particular services, it may cause higher costs for security controls, network bandwidth, redundant power supplies, and business loss due to the higher risks from a service outage. To assess the trade-off between 100%-outsourced cloud and hybrid, Intel (2013) has developed a financial model that considers not only the purchase costs but also the business velocity requirements and capability maturity. The business velocity means the capacity to handle peaks in demand at runtime, while the capability maturity deals with the 'additional effort' such as the security efforts or health monitoring capabilities. Figure 23 shows the result of this assessment, i.e. that hybrid cloud offers the potential cost savings compared to the full cloud. The orange line indicates the cumulative investment required for the full cloud, while the green-blue bar represents the hybrid cloud. The orange shading is the gap between the cost of full and hybrid cloud.

Figure 21 Cost analysis for hybrid approach – **CONFIDENTIAL** ***(financial sensitive data)***

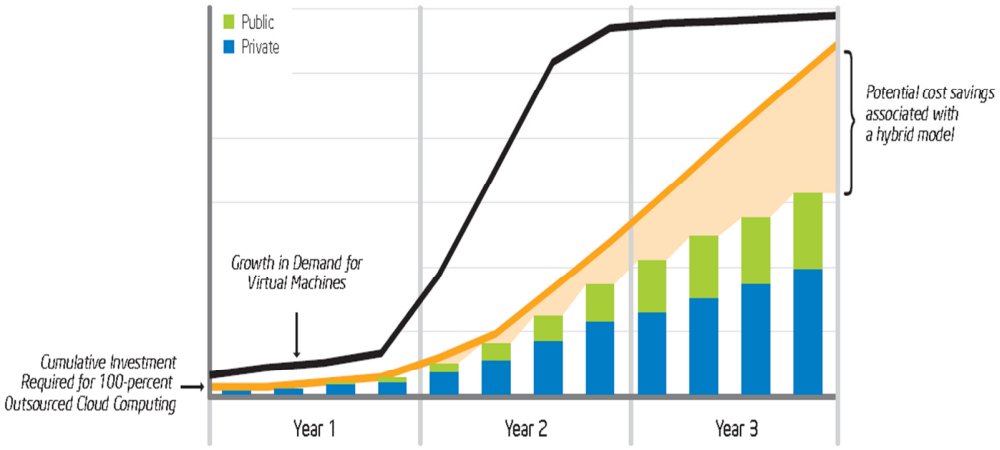

Figure 22 Projected costs for full and hybrid cloud (Intel, 2013)

4.3.5 Appraise the investment

After calculating the associated costs, we now quantify whether the value of the return equals, outweighs, or falls behind the all potential costs. For this purpose, we use Return on Investment (ROI) calculation coupled with Net Present Value (NPV) indicator. From the calculation shown in Figure 22, the total benefits for hybrid cloud during 4-year implementation are slightly higher than its total costs. This yields a **3% ROI**, indicating that the investment can still be considered as beneficial although only slightly.

To determine the discount rate used in NPV, we take into consideration the risk level of this cloud project. Though cloud computing is an emerging technology and entails some uncertainties, the risk can still be managed into an acceptable level through a sufficient coordination and planning. Therefore, we choose a moderate level for this discount rate, i.e. 10 %. Using this rate and the NPV formula, this cloud project displays **a positive discounted cash flow (€ 66,928)** when reaching the fourth year of implementation. The discounted payback period is **3.3 years**.

4.3.6 Analyze the potential risks

Along with the appealing benefits of cloud as described earlier, there are risks that must be concerned. As the IT services are handled outside of the company, there are increasing risks due to higher dependencies on the third-party provider and the security concerns. To identify the risks and also the suitable control strategies, we will follow the steps suggested in Section 3.3.

- Top-down approach: the requirements described in the motivational model – appendix A will be assessed for the potential risks.
- Bottom-up approach: a set of plausible risks is selected from the cloud risk intelligent map by Deloitte (2010).
- Combine the risk lists and analyze the likelihood and magnitude of the identified risks. This analysis can be found in appendix B.
- After having a list of possible risks, the risk responses are then defined in order to reduce the impacts to an acceptable level. The details of these risk responses can be found in appendix B.

In a general level, the risk profile for option 2 (hybrid approach) is different from option 3 (full cloud) in certain aspects.

- Option 2 will have greater dependencies on the premise-based infrastructure, causing more complexities in the integration and network arrangement between the contact center sites and the cloud data centers. This also requires a more detailed SLA between contact center providers and the cloud-service provider. The responsibilities of these involving parties should be clearly specified and segregated to prevent disputes or ambiguities.
- Meanwhile option 3 will have more severe business disruptions when the cloud service is outage, higher risks in inconsistent call qualities while connecting to off-shore cloud operation, and also greater threats of losing control of voice recording data since all the infrastructure are handled in cloud.

Given the advantages and disadvantages of the cloud deployment approaches, the hybrid cloud is considered as a more viable option compared to full cloud, especially in the geographic-dispersed setting where the legal considerations and the network quality are critical. With the hybrid approach, the critical data like the recordings of consumers' call can reside and be processed locally with a better quality voice. While the connectivity to the cloud data center is disrupted, the call streams can still be routed and processed locally.

Despite those reasons, the other consideration why we choose the hybrid approach is to balance the reliance on the cloud service providers and the contact center outsourcers. A hybrid cloud offers a mix of utilization of the cloud services and premise equipment and thus reduces the dependency on one party. The organization can enjoy the flexibility to change its underperformed partners. Furthermore, removing all the premise routing systems to the cloud services may cause significant changes to the ongoing practices and agreement with the current outsourcers, especially in the price negotiation. Therefore, a hybrid approach provides many benefits with a better resiliency and thus fits better with the requirements expected in the motivational model.

4.4 Targeted Architecture

After recognizing the benefits and justifying the costs and risks for hybrid cloud contact center, this section will continue with the specification of the targeted architecture, revealing the changes required in the baseline infrastructure and the new business values captured in the updated business model.

4.4.1 Produce a concrete targeted architecture

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4.4.2 Identify the new values offered in the corresponding business model

From the point of view of the consumers, the cloud contact center offers more capabilities compared to the premise-based application. It allows more personalized responses and a better experience to the consumers. With its seamless integration with CRM, consumer´s record can be automatically populated to give the agents adequate details about the consumers and deliver satisfactory responses to them. Moreover, with its virtual environment that can be accessed from anywhere,

cloud contact center can create a larger pool of agents to choose from around the globe and route calls using skill-based and presence-based prioritization routing. Therefore, the consumers will have "the right" agent to deal with their queries.

The other distinguishing benefit of this cloud contact center is that an agent can manage customer interactions and his/her presence management from one interface. This is expected to reduce number of minutes per contact and resulting in labor cost efficiency.

From the point of view of technology landscape, one integrated platform will allow more efficiency in managing the service maintenance, getting rid of legacy applications, and also reducing redundant technologies. The new values offered by targeted business model are highlighted in blue color, as illustrated in Figure 24.

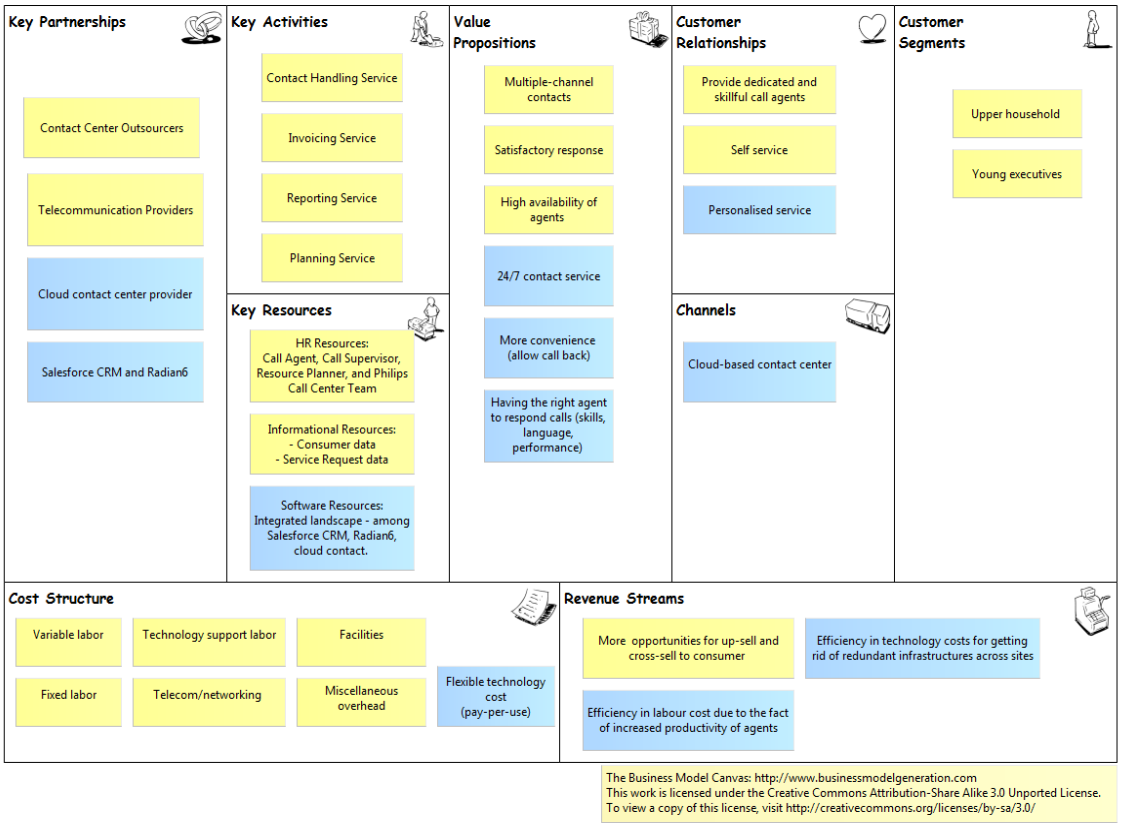

Figure 23 Targeted Business Model

Figure 24 To-be architecture – **CONFIDENTIAL**

4.5 Gap analysis and Transition Planning

This chapter discusses the preparations that an organization should perform in a cloud solution implementation. The gap analysis is necessary to assess the shortfalls between what has currently gone well and how to improve it for a better outcome. This gap analysis also gives essential information of what may have been overlooked or forgotten and supports the development of a change management plan.

4.5.1 Perform a gap analysis

The first section of this gap analysis covers the shortfall identification from the perspective of a project, i.e. the people, the process, and the project management itself. For this purpose, information from different sources is used, such as the lessons learnt from similar project conducted by other line of business, the publications from cloud research community, and also observation on the in-progress project in Philips Consumer Lifestyle. The second section of this gap analysis focuses on the technical differences between the baseline and targeted architecture, as illustrated with Archimate implementation and transition model.

4.5.1.1 Identify shortfalls from project perspective

According to Garrison, Kim, and Wakefield (2012), some common obstacles while an organization tries to adopt the cloud services are as follows: lack of coordination among the relevant stakeholders, inadequate business and technical insight, data security, and insufficient understanding between the organizations and cloud vendor about the scope, span, and the implementation of the services. A survey performed by International Data Corporation (IDC) in 2008 also indicates security as one of the major challenges of cloud adoption (Dillon, Wu, & Chang, 2010). These typical findings are also found while analyzing the cloud implementation process in Philips Healthcare and Philips Consumer Lifestyle:

- **Lessons learnt from similar project**. Philips Healthcare has implemented this cloud contact center since 2013. Despite the number of its contact center sites is far lesser than Philips Consumer Lifestyle and mainly centralized in US, the experiences with cloud contact application can still be useful as a lesson learnt. Table 14 shows the summary of what had run well, been executed badly or needed improvement by Philips Healthcare.
- **Observation on the in-progress project management.** Within the IT department, sufficient policies and procedures to drive the project management have been in place. Lists of best practices, including the methodology, guidance, and templates have been properly defined and made available in internal knowledge repository. This project is also supported with adequate technical expertise from either the internal or external IT personnel.

  However due to the fact that a large-size team has been formed, comprise of business analyst, network experts, business users, and also high-level managerial team, the coordination to ensure a clear work distribution and equal information dissemination is inherently a rather challenging task. This different-background team results in different expectations and level of knowledge of the cloud functionalities and capabilities, and causes misunderstandings while creating the project scope and the business case. Meanwhile, the

awareness on risks and compliance within Philips Consumer Lifestyle is already sufficient, as indicated by the involvement of those with risks/audit conscience to perform the business impact analysis. This analysis has assessed the confidentiality, integrity and availability concerns in regard to the cloud computing.

Categories	The lesson learnt
Went well	o Good teamwork among different teams: business and IT team, local and global project management team. o Good preparation for go-live decision: intense testing, sufficient script for cutover and issue resolution. o Good team spirit: strong dedication and willingness to cooperate.
Went badly or lacking	o Lack of precise implementation of MPLS. o Overlapped documentation for the development and SIT/UAT phase. o Lack of business insight at the beginning of the project. o Imprecise change management. o Lack of role and responsibilities definition. o Lack of foresight for actual implementation.

Table 14 Lesson learnt from similar project

Table 15 displays the shortfalls identified from three different sources: the lesson learnt from similar project, research publication, and observation, including the formulated recommendations. The identification of these shortfalls is a useful source to analyze the likelihood of a potential vulnerability while performing a risk assessment.

Shortfalls from Business Domains	Similar Project	Research Publication	Observation	Recommendations
Lack of coordination among relevant stakeholders	√	√	√	• Routine catch-up session to update new information from both sides, ensuring that each party receives sufficient information. • A clearer definition of each party's roles and responsibilities.
Inadequate business and technical insight	√	√	√	There should be mutual information sharing between IT and business users, having both sides understand the project scope and plan better.
Data security	-	√	-	Besides the business-side users, the identification of key risks has involved those with risks/audit conscience.
Lack of understanding between the organizations and cloud vendor about the scope, span, and implementation of the services	√	√	√	• The internal knowledge sharing and brainstorming, aiming to having the same level of understanding between IT and business users, should be carried out prior to the discussion with the vendors. • The communication with vendor should uphold a transparent view into what services they can actually deliver, the inner working of their cloud

Shortfalls from Business Domains	Similar Project	Research Publication	Observation	Recommendations
				infrastructure, and how extensive the customers need to change their processes.

Table 15 Shortfalls identified from project perspective

4.5.1.2 Identify gaps on application and technology domain

Implementation and migration model. As mentioned earlier, Philips Consumer Lifestyle plans to realize the Xcellent Care program by 2014-2015. It aims to have one unified cloud-based platform for the CRM application and consumer contact which are currently still disintegrated. To fulfill this program, two main projects are required: 1) centralizing the contact center through cloud computing and 2) integrating it with Salesforce cloud CRM.

Work packages for each of these projects, e.g. the software, hardware, cloud service, and also the integration toolkit, are identified. From Figure 26, the blue-colored work packages are the components implemented in contact center sites for which an adequate coordination with the outsourcers is required to ensure a proper installation and monitoring on the daily operation. As the signal and voice streams transferred within the networking, the cloud solution also requires a high level of network quality and bandwidth, and therefore, a precise implementation plan is important.

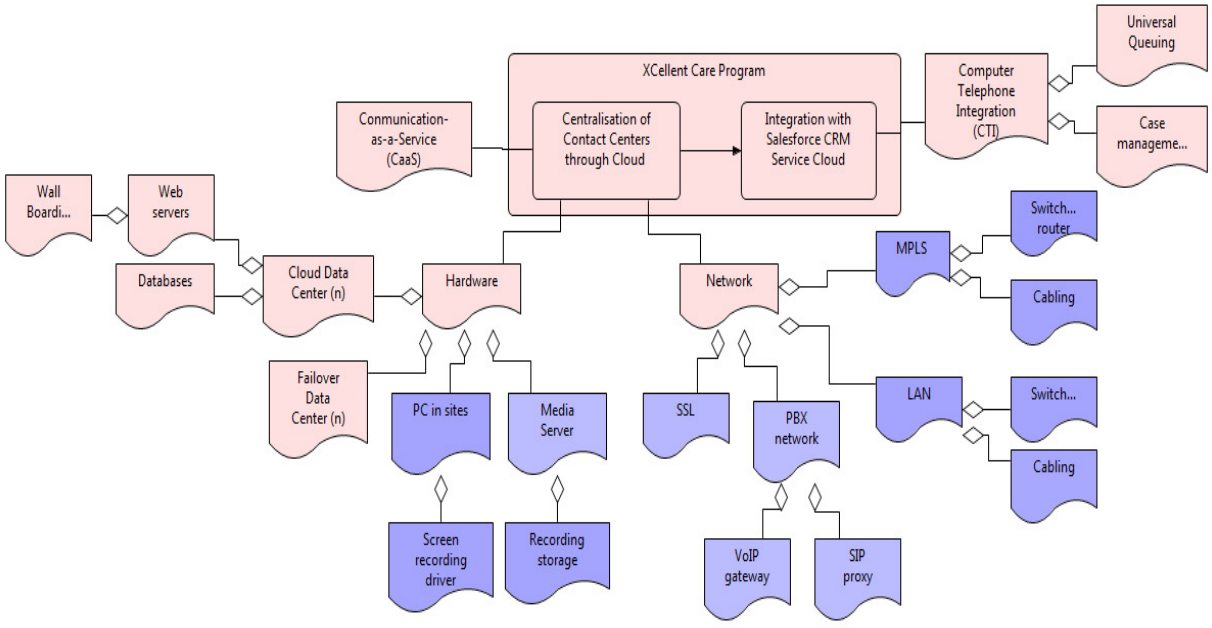

Figure 25 Work packages of Cloud Contact Center Project

Changing from a wide-distributed contact center solution to an integrated cloud-based application will cause substantial changes and thus needs to be managed cautiously for both the technical and behavior aspects: the readiness of application integration, the user behavior, and the agreements with the outsourcers. These substantial changes require not only a considerable amount of financial

investments but also the man-hour. To prevent a drastic change which inherently entails higher risks of failure, a plan that reflects the gradual transitioning from the baseline into the targeted architecture is needed. This plan is briefly illustrated in Figure 27. The components are distinguished in several colors which represent different meaning:

- The grey nodes are the components that will be terminated in the new architecture.
- The blue nodes indicate the components located in contact center sites.
- The green nodes are the components that will still be in use in the new architecture.
- The orange nodes show the new components required to realize the targeted architecture.

The first-year implementation of Xcellent care program will mainly focus on having SF CRM cloud running in Iberia region. The cloud contact center solution, at current state, is not yet ready to have a fully-integrated routing and thus needs more time to develop and test the integration. While the unified routing is developed and tested for its reliability, the Salesforce cloud CRM will be integrated within the cloud contact center.

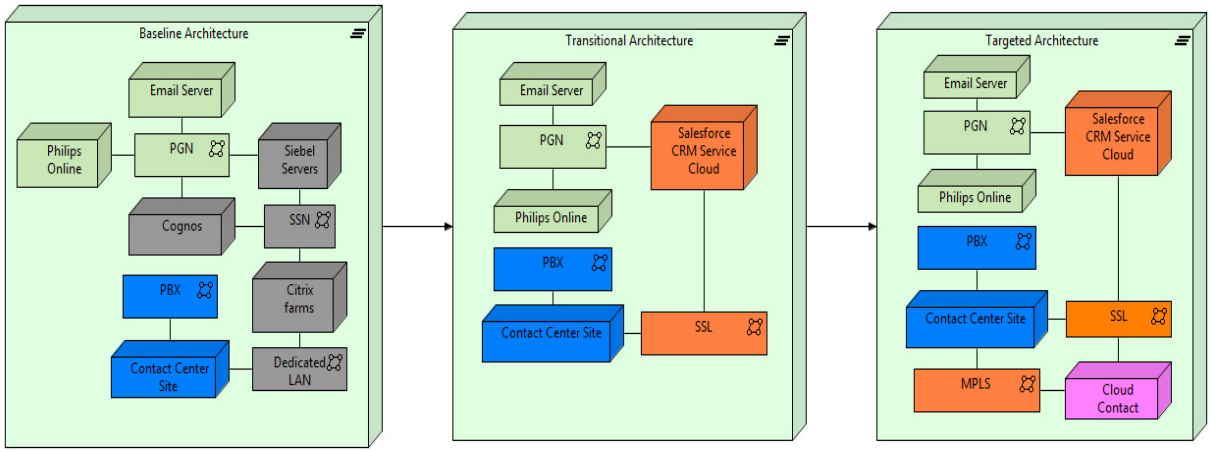

Figure 26 Transitional Model of Cloud Contact Center

4.5.2 Establish a change management plan

Rather than focusing merely on the technical configuration, the change management in this section emphasizes more on the strategy to prepare the people, allowing them to go through the changes smoothly. Following the suggested change management framework in Section 3.2, the first step of this plan is to identify the key stakeholders and their attitudes toward the cloud solution. The identification is steered by relevant questions to identify the inter-dependency structure of the involving parties and the factors that influence the users to adopt or resist the cloud computing. The information is gathered through the discussion with Philips Global Call Center Team, analysis on the actual reports of call traffics, and whitepapers from technology research firms or cloud vendors. The outline of this knowledge formulation is presented below and can be found in Figure 28.

The second step of this plan is to formulate a change management strategy by considering the power and influence of both the focal firm (the initiator) and the participating partners. Nevertheless, the

effectiveness of this strategy (whether it will help the change process or not) cannot be assessed further. According to the management, these change processes, especially the communication with the contact center outsourcers, will be commenced when the inter-cloud integration is ready to be launched.

4.5.2.1 Knowledge formulation phase

Who are the transaction partners that will use the new system?

The primary users who operate the cloud contact center system are the call agents and supervisors in outsourcer sites. Currently, there are six prominent outsourcers within Philips CL. Each of them holds exclusive right and responsibilities to run the contact center service in the assigned areas.

Power of the focal firm: How dependent are these parties on the focal firm?

Apparently, Philips CL has a powerful bargaining power as a buyer. The outsourcers can secure their financial performance by serving large-volume of calls from Philips' consumers and highly utilizing their agents and contact center infrastructure. The image of Philips, as a prominent player in international market and its strong commitment to deliver excellent service to consumers, can help the outsourcers to enhance their portfolio of client.

The importance of the transaction partner: How critical are these parties?

Among these transaction partners, there is a high tension of competitiveness, especially between SITEL and Teleperformance. Both of them are the key leaders in the contact center solution market, as reported within the survey performed by Gartner (2013). Currently, SITEL serves the biggest portion or almost 50% of total interactions in Philips CL, while Teleperformance only interacts around 9.78 %. SITEL has also been a long-term partner for Philips CL for almost 16 years. During this period, SITEL has constantly proven itself as an excellent partner and achieved the expected service level, resulting in a positive review from consumers about services in contact centers.

Although SITEL has a stronger position compared to Philips´ other partners, the market of contact center outsourcing service is still very dynamic and competitive. The non-exclusive contracts and equivalent services among these outsourcers are some of the reasons why Philips CL can easily change its partners. Furthermore, the implementation of a cloud contact center will reduce the dependency on the front-end systems provided by the outsourcers. It emphasizes the importance of a robust and scalable network infrastructure. Therefore the outsourcer who has more capabilities in providing scalable network coverage, such as voice gateways installed in dispersed areas, will be more preferable. In this case, Teleperformance outperforms the other outsourcers, including SITEL. With more than 270 contact centers in 46 countries, Teleperformance has a better global coverage.

External Pressure: How dependent is one partner on the other?

When the organizational technologies are hardly understood or when the market has high uncertainty, an organization tends to mimic the actions of similar organizations which are perceived to be more legitimate or successful (DiMaggio & Powell, 1983). Within the contact center outsourcing market, the companies are exposed to the risks of uncertainty in global economy, the

fast obsolescence of technologies, and the price competition with other competitors. Especially with a cloud solution, the uncertainty becomes greater, for example the concerns about the exposure of unlawful data disclosure will be higher or the degradation on the network capacity and performance, etc. The actions performed by the market leader in coping with these uncertainties will have a strong influence to the others.

Perceived benefit: What benefits can they get?
As identified within the business case in Section 4.3.2, the benefits of implementing a cloud contact center are various. The integration between cloud contact center and CRM Salesforce offers one interface for multi-media interaction with the consumers, resulting in a better productivity for the agents, a higher utilization rate, a greater level of responsiveness and effective service to consumers, and a lower contact-abandon rate.

Organizational Compatibility: How much effort do they need to invest?
For the outsourcers which operate in an extensive distributive network and globally diverse, such as SITEL and Teleperformance, these cloud-based services are already a part of their innovative solutions to customers. These outsourcers have offered communication-as-a-service (CaaS), an on-demand contact center solution. Therefore, they can be considered to have more technological readiness and experience in managing the cloud set-up compared to other outsourcers.

Nevertheless, the implementation of cloud contact center will still bring essential changes on the existing processes and infrastructure, and thus require sufficient planning and coordination to:

- Configure the existing gateways in sites to be able to manage and route incoming calls to the intended cloud data center.
- Configure the network infrastructure for the MPLS and LAN installation.
- Manage the integration between cloud-based application and premise systems.
- Manage the ongoing maintenance and administration for the premise infrastructure and the connectivity to cloud data centers.
- Manage changes from locally independent administration to a centralized operation.

Facilitating condition: What supports do these parties need?
To facilitate a smooth implementation of cloud contact center, the initiator – Philips CL should provide trainings and technical supports for their partners. A good coordination between the cloud provider, the outsourcers, and Philips IT should be in place to ensure that a clear plan of network installation is cautiously managed and executed, including the well-defined roles and responsibilities. A feature of local language within the cloud application is also required to allow the agents in comprehending the functionalities more quickly.

Anxiety: What are their concerns?
For the outsourcers, the initiative from Philips CL to centralize its contact center service through the cloud-based applications brings a threat to decrease the demand on their front-end technology services, probably causing the reduction on their fee. By having its contact center application

managed in cloud rather than dispersed in sites, Philips CL can also be more flexible in switching over its consumer contact service from one outsourcer to the others. This will cause the outsourcers to face more pricing pressures and tight competition in the market.

The additional cloud equipment in existing infrastructure may increase the costs in the maintenance, monitoring, and administration for both the network and application, and also the costs of electricity. Besides these financial concerns, the cloud-based contact center may expose the premise-based systems to the external party. The cloud provider will have access and visibility to these outsourcers' local infrastructure and thus may increase the concerns about the security and confidentiality issue.

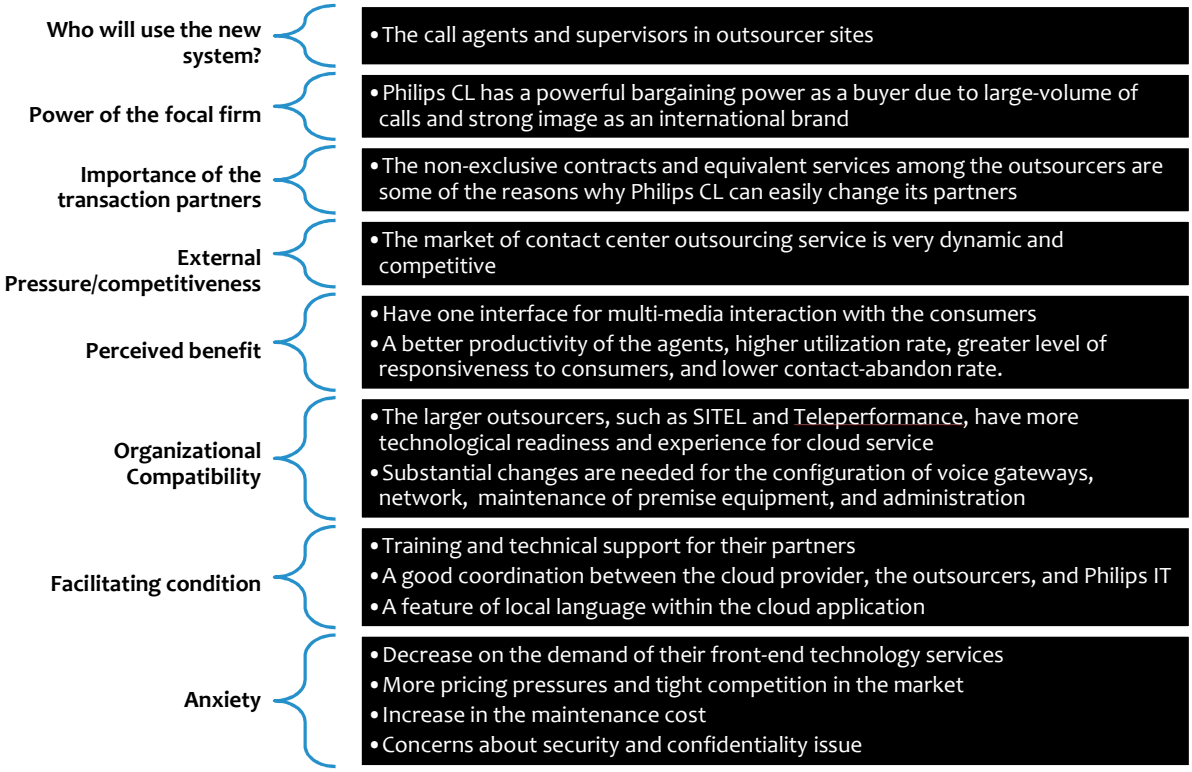

Figure 27 Knowledge formulation for Philips Cloud Contact Center

1.5.2.2. Strategy implementation

From the knowledge formulation phase, we can see that the intensity of competitiveness among these outsourcers is high. There are concerns that cloud contact center may reduce the dependency of Philips CL to their services, resulting in a price reduction, reduced gross margin, or loss of market share. Consequently, this cloud-based contact distribution subjects to the lack of enthusiasm and cooperation from these outsourcers. When the cooperation cannot be sustained over time or the participating parties do not perceive that it is fair and beneficial, the fruits of cooperation can be hardly realized (Kumar & Van Dissel, 1996). Therefore, the relationship between the cooperating parties, i.e. Philips CL, the outsourcers, the cloud provider, and Philips internal IT, should be managed properly as a part of the change management process.

As the initiator and leader in this cloud implementation, Philips CL should create a strategic vision of the organizational changes. Following the proposed theoretical framework by Kettinger & Grover (1995), the strategic vision is depicted in Figure 29 and consists of four main initiatives – the willingness to share knowledge, the IT leveragability, a balance network relationship, and a capacity to learn.

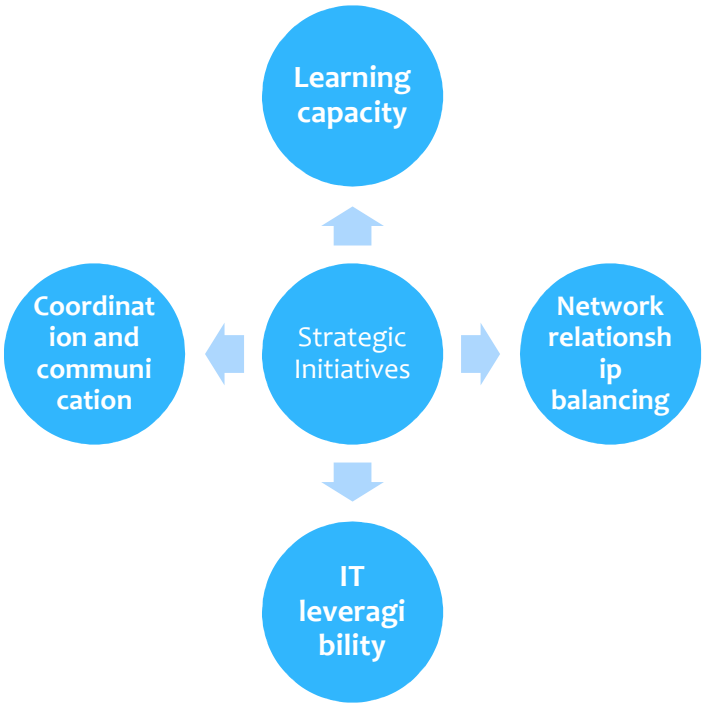

Figure 28 Strategic Vision for Organizational Change

Learning capacity. This learning capacity needs to be nurtured at the individual cognitive level and the organizational learning (Kettinger & Grover, 1995). At the individual level, training for end users is an important driver for implementing the cloud successfully. The realization of cloud capabilities might be impeded if the call agents and supervisors at sites are not trained properly to know how to optimize the use of cloud solution. Therefore, it is essential for Philips CL to provide the following activity or deliverable:

- Giving hand-on training. This training should be seen as a good opportunity to help the users adjust to the new systems and processes. The training should be arranged to provide sufficient hand-on experience and to show the actual functionalities and potential benefits of the system.
- A user manual is provided as guidance or specialized instructions for the users to know what functionalities are available and how to use them.

At the organizational level, the learning will accommodate the information equivocality, detect errors during the implementation and operation phase, and take actions to remediate them. A

communication mechanism needs to be established as a part of problem-escalation procedure, defining which group should be informed and has the authority to take actions. The problem logs should be maintained continuously and will be a valuable source while creating lessons learnt after the project has been rolled out.

Network relationship balancing. Managing relationships with multiple parties is a difficult task, especially when there is a range of issues involved within the relationship (Cousins et al., 2008). Below are several recommendations to develop a successful relationship management:

- **Re-arrange the sourcing structure for contact center.** As indicated within the business case, the realization of this cloud-based contact center requires an extensive amount of resources (time, people, and budget). In practice, these resources are limited and need to be carefully managed. Therefore, by reducing the number of contact center outsourcers, Philips CL can focus more in allocating its resources. Instead of having multiple outsourcers, it might be more productive for Philips CL to have only two leading outsourcers to operationalize the contact center service. This may allow Philips CL to work more closely with them, reduce complexities in system integration and network setup, protect the capacity, and at the same time maintain the price competition.
- **Manage the dependencies and certainties.** Besides the cooperation with the outsourcers, Philips CL should also manage the relationship with the technology providers, which are the cloud provider and the telecommunication service and network companies. The relationship strategy should be carefully applied to each of these parties, depending on the level of dependencies and certainties (Cousins et al., 2008). Dependency is defined as a degree to which the buyer relies on the supplier, while the certainty is related with the level of trust exists between the buyer and seller. The combination of the level of dependency and certainty yields a variety of relationship management strategies which can be seen in Figure 30.

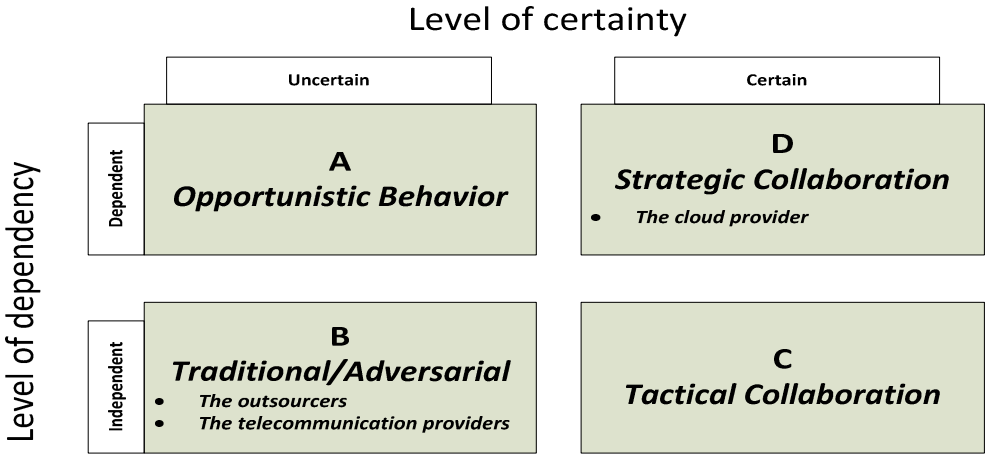

Figure 29 Relationship Strategic Model adapted from Cousins et al. (2008)

a) With the implementation of cloud, Philips CL will have a lower level of dependency (independent) with the outsourcers, especially in term of technological capabilities, and a lower level of risks (generally due to the dual sourcing and low switching cost). For this, a contractual relationship is sufficient. The specifications and standards should be mentioned clearly within the contract, and monitoring is performed in a frequent basis.
b) The same contractual strategy is also appropriate for the telecommunication companies which are responsible to ensure the availability and resilience of telephony and MPLS network. These telecommunication services can be considered as commodity-type purchases for which the focus of the SLA is about the network speed, availability, and price.
c) Meanwhile, for the cloud providers, namely the Interactive Intelligence and Salesforce CRM, the relationship should be seen as a part of strategic development. There is a high level of dependency to collaboratively develop the integrated landscape for consumer service, and high levels of risks due to a large amount of investment and the complexities of system integrations. Within this relationship, the collaboration, especially during the initial years of system implementation, is intended as a way of problem solving and needs to be done intensively.

- **Commitment from the focal firm.** Philips CL, as the coordinator of this cloud implementation, should continuously show its commitment and supports for facilitating the process changes and system transformation. This commitment can be shown by providing specific technical groups which are available for assistance with the system difficulties.

IT leveragability. IT is seen as an organizational resource that provides the necessary means to induce organizational change (Kettinger & Grover, 1995). The competencies of IT personnel as well as the IT process and tools are necessary to enable the process change.

- **Changes to the roles and responsibilities of internal Philips IT.** With the existence of cloud services, IT department needs to transform itself to be more service-driven, focusing on how to manage and deliver the services within an operating-shared environment (Lees, 2012). Rather than troubleshooting technical problems with the applications, IT role has been shifted to dealing with gathering business requirements from end-users (The Wall Street Journal, 2013).
- **Knowledge-sharing tools.** It is critical to facilitate knowledge integration especially between the globally-dispersed teams. Having its contact center sites located across the globe, Philips CL may face a challenge to pool and deploy their knowledge resources with their partners – especially the cloud providers and contact center outsourcers. Therefore, an effective teamwork in this global-scale project requires an emergent process and tools of rich exchanges that integrate information and jointly solve the problems in an organized manner.

Communication and coordination. As a central hub, Philips CL needs to specify the roles and responsibilities within its cross-department/company project team. For this purpose, a responsibility matrix, known as RACI (Responsible, Accountable, Consulted, and Informed) displayed in Figure 31, can be used as a means to distribute and segregate the roles. The formulation of this RACI table is

based on the implementation plan by Philips Healthcare and also publication performed by CISCO researchers - Clark, Reddy, & Walton (2011). Besides this coordination, a careful timing while introducing the new system is also a critical strategy. The preparation for testing and communication to users should be arranged properly before the final deployment occurs.

RACI Matrix

		Project Leadership	Project Team Members									External Resources	
Role / Project Deliverable (or Activity)	Component Location	Service Executive	Service owner	Business user management	System lifecycle Management	Service offering management	System/technology architect	Service Roadmap management	Business users	ININ	Salesforce	Outsourcers	Telco
Implementation planning phase activities													
- Identify and plan the cloud setup efforts - the network configuration and equipment arrangement		C/I	C/A		R	R	C	R	I/C			I/C	R
- Design and document the integration requirements and tests		C/I	C/A		R	R	C		I/C	R	R	I/C	
- Arrange the work statements and define SLAs for a contract with these providers:													
Cloud provider (ININ & Salesforce)		C/A	C			R							
Contact center outsourcers									R/A				
Telecommunication providers		C/A	C			R							
Implementation governance phase activities													
The execution and compliance assessment													
- The implementation of components used for cloud setup:			C/A		R	R	I	R					
CIC server	ININ data center									R		I/C	
Media server	Contact center sites									R		I/C	
SIP proxy server	Contact center sites									R		I/C	
Web server	ININ data center									R		I/C	
Terminal server	ININ data center									R		I/C	
Data center server	ININ data center									R		I/C	
VOIP gateway	Contact center sites									R		I/C	
Recording storage	Contact center sites									R		I/C	
PSTN network	Contact center sites									R		I/C	
MPLS network	Contact center sites											I/C	R
LAN setup	Contact center sites											I/C	R
Premise equipment - desktop, workforce, etc	Contact center sites									R		I/C	
- Build, test, and release the user stories					R	R	I	R	I&C	R		I/C	R
- Provide trainings and user manual to end users	Contact center sites							R	R	R		I/C	
The ongoing operation and update risks													
- Manage incident and problems					C	R	R			R		I/C	R
- Support ongoing cloud operation					C	R	R						
- Analyze and report the infrastructure performance and capacity			I	C	C	R			C				
- Manage relationships with these providers & monitor their service performance:													
Cloud provider (ININ & Salesforce)		I	C	C	R	A/R	C		I				
Contact center outsourcers									A/R				
Telecommunication providers		I	C	C	R	A/R	C		I				
Close Phase Activities													
- Create Lessons Learned		I&A	I	R	R	R	C	R	C				
- Create Project Closure Report													
Optimise Phase Activities													
- Identify requirements for service improvements			C	R	A/R	R	R	R	R	R	R		
- Approve service improvements		I	A/R	I	R	I	C		I				
- Execute service improvements			I		R		C			R	R		
- Update the architecture and service roadmap			C		R	C	R	A/R					

Figure 30 RACI matrix for Philips Cloud Contact Center

4.6 Implementation Planning

This can be considered as the final planning phase. Certain arrangements need to be made with the vendors and agreed upfront. It is important to have the providers working in the same fast-track as Philips CL, applying the same approaches to the cloud delivery including the documentation for the project progress. The following sub-chapters describe the key plans relevant to this implementation phase.

4.6.1 Identify and plan the setup efforts

Within the hybrid approach, there are two main backend communications required for this cloud contact center setup. The first one is the MPLS communication from sites to the cloud data center, and the second one is the LAN communication within the site itself to process the voice traffic and keep them in local. While for the frontend communication, there are one or more router voice gateways to connect sites to PSTN (Public Switch Telephony Network). The simplification of this connectivity setup is displayed in Figure 32.

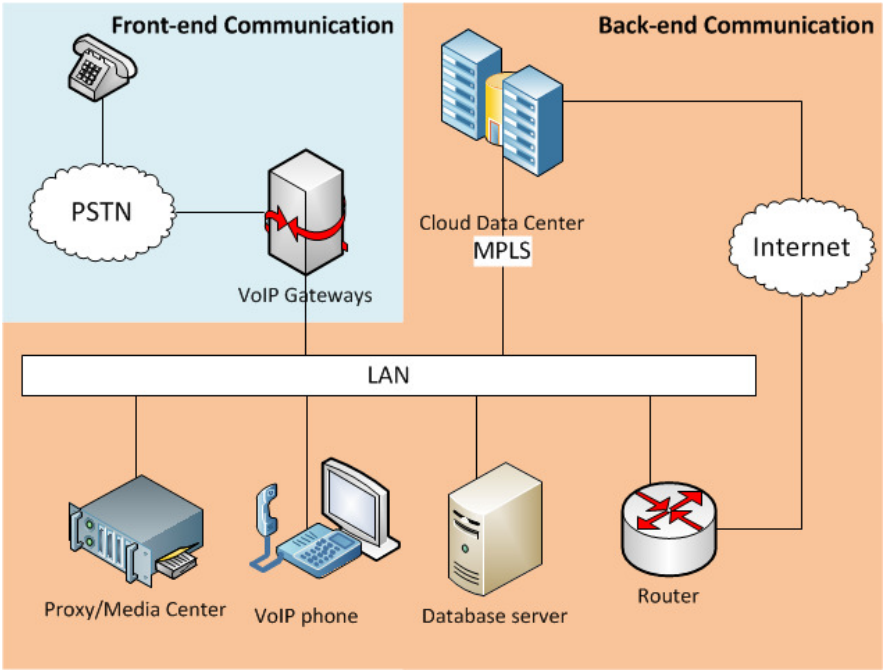

Figure 31 Hybrid Cloud Topology adapted from Interactive Intelligence Group Inc (2012)

This setup requires three main processes: the preparation, the realization and build, and the go-live preparation. Using the white papers provided by the cloud and communication providers and also the actual implementation plan prepared by Philips HealthCare, some key aspects for the implementation planning are derived and elaborated, including the required deliverables.

Step 1: The preparation for network setup. This consists of several blueprints for the implementation and the detailed design documentation.

- **Front-end communication.** The voice gateways will turn the incoming calls from PSTN into TCP/IP packets, namely SIP (Session Initiation Protocol) and RTP (Real-time Protocol), which can be routed over the organization's LAN or WAN (Interactive Intelligence Group Inc., 2012). These gateways connects the traditional phone lines (ISDN, T-1, E-1, analog) to the contact center network.

  Based on the discussion with ININ engineer, it is preferable to have these gateways located in the same location where the voice traffic is processed. Therefore, Philips CL may use the existing gateways in contact center sites which are currently owned and managed by the outsourcers. However, it is necessary to ensure that these gateways, which may also be used by the outsourcers to process voice traffics of their other customers, can be configured to route towards different environments, i.e. the existing PBX and the new cloud data center. The specifications of the compatible gateways for cloud setting need to be checked and coordinated with the contact center outsourcers.

  Deliverable: list of gateways in sites, including their location and detail specifications.

- **Back-end communication.** One of the TCP/IP packets resulted from the voice gateway is SIP signaling stream. It has a low-bandwidth stream and is used to control the responses to the incoming call. These SIP steams are travelled through the MPLS networks that connect the sites and the cloud data centers. This MPLS infrastructure will be managed by third party carrier network. The bandwidth and security protection over this MPLS connection should be carefully managed and monitored. For the continuity purpose, it is also necessary to have this MPLS infrastructure redundant by means of dual routers and circuits between sites and cloud data center.

  The quality of service of cloud contact center is dependent heavily on the MPLS network performance. Therefore, the network capacity should meet the minimum requirement level of bandwidth, latency, and security. Particularly for the security matter, firewalls rules should be applied and allow only authorized ports, especially those from the cloud provider, to access the MPLS network. The cloud provider needs this access to monitor the premise equipment 24/7. Several connection ports mentioned in figure 33 are the examples of the connectivity required by the cloud provider.

  Besides this MPLS infrastructure, the installation of the networking equipment in contact center sites should also be carefully planned, including the design of LAN topology, cabling infrastructure, the inventory of network components, clustered storage servers, backup devices, etc. This planning requires sufficient coordination and communication among the respective parties. For the listing of network components, a site survey is necessary to inform which components are available and compatible to be used. To coordinate this survey, Philips CL team needs cooperation with the outsourcers and guidance from the cloud provider and telecommunication provider. Based on this site survey, the LAN and MPLS topology will then be designed as a basis to arrange the details of cabling patches and call flow.

Network Traffic Direction	
Ingress	IP traffic towards the CaaS data centers
Egress	IP traffic towards the Customer location
Bi-directional	IP traffic that originates from either location

Example: Media Servers and Remote Content Servers			
Monitoring Tool	**Protocol**	**Port (Range)**	**Direction**
Network Monitoring Tool	TCP / UPD	48000 – 48100	Ingress
Syslog	UPD	514	Ingress
Remote Desktop Protocol	TCP	3389	Egress
SSH	TCP	22	Egress
HTTPS	TCP	443	Egress
iLo	TCP	17990	Egress
NTP	UDP	123	Ingress
Hardware Monitoring	TCP	2381	Egress
Hardware Monitoring	TCP	2301	Egress
FTPS	TCP	21	Ingress
SNMP – Polling	UDP	161	Bi-directional
SNMP – Trap	UDP	162	Ingress
WMI	TCP	5989	Egress
SMB	TCP	445	Egress
MRC	TCP	442 & 446	Bi-directional

Figure 32 Monitoring Ports implementing in MPLS between sites and cloud data center (Interactive Intelligence Group Inc., 2012)

Deliverable for this backend communication planning:

- *List of network components available in sites, such as MPLS routers, LAN switch, including their IP address.*
- *Physical LAN and MPLS topology design.*
- *List of network and hardware components from the cloud provider located in the sites.*
- *Cable layout diagram, such as the network switches, the server concentration areas, to identify the required cabling components.*
- *Patch-cables plan to connect ports between two local patch panels and the panel with end devices.*
- *Call-flow plan.*
- *Pre-installation checklist.*

***Step 2:* The realization and build**

To realize the planning, there might be some additional network equipment that are not yet available and need to be ordered. Later, the initiation plan is translated into a deployment plan that prescribes several key activities prior the actual realization, i.e. temporary firewall deployment activities, LAN readiness checking in sites, MPLS readiness checking, and the readiness of cloud provider's equipment.

Deliverable: Order list for network equipment, the deployment plan.

Step 3: The go-live preparation

After the planning and deployment activities have been conducted, the capabilities of these networks need to be tested rigorously.

Deliverable: network testing, connectivity test to cloud data center, UAT, SIT, failover testing.

4.6.2 Develop integration requirements

The inter-cloud integration has been one of the greatest challenges beyond the security and trust issues for the long-term cloud adoption. With the presence of numerous cloud vendors nowadays, the needs to have the application and data interoperability are increasing. This integration is important not only for securing the end user investment but also for creating the cloud ecosystem (Petcu, 2011). To achieve this data portability and interfacing, regardless of the cloud providers, standardization is required to provide a platform-independent data and functionality representation.

However, each cloud provider tends to have its own way of working and system interaction with the users. This situation causes vendor lock-in, limiting the cloud choices for end users and thus increasing the issues of interoperability and data portability (Parameswaran & Chaddha, 2009). There are several aspects that prevent these vendors to fully apply the standardization:

- To put exit barriers for the consumers.
- To offer differentiated services compared to other vendors, and want to offer this special service to appeal more consumers.
- To reduce competition tension by preventing an easy and standardized export/import data configuration.
- Among the numerous standards being developed, the consensus is difficult to achieve, etc.

These reluctances can be reduced if the big customers put some pressures on the cloud service providers to fulfill the following integration requirements:

- **Programming:** use the open platform and standards to allow movement from one cloud provider to another without severe implication. The common set of interfaces can be fulfilled by using these open platform:
  1) Open APIs, for example jClouds for Java, libcloud for Python, etc.
  2) Open platform, for example OCCI – Open Cloud Computing Interface with HTTP protocol, etc.
  3) Standards, for example standards for data management or cloud deployment.
- **Application:** besides the portability, the transactions handled between clouds should maintain these criteria: ACID requirement, completeness, responsiveness, scalable, fault tolerance.
- **Monitoring:** SLA and performance monitoring in order to support the governance requirements, monitoring, and delivering the agreed services.
- **Deployment:** the cloud resources are provisioned within one single management tool under the agreement between the cloud providers.
- **Authentication, authorization, and security:** the single sign-on access for users to access multiple clouds; the availability of authorization and authentication mechanism.

4.6.3 Define the cloud vendor's SLA

The SLA should provide the necessary transparency between the cloud service providers and the customers, specifying the expected quality and delivery performance of the services. To build a comprehensive SLA, we follow the suggested steps by Cloud Standards Customer Council (2012).

Step 1: Understand the roles and responsibilities. Based on the analysis performed in Section 4.2.2 about identifying roles and activities for a business model, the actors that are engaged in the operation and delivery of cloud services in Philips Consumer Lifestyle are:

- The cloud provider – the person or organization that provides or makes the cloud services available to the customers, in this case the Interactive Intelligence Inc.
- The cloud customer – the person or organization that uses the cloud services for daily operation, in this case the contact center outsourcers.
- The cloud owner – the person or organization who manages the use, performance, and negotiation with the cloud service provider, in this case the Philips CL team.
- The cloud carrier – the organization that provides the connectivity and transport of cloud services from the providers to the customers, in this case the telecommunication company.

The understanding of the activities performed by these actors will help the cloud owner in specifying the requirements and the desired service level performance. The subsequent steps for this SLA establishment will primarily focus on the SLA between the cloud owner and cloud provider.

Step 2: Evaluate the business level policies. As noticed in Section 4.1.3 about the governance and legal frameworks in Philips CL, the key policies that should be aware while implementing a new system are as follows:

- FDA (medical devices) – whether the application is subject to medical device regulations.
- PCI/DDS (credit card processing) – whether the application processes any relevant data regarding the card holder for the use of payment cards,
- IT Security – whether the application has significant impact to the confidentiality, integrity, and availability of the information it supports.
- Data privacy – whether the application stores any critical or sensitive data of the customers.

Based on the discussion with the IT analyst and Philips Global Call Center team, the data stored in cloud contact center is forced to be minimum or none at all. The consumer details will still be handled in internal factory data rather than in cloud data center. This data will be interfaced and retrieved through SF CRM cloud. Due to budget efficiency, voice recordings will also not be applied in contact center service. Thus, the concerns about data storage can be lowered. The most applicable regulation in this case is therefore the PCI/DDS. It regulates compliance to the technical and operational requirements set by the PCI Security Standards Council to protect the cardholder data.

Besides the data policies as discussed above, the other essential legal policies that should be covered within the SLA are the penalty matrix as the impact of non-performance by the providers, the acceptable use policy, the list of services not covered by the providers, the scale up/down procedure,

payment method, software license and renewals, level of support, planned maintenance, and certain standards.

Step 3: Understand the service and deployment model differences. Several general service level objectives for cloud contact center are related to the application availability, downtime, scalability, response time, and data storage. Meanwhile for the deployment model, as justified in Section 4.3.6 - the cloud vision and capabilities, the hybrid approach is considered as a more suitable option for the geographic-dispersed setting in Philips CL. In this model, the integration requirements described in Section 4.6.2 should be taken into account to ensure that the SLAs adequately cover the interoperability and standardization issues.

Step 4: Identify critical performance objectives. Several expected service performance objectives can be derived from the requirement list identified in Section 4.2.3 – the motivational model. Within that list, the main concerns about the system performance are related to the availability and scalability of cloud services. Though it is not meant to be exhaustive, here we define in Table 16 the potential metrics for the critical performance requirements.

Criteria	Metrics	Collection Method
Availability o Availability of 24/7 support of 1st and 2nd level from vendor. o Emergency routing capabilities. o 100 % up time of the system. o Being able to operate when a system (front or Salesforce) is down.	Without planned outages, the up time for cloud services should be at least 99.99 % for 24 hours per day, 365 days per year.	Machine – real time update for the uptime.
Scalability o Easy and short term upscale possibilities during peak-time situation.	The capacity to handle maximum number of concurrent users without severe system latency or bottleneck.	Testing through DOS attack.

Table 16 SLAs for the Critical Performance Objectives

Step 5: Evaluate security and privacy requirements. This step is required to ensure that sufficient cloud controls are available and applied properly, based on the sensitivity and criticality of the data. The provider should ensure that the customer is isolated from other cloud tenants through virtualization and segmented infrastructure to prevent misuse or unintended intrusions. The other critical security controls are the protection of critical data through encryption and the trustable network connectivity to the cloud data center.

As mentioned earlier, the administration and storage over the sensitive consumer data, such as the profile and activity history, are managed centrally within the CRM Salesforce. Therefore, the data retention control is less applicable for the agreement with the cloud service provider. The security controls that are applicable for this cloud will focus more on the access distribution, such as preventing unauthorized use of functionalities within the software, compliance to PCI/DSS, and zero viruses or threats.

Criteria	Metrics	Collection Method
Security o The compliance to PCI/DSS and other security requirements. o The sufficiency of authentication mechanism. o Automatic alert for any unauthorized access to Philips' network or cloud. o The sufficiency of preventive and detective controls to prevent viruses or Trojan.	o PCI/DSS certificate o UAT o No occurrence of security breaches that may cause denial of services, theft or destruction of data.	o Regular report for any unauthorized use or threats. o Accessibility to review the infrastructure of cloud service provider.

Table 17 SLAs for security requirements

Step 6: Identify the service management requirements. In order to ensure a transparent, straightforward, and extensible system, the monitoring and automation mechanism in cloud services should be in place. The customer should demand for traceability over the system failures, issues, actual use, and response time. This traceability is required to get an accurate figure of system use and billing. Beside this cost-related feature, the SLAs should also cover the maintainability requirements to ensure ongoing supports from the cloud provider and the inter-cloud interoperability.

Criteria	Metrics	Collection Method
Traceability	o The clarity and availability of supporting data for the total use per month, total outage, total fee. o Ensure accurate billing.	Machine – routine report and usage log from the provider.
Maintainability o Get the updated version without additional charges. o Be able to manage and administer any changes.	The service includes the routine patches, maintenance upgrades, and bug fixes.	Regular report.
Interoperability	o The use of standard platforms. o Ensure atomic, complete, isolated, and durable queuing and interfacing process.	UAT and system testing.

Table 18 SLAs for service management

Step 7: Prepare for service failure management. To prevent interruptions in the service delivery, the remedy actions should be defined upfront, such as:

- The list of responses in accordance to the failure priority level and the response time is formulated.
- The notification process of failure and its impact should be promptly informed to customers in transparent manner.
- The customers should be entitled with service credits to deduct the monthly fee based on the failure to meet the uptime plan.

Step 8: Understand the disaster recovery plan. The necessity to have a robust disaster recovery plan should be justified from the application criticality and business objectives. The following steps are the core of an effective disaster recovery plan:

1. **Assessing the business exposure to disaster.**
   A business impact analysis needs to be conducted in order to assess how much data lost or the duration of transaction interruption can be endured by the company. In this cloud contact center case, the application criticality can be considered as moderate. It is important to make the contact center highly available to the consumers because it shapes the opinion about the company's image and consumer experience. However, it might not directly result in business loss if the contact center is temporarily not reachable. The consumers can still try to redial their calls.
2. **Reviewing options for having cost-effective recovery.**
   The hybrid deployment approach has been designed to provide a sufficient survivability. If for any reason the cloud primary and backup infrastructure is unavailable or the connectivity is down, the incoming calls can still be handled locally. The media servers located in sites will automatically act as an emergency generator and begin providing basic communication services, such as direct dialing, in-queue audio, recording, etc. While the operation returns to normal situation, the media server will resume the operation. To support this survivability, the company can review which components within the infrastructure are critical and prone to system outage:
   - Probability: the likelihood of a loss event, such as: which contact center site has significant traffic calls and thus may cause the network or servers highly occupied, which contact center location has insufficient network backbone, etc.
   - Investment: to improve the survivability, redundant equipment might be required, such as multiple media servers in site, redundant MPLS network, backup cloud data center, etc.

   The tolerance for loss should also be defined into these two main scales and should be matched to the priority within SLAs with the respective providers.
   - Recovery Point Objective (RPO) = the tolerable time to re-establish a working network connectivity.
   - RTO = the point at which data can be recovered.
3. **Setting the expectation for performance.** The recovery should be done in a fast and easy manner and therefore needs to meet the following expectations:
   - **Automation:** reduce manual intervention and promote the use of events-driven application control management.
   - **Comprehensive fit:** the installed redundant components within the infrastructure should be capable of communication among disparate pieces.
   - **Availability and reliability:** the temporary call log and stream should be able to be retrieved and recovered quickly.
4. **Testing the plan.** After assessing the needs, priorities, and investments required for the disaster recovery plan, a comprehensive testing should be conducted in a regular manner in order to find the shortfalls in the plan.

4.7 Implementation governance

In this phase, the efforts focus on overseeing the overall project in order to ensure compliance to the targeted architecture. According to Iacob et al. (2012), there is no specified graphical model for this phase. The outputs of this phase are mostly documentations resulted from the following activities.

Step 1: Confirm scope and priorities for the cloud deployment. The migration planning outputs are re-assessed and confirmed for their sufficiency and priority. In chapter 31, TOGAF 9 mentions that risk monitoring is continuously conducted especially during the implementation governance. The risk identification and mitigation assessment checklist are updated and maintained in order to ensure that critical risks have been sufficiently mitigated before the system goes live.

Step 2: Confirm the deployment resources and skills. Within cloud context, the development and customization are performed by the provider. However when it comes to the deployment and integration, the provider team needs to be supported by customer's architecture team.

Step 3: Perform EA compliance review. The ongoing deployment processes are reviewed continuously to ensure compliance to each defined building block in the targeted EA. Any problems or incompliance identified during the review are analyzed promptly to find the appropriate remediation actions.

Step 4: Implement Business and IT operation. The deployment projects are carried out, including the training and skill development as well as the communication and publication. The knowledge repositories regarding the EA are updated with the new EA.

Step 5: Perform post-implementation review (PIR). Depending on the complexities and urgency of the project, the PIR should be conducted periodically during and after the deployment process. It ensures the achievement of short-term and long-term outcomes of the project (The government of Hongkong Special Administrative Region, 2009). The results of PIR are expected to answer the following questions:

- Whether the project was successful or not and what are the evidences or reasons?
- To what extent the project has achieved the expected outcomes and delivered the agreed outputs?
- What improvements are needed to current or future projects?

4.8 Architecture change management

The typical processes within this phase as suggested within TOGAF 9 are the continual monitoring of business changes and the assessment on the new requests. This analysis assesses whether a new architecture evolution cycle is needed and whether the implemented architecture copes with the technology and business environment. Similar to the implementation governance phase, the deliverables from this phase are also mostly the analysis documentation.

Step 1: Establish value realization process. In Section 4.3.2 – the benefits in business case, the measurement for each intended benefit has been identified. The actual survey and observation to

collect the supporting evidence should be performed after the cloud goes live. The value analysis will be performed to compare the actual values and benefits with the predicted ones in the business case.

Step 2: Deploy monitoring tools. The changes in technology and business are continuously monitored as well as the performance of the deployed cloud services. The performance monitoring in cloud computing is different from the traditional infrastructure because the large extent components are based on virtualized resources which are under the controls of third party (Infosys, 2012). The cloud provider is therefore expected to provide a robust set of resource utilization statistics that can provide a holistic view of entire environment. The following reports would help the customers in tracking and assessing the quality of services from the cloud provider:

- Multidimensional reports: different levels of reports depending on the user location, such as usage reports of specific contact center location.
- Application level report, such as the performance of the resources in cloud.
- Busy/peak usage reports: to provide a better view of the resource utilization and SLAs.
- Trend and what-if analysis: to forecast the usage capacity and pattern.

Step 3: Manage risks. The list of risks is routinely assessed and maintained in order to provide recommendations and improvements for the IT strategy.

Step 4: Provide analysis for architecture change management. The performance of cloud services is monitored and reviewed against the SLAs and intended benefits. The cloud exit strategy must also be prepared and considered when the provider is unable to meet the performance requirements or when technical/security breaches occur. When the functionalities require new improvements or customization, the change requests should be consulted to the cloud provider. The mechanism to request change, exit or transfer to other solutions should be documented clearly within the contracts. These change processes should be ensured to not severely affecting the ongoing services.

Step 5: Develop change requirements to meet performance targets. The architect teams along with the cloud provider make clear recommendations on change requirements in order to meet the intended targets.

Step 6: Manage the governance process. The decision to perform changes in the baseline architecture should be escalated to the architecture board member or other governing council in order to achieve the same level of understanding and decisions on handling the changes.

Step 7: Activate the process to implement the change. While the decision to continue the changes has been achieved and approved by the board members, the new change requests or proposal should be created for budgeting and planning purpose. Any changes are updated and documented within the architecture knowledge repository.

5 – The Evaluation of the Framework

In this chapter, we evaluate the utility of the suggested framework and whether it is effective or not to address problems concerning the implementation of cloud computing. Evaluation is a critical phase of the research process, and therefore the well-executed evaluation methods should be arranged to demonstrate the efficacy, utility, and quality of the design artifact (Hevner et al., 2004). There are several evaluation methods mentioned by Hevner et al. (2004) and the selection of these should be matched with the design artifact. In this thesis, we will apply the observational evaluation method in which a study is performed to examine the use of artifact in a certain business environment.

The first observation is performed as a means of self-reflection by the author, describing the experience while creating and using the framework. To obtain the countermeasures for the subjectivity from the author, the second observation is conducted by having an interview in a semi-structured manner with the representatives of a business user and an IT project team about the utility of this framework.

A presentation about the approaches and steps suggested within the framework is given to these personnel. After the presentation, the evaluation session is conducted. The following table represents the key criteria that are used to assess the utility and sufficiency of this framework. These criteria are expressed to the representatives and their responses are summarized in Section 5.2.

Criteria	Description	Questions
Problem relevance	The framework helps to acquire important business insights and the understanding of critical architecture information required for the implementation of cloud computing.	1. Does the framework facilitate sufficient information-gathering for the requirements and specifications for the planning, communication, and execution of a cloud computing strategy? 2. Does the framework show the relationship and coherence between the business and technology elements? 3. What are the missing parts that are relevant and critical for the practice but are not mentioned in the framework?
Practicality	The framework contains the attributes of the suitability, the ease and the simplicity and enables both the IT experts and novices to understand the concepts about cloud computing.	1. Does each phase within the framework employ practice-relevant and comprehensible approaches to guide the creation of the deliverables and the architecture? 2. To which level of complexity will you categorize the suggested approaches within this framework? Are they overly simplistic or complex? 3. Do the framework and its application display the transparency and consistency of planning creation processes?
Implementability	The framework is relevant to address the implementation of different types of cloud	1. Does the framework contain usable approaches that can be applied in a variety of cloud computing

Criteria	Description	Questions
	computing models. It is easily implementable by the organization and promotes a greater intent to the actual use.	projects? 2. Does the framework stimulate your confidence to practice the suggested approaches?

Table 19 Criteria for evaluating the framework

5.1 Framework creation and usage experience

During the processes to formulate and apply the framework for a cloud adoption strategy, there are several challenges which are mostly due to the motivation to distinguish the framework with the existing ones and make it adequately practical. Below are several questions that emerge as part of our self-reflection about this framework.

- *What are the key challenges we have while trying to create and apply the framework to the case study?*
  As mentioned in the problem statements in Section 1.1, there is a lack of consensus for a cloud adoption strategy. Various practices and approaches have been proposed and discussed by the practitioners and academics. This situation has led to confusion in choosing which of those approaches is the most suitable for the case we are facing now.

  To answer this question, we firstly learned the nature of the cloud case we had, i.e. what type of cloud application the Philips management team aspired to utilize, the cloud market and vendors, and the key information the management team needed to know in the very early phase of cloud strategy. Knowing the cloud context, we then selected three literature sources and used them as the main guidance to do this research: cloud adoption strategy by Isom & Holley (2012), business modeling method by Meertens (2013), and relating business model and EA by Iacob et al. (2012). The approaches within these sources helped us in creating several deliverables that were practically in use by the management, i.e. the business case and the vendor pre-screening and selection. During the time, we then learned that there were more critical aspects surrounding cloud computing and more literature reviews were needed.

  The efforts to select and explore the relevant theoretical concepts for this full lifecycle of cloud computing should not be underestimated. We tried to expose the impacts of cloud implementation not only from the architectural changes but also from the dynamics in the sourcing and the relationship structure. Cloud computing causes higher dependencies and levels of risks on the external parties. It also brings a new paradigm for collaborative or inter-organizational systems. Autonomous or closely dependent companies, disregarding their dispersed locations, can collaborate with each other using the same cloud platform. Therefore, to cover this extensive spectrum of cloud, a review over literature from various studies has been conducted.

The other challenges are related to the nature of a lifecycle itself. The information from one phase to another phase within the framework should be coherent and correlated to each other. While there are updates in one phase, we need to assess its impacts toward the other phases. We can expect that when this framework is operationalized not by one or two personnel but by a team, the coordination will become more complex.

- *What makes this cloud adoption framework different from TOGAF 9 and other cloud strategies?*
  TOGAF 9 is highly general and broad with some repetitive inputs and outputs from one phase to another phase. In this framework, we highlight only the critical deliverables that are required for cloud implementation. Therefore, the effort and time used to perform the planning and execution can be more efficient. Compared to other cloud strategies, this research presents an approach, including its metamodel, from which a company can use to analyze the changes in its operational processes and architecture while moving to a cloud solution. It also emphasizes the importance of motivational or requirement lists as inputs for the other critical steps in the cloud adoption, especially in the formulation of new architecture, risk identification and even the SLA creation.

- *Does the business-model driven approach proposed by Iacob et al.* (2012) *work effectively to bridge the business fitness with the formulation of a targeted architecture?*
  The business-model driven approach has provided a systematic and comprehensible way to align the needs to have changes in the enterprise architecture with the strategic business objectives. The mapping of BMC and ArchiMate introduced in this approach has provided several positive features:
  - The simplicity: the notation of ArchiMate has been extended in such a way that it can be 'plug-and-play' to be matched with the boxes in BMC.
  - The traceability: the approach makes the changes in architecture measurable and driven by the requirements and goals in the business model.

  However, while using this approach, we identified that it justifies the necessity to have an architecture change merely on the financial returns or increase in profit. On one hand, it promotes the most appropriate architecture changes from the business point of view. But on the other hand, we argue that it may discourage innovative uses of IT which are not profitable but deemed significantly essential and of course feasible. Therefore, in this thesis, we are not only emphasizing the cost/revenue calculation, but also the strategic values of the cloud solution using the business case approach by Peppard, Ward, and Daniel (2007).

  We also suggest that the mapping between the BMC and EA context should be conducted in a reciprocal way. When it is performed only from the BMC to EA, there is an impression that the concepts of the Archimate metamodel are analyzed just to fit in the boxes of BMC, and not to complement and make the BMC more concrete. We contend that the components within BMC are not enough to justify the migration process. The other components, such as the key risks, the partnership mechanism and the capacity of organization's partners, are critical to support the

success of architecture change. The following will briefly describe the main drawbacks of BMC that are not captured in the business-model driven approach.

1. BMC focuses mainly on the implementation of the business strategy within the internal boundary of one organization. Although it recognizes the importance of key partners or networks, the critical notion of how to manage these partnerships is rather neglected. This weakness is also recognized by Kraaijenbrink (2013) who mentions that the level of abstraction among the components within BMC is different. Some components receive more emphasis compared to others. The components, such as customer relationships and channels, are derived in a quite detailed manner as the elaboration of marketing components. Meanwhile, there is no further exploration on the partner relationships, for example the contractual strategy, the monitoring and the partnership development. From the proposed framework in this thesis, these partnership relationships are covered in these phases: 1) the migration planning by structuring the partnership arrangement, and 2) the implementation governance by continuously monitoring partner performances and development.

2. The BMC also does not comprehensively cover the importance to have KPI and performance measurements (Ching & Fauvel, 2013). In the context of cloud computing, the success to run the virtual resources and services relies heavily on the capabilities of the external parties, mainly the cloud providers and network companies. Therefore, the mechanism to establish and arrange the formulation of SLAs with the partners should be in place, as indicated in the 'implementation planning' phase from the suggested framework.

3. Creating value is important, but not sufficient, for fully realizing the benefits to business practice. The business model should also provide a careful oversight to manage the risks and finally to select the most promising models while rejecting the ones that appear to be risky and non-profitable. Figure 34 portrays the suggested components (colored in blue) to further abstract the importance of partner relationships, monitoring and risk assessment, including the supporting phases in the EA context.

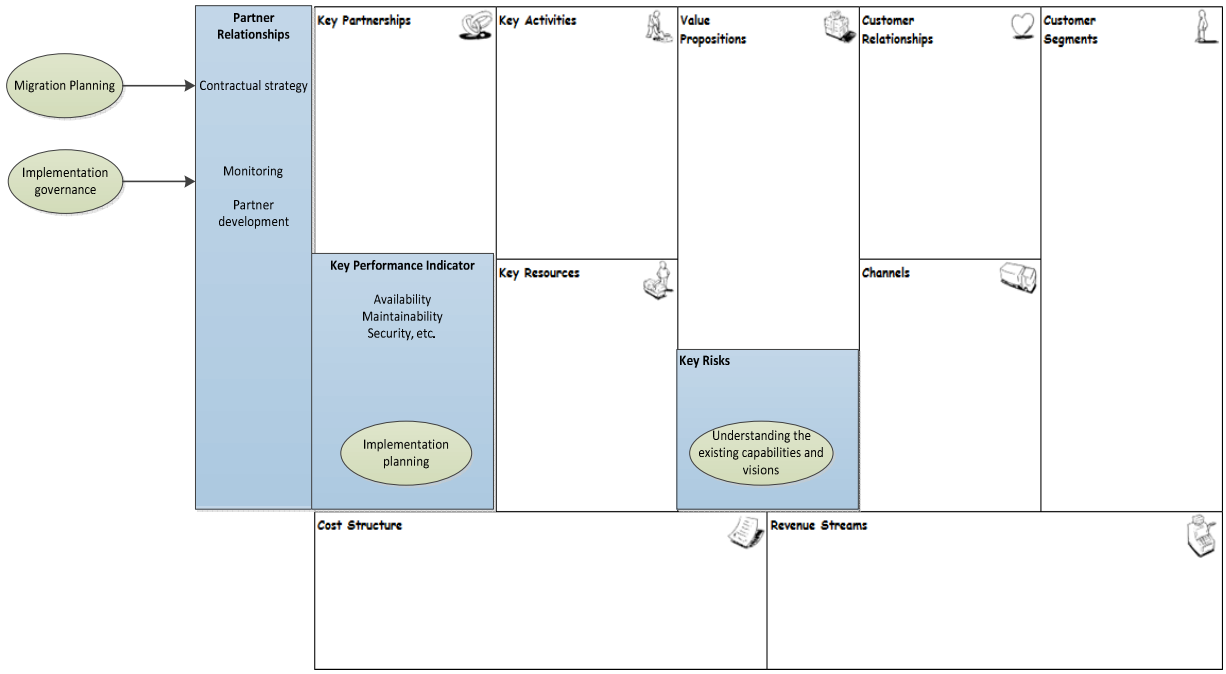

Figure 33 The suggestions to use components from EA context to complement the BMC

Lastly, this business-model approach can be advanced to further levels to comprehensively cover all phases in TOGAF 9 rather than just phases B, C, and D. It does not focus merely on the comparison of a business model but also the wider aspects of the implementation and governance, consisting of a four-step abstraction transformation: BM changes, EA changes, value realization and governance. We suggest that the analysis on the target business model is not only to decide whether to proceed or not the implementation process but also to review the value realization when the new system has actually been deployed. While the actual business values are still behind the expectation, a new request for architecture updates can be suggested and the change management process will take place. This new abstraction can be seen in Figure 35.

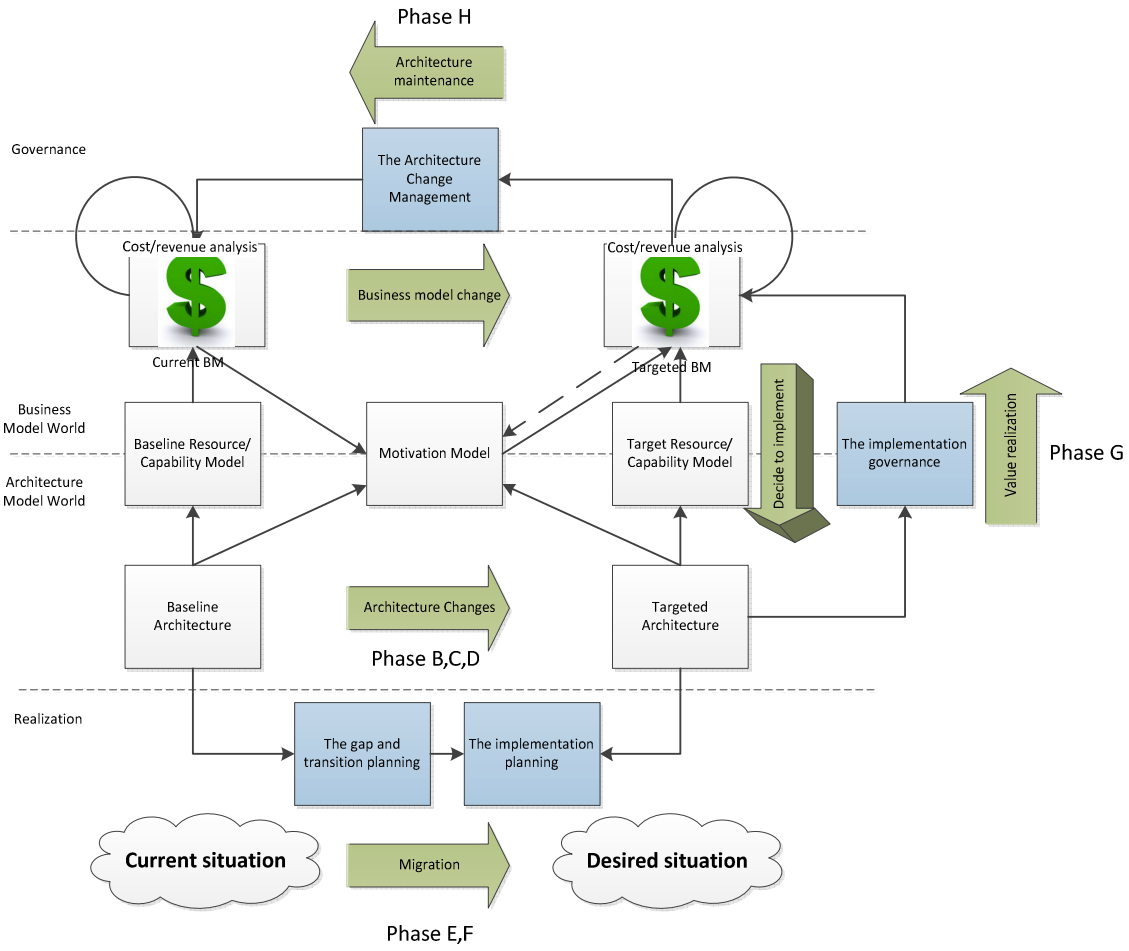

Figure 34 The suggestions for the business model driven approach

5.2 The evaluation from practitioners

To obtain feedback on the utility of this framework, we have interviewed several practitioners from Philips Consumer Lifestyle which are a mix of business users and the IT project team. Their real experiences while dealing with cloud projects will give valuable inputs to improve this framework. Using the criteria and questions described in the earlier section of this chapter, we have gathered feedback as summarized in the following section.

Interviewee 1

Role	IT project leader. He has been working in IT Philips since 1979 and is regarded as an expert who has been involved with and witnessed the growth of IT internal systems in Philips since its very early stage until now.
Date	10 June 2014

Problem relevance

The framework has sufficiently covered the required information for both the business and IT strategy. However, in the context of cloud computing, the portion for business decision should be emphasized further since it is far more important than the technical details. The organization should really pay attention on the benefits, costs and risks calculation. Moving to cloud is likewise outsourcing your physical infrastructure. Though it is appealing, the license fee will be an immense expense if it is not cautiously managed because it grows along with the number of users. It is also less flexible in terms of customizing the application. Usually, the cloud application will be taken as 'granted' or out-of-the-box and thus it is the organization that needs to be compatible with the cloud. Moreover, the compliance surrounding the cloud, especially the data storage restriction, should not be neglected. In practice, these considerations are far more difficult to manage as opposed to the technical installation.

Practicality

The activities described in the framework are practical and reflect the required processes surrounding the cloud computing. Nevertheless, in practice, the execution of these activities is not always as planned. There are usually unexpected factors that appear and should be taken into consideration, for example the dependencies on the existing contractual term and the other legacy or inter-cloud systems. In the case of Philips Consumer Lifestyle, the decision to choose which cloud contact center version should be deployed is not merely determined by the technical aspects, such as the newness or the functionalities, but also the compatibility with the other cloud systems and the contractual agreement that Philips Healthcare already has with ININ. Philips Healthcare, whose main base is in the United States, currently uses ININ v3.0. Thus, instead of implementing v4.0, the pilot project of Philips Consumer Lifestyle in the US is determined to use v3.0 in order to maximize the contractual term. The compatibility between ININ v4.0 and Salesforce is also under the construction by both providers. Therefore, it is much more feasible to use v3.0 in the pilot project.

Not all activities can ideally be implemented and thus the prioritization, based on the urgency and importance of these activities, should be considered. Rather than analyzing the existing systems and processes, the same effort can be allocated to learn the functionalities offered by the cloud providers. Due to the personnel turnover and the growing complexities in the internal processes, the knowledge about the existing systems cannot be easily gathered. Moreover, these systems will be replaced with cloud functionalities. Thus, the baseline infrastructure can be put at a lesser priority.

Implementability

For the start-up companies or those which have no experience with cloud computing, this framework will be a useful source because it will help them to consider the key things both in the technical and in the business areas of insight. However, for a complex company like Philips, the cumulative experiences while dealing with massive IT projects and also the existing methodologies have been prevalent in their ways of working, helping them to prioritize the project activities within their own limited project time. Therefore, this suggested framework will be used as the supporting, rather than the primary, guidance to check which aspects are missing in the actual implementation.

Interviewee 2

Role	IT project manager. He has an extensive consulting experience for more than 30 years in delivering IT projects.
Date	18 June 2014

Problem relevance

This framework has provided a balanced composition of business and IT insights. A cloud computing implementation, though relying upon the capability of the cloud service provider, still needs a good collaboration and mutual understanding between the internal business users and IT in order to draw the scope, expectation, and feasibility assessment for executing the cloud vision and implementation. The critical parts that should be profoundly emphasized by this framework are the importance of legal aspects and data extraction in the cloud environment. For a global-operating company like Philips, the legal issues in cloud computing may restrain its utilization in certain countries, such as the US; data protection rules forbid cloud data storage and processing for several restricted countries, like North Korea. The data extraction for reporting purposes is also sometimes problematic in cloud computing. There should be some arrangements with the provider to allow internal data warehouse or business intelligent application extracting and reformatting of the data from the cloud computing service.

Practicality & Implementability

The steps discussed in this framework are logical and comprehensible. A framework is meant to be general and applicable to a wide range of cases rather than detailing the technical processes. This framework has provided a useful guidance for cloud computing and can be adjusted to fit specific implementations.

The framework can be used not only for cloud computing but also for other common IT projects. What makes cloud computing different is the degree of importance to have a robust SLA definition and contract with the third-party provider. The SLAs and the capability assessment of the cloud provider are certainly important and should be performed in the early phase during the vendor selection rather than prior to the cloud implementation planning as suggested in this framework. The provider candidates should demonstrate their excellent performance and reliability.

In Philips, the management has already had a standard implementation method which consists of several required deliverables for IT projects such as BIA, testing, deployment, and post-implementation review. This method is executed in an agile mindset, delivering the requirements in several sprints in an iterative manner. Nevertheless, the suggested framework in this thesis can still be used as a general reference or guidance to prevent something that could be overlooked in a cloud computing project.

Interviewee 3

Role	Senior manager for reporting/forecasting and telephony. He has been in charge for contact center operations since 1990s when it was still handled internally by Philips until now when it has been totally outsourced.
Date	19 June 2014

Problem relevance

For a business user, the implementation of cloud computing could be a complete-grey area. Plenty of cloud benefits and capabilities have been widely marketed, promoting that it has superior functionalities and performance compared to traditional computing methods. Nevertheless, it is somewhat imprecise as to how to have this cloud computing run in our operation, what aspects we should be aware of and what the roles of the business users and IT experts are. This framework helps to make all of the processes far more clearly for business users to understand what processes the IT team is dealing with, how to monitor the project progress such as the setup and implementation and also to assure that the project goals are reachable and on the right track.

Practicality & Implementability

The suggested approaches and application of this framework are comprehensible enough and easy to follow at each step. It is sufficient for the business user to know the processes on a general level and not to get lost in the details as the technical implementation will be the responsibility of the IT team and the cloud service provider.

This framework can be a practical source whenever the business user is dealing with cloud computing. Although in future projects the cloud types or solutions might be different, there are certainly some commonalities that can be found from the current cloud project. We can always learn something and use it as the preparation and precaution for the next project. This framework can help to guide through all of the processes, to map the key activities and resources we need, to identify the challenges and risks and to monitor the IT team work and progress.

6– Conclusion

In the previous chapters, the research has proposed a framework for cloud adoption that covers both the enterprise architecture and the business perspective and applied it to the case in Philips Consumer Lifestyle. Based on the usage experience, this research has shown its usefulness, demonstrating an end-to-end planning for cloud adoption. However, this research still has limitations and opens opportunities for future research.

6.1 Answers to research questions

The research questions described in Section 1.2 have formed the structure of this thesis. The research is firstly guided to explore the state of the art context of research. Then the accumulated knowledge from this literature review is formulated into a practical framework that leads the steps required for the implementation of cloud computing.

- *RQ1: Which methodological frameworks can best provide a basis for the concept of cloud computing adoption?*
  Chapter 2 has explored the prominent frameworks and approaches that cover certain aspects concerning the cloud implementation, starting from TOGAF 9 for the IT architecture and continuing with the step-wise approach for cloud adoption, risk assessment, change management, IT investment, and so on. In Chapter 3, these concepts are brought together into a practical and usable framework. Table 4 in Section 3.1.4 has outlined the key steps, inputs, and outputs, including the applied approaches that will make the efforts and planning for cloud adoption more seamless and structured.

- *RQ2: How can a business migrate from an as-is to a to-be cloud-enabled architecture by using a business model-driven approach?*
  By referring to the business model-driven approach proposed by Iacob et al. (2012) and the cloud adoption strategy by Isom and Holley (2012), the direction to transform to a cloud solution is started from the understanding of the baseline processes and then continuing to the analysis of the benefits, costs, and risks. These activities are described within three phases depicted in Figure 11: the initial planning, the understanding the capabilities and vision, and the formulation of targeted architecture. These have been applied to the case and explained in Section 4.2 – 4.4.

- *RQ3: How should the to-be cloud-enabled architecture be delivered?*
  While the business decision and the vision of targeted architecture have been justified, the next phase continues with the plan for transition, implementation, and governance.
  a) *How can the change process be managed, especially when cloud computing is used as a pool of shared resources accessed by multiple parties?*
     In the Section 3.2, the approach to lead the formulation of change management strategy has been described. Several key determinants that may influence the resistance and commitment

to cloud adoption have been cautiously selected from literature and proposed in this approach. The planning for this change management process has been conducted and described in the Section 4.5.2.

b) *Which key aspects should be prepared and managed for the implementation of cloud computing?*
The virtualization offered by cloud computing has brought different implementation perspectives compared to traditional computing. The network infrastructure, holistic agreements with the vendor, and inter-cloud integration are the key planning we proposed in this suggested framework. Using the white papers and the actual cloud project documentation, we have executed these key planning deliverables in Section 4.6.

c) *How could it be ensured that the cloud implementation will deliver the promised benefits without putting the business at risk?*
The governance is proposed to be continuously conducted during and after the implementation in order to ensure the compliance to the targeted architecture, managing of the risks, and provide learning outcomes for the next projects. The suggested key aspects of this implementation governance have been described in Section 4.7 – 4.8.

6.2 Contribution

By reflecting back to the expected research impacts mentioned in Section 1.4 and the results evaluated in Chapter 5, we summarize our key contribution into three points. Firstly, various methodological supports in relation to cloud computing and generic business strategy have been elaborated to complement the TOGAF ADM. The suggested cloud adoption framework has emphasized the importance of having a business model, business case, and risk assessment in defining the cloud-enabled architecture vision. It has also optimized the utilization of business requirements captured within a motivational model for the identification of potential risks and relevant SLAs. The practitioners we interviewed have appraised this framework in a positive tone, especially for its balanced composition of business and IT insights and practicability.

Secondly, we have revealed the complexities surrounding the cloud adoption not only from the technical concerns but also from the inter-organization managerial aspects. The suggested change management process has outlined several key determinants to identify the attitudes of the key users toward the cloud adoption, including the strategic initiatives to address the resistances. Lastly, we have demonstrated the use of the suggested framework and approaches by applying them to a real case of cloud implementation in Philips CL. The case study has provided us enough rooms to assess whether the suggested approaches are applicable and practical to use or not. The discussion with some practitioners in Philips CL and cloud providers has given us some insights to refine the framework.

6.3 Limitations

Prior to discussing the recommendations for future research, it is necessary to recognize the limitations of this research. One of the limitations concerns about the skills and people required to bring the success of the cloud computing adoption lifecycle. In their paper, Gewald and Helbig (2006) mention that the success of the whole model relies not only on how well the processes and structures are defined but also on the elements of the people and leadership issues. Though we have mentioned the key roles required for each phase in the suggested framework, we did not specify their soft and technical skills. The leadership styles and technical capabilities owned by the project team leader and members will influence the success of the implementation of the suggested framework.

The other limitation relates to the gap between the planning and the actual implementation. This thesis covers only the planning and not its real implementation. Therefore, we cannot fully assure whether the practices suggested by the supporting theories will be very useful or not in practice. We are aware that the implementation will usually uncover more challenges than the conceptual analysis. Besides this gap, the framework is also applied to only one cloud case study that is the contact center as a Communication as a Service. More cases from different types of cloud services such as the IaaS, PaaS and SaaS will provide more views for the validation of this research.

This suggested framework is the combination of TOGAF 9 and cloud strategy which initially aims to provide practical, light-weight, and streamlined processes. Some parts of TOGAF 9 might therefore be overlooked, such as the capability or maturity measurement. This capability measurement may help the organization in assessing its readiness and current capacities to do the cloud transformation and foresee which improvements are needed. It also provides guidance on prioritizing and planning its limited resources to achieve the targeted result. This is in line with the feedback we gathered from the practitioners that not every step within this suggested framework can be practically done due to the time and effort efficiencies. Thus, the maturity assessment can be the option to pinpoint the key areas that require serious attention while drawing the cloud strategy.

Also in accordance to the feedback from the practitioners, there are several steps which are practically more important than others, such as the business-fitness justification, the legal aspects covering the existing and upcoming contracts, SLA, etc. The degree of significance of each step within the suggested framework has yet been defined. The justification based on a further analysis on the impacts and risks of each step might be useful to help the management in identifying the critical actions within this cloud strategy.

6.4 Future research

As deducted from the limitations described earlier, further research and analysis is expected to improve the suggested framework and make it more comprehensive and viable for cloud implementation. There are several opportunities to extend the current research.

- The specification on the soft skills and technical capabilities of each critical role in a cloud project will provide better insight on what criteria should be used while appropriately selecting the project team member.
- Future research on a comprehensive cloud maturity model will add more value to this framework. It will help to accelerate cloud adoption by identifying the specific capacities that are either lacking or adequate in one organization and what improvements are needed. This maturity covers not only the EA project management but also the cloud-service portfolio management. The result of this maturity assessment may become the basis for the management to decide whether or not to pursue the improvements in certain critical areas.
- The scale to express the significance of each step within the framework is analyzed and can be expressed into two classifications, i.e. primary – the step is an important support for the success of cloud implementation and secondary – the step is useful but less important.
- One of the interesting mentioned aspects in the nature of cloud computing nowadays is the inter-organizational interaction. Cloud computing has changed the landscape not only in the internal IT organization but also in the interaction among different partners. The actual survey to the corresponding partners will help to assess whether the determinants and strategies proposed in the change management approach in Section 4.5.2 are sufficient and helpful to enhance the commitment and trust within the inter-organizational relationship.
- By investigating more cloud cases with different types - SaaS, IaaS, PaaS - the steps suggested in the framework can be validated to check whether they are generally applicable or certain technical aspects should be taken into consideration.
- In this research, we have also suggested some additional components to be displayed in the BMC. A more extensive investigation is needed to check whether the outcomes of this addition will help the organization to realize the values more effectively or not.

6.5 Recommendations to use the framework

The points below are the suggestions to the management for getting started on the use of the cloud adoption framework.

1. The need for socializing the framework to the related stakeholders is performed early in the project process. These stakeholders represent various relevant areas, such as the IT people, the key business users, the cloud experts and providers that are needed to deliver on the purpose of cloud computing implementation. The socialization covers the overview of this framework – the main steps, the key deliverables, the goals, etc. – to achieve a common understanding and expectation among the team. The flexibility of this framework should be emphasized to deal with the need to customize it to specific situations or initiatives to be addressed.
2. A considerable discussion about the selected team members and their roles and responsibilities should take place. The selection can be succinctly conducted based on the skills of each member, determining who assumes the risks, who gets the benefit and dis-benefits, and who provides the necessary resources. The team comprises not only of the core

project officers (project leader, business analyst, system architect, etc.) but also governance officers, internal oversight body, technical advisors, and also the cloud providers.

3. Besides the people, other key project resources such as the equipment, the time, and the budget are critical to support the execution of each step within the framework. The project portal, various schedules and timelines had already been established to help the team members organize each cloud project.
4. During the cloud implementation process, the roles of team leaders are very critical to determine the business and technical directions and to endorse the advance from one phase to the next of a cloud implementation project. There should have certain approval and review processes to keep a good governance practice.
5. Collaboration within the team should be nurtured continuously during cloud implementation in order to let the team members receive equal amounts of information and feel certain that they are going in the right direction. The different views during the project should be consolidated and solutions looked for if problems emerge. The project leader position is pivotal to determine the next steps and to adjust the allocated resources and time.

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Appendix A – The Motivational Model

As an example:

Driver	Assessments	Goal	Requirement	Classification	Basic/Additional Fee	Risks
Achieve excellent consumer journey	Reach higher NPS	Give personalized service with 1-on-1 interaction	Have agents see which consumer is contacting before accepting the contact	Functional requirement	Additional fee	Lack of integration with CRM service cloud

Appendix B – The Risk Assessment

No	Risk Category	Risk Description	Risk Owner	Consequences	Impact H/M/L	Probability H/M/L	Risk exposure	Risk Response
1	Sponsorship/ Ownership	Lack of top management commitment	IT Team	Failure to gain sufficient commitment from top management may lead to no or few cloud initiatives to be deployed.	100	0.1	L	A steering team should be established and ensures that: - The strategic value of the project is communicated to the project sponsor and the other key stakeholders. - The project status is frequently informed to relevant stakeholders. - The project benefits are visible to senior management through in-person, informal, or short meetings. - Weak links that hinder the project performance should be promptly resolved.
		Resistance to change the existing contact center operation	Philips CL Consumer Care Team	Reluctance to support the cloud solution may be due to the fact that contact center provider can no longer charge the technology cost as part of agent fee. This may impact commitment and relationship with these providers.	50	0.1	L	A project feasibility study is conducted and closely communicated to the respective outsourcers, determining and explaining the expected benefits to the business and rearranging the expectations.
		Resistance to support the global routing	Philips CL Consumer Care Team	The possibility to route calls around the globe will tighten the competitiveness among contact center providers. The consequences of this may lead to a long negotiation time with these providers. The providers which previously have exclusive right to handle calls from certain regions are now facing pressures upon their profit margin. This may impact commitment and relationship with these providers.	50	0.1	L	This might be the right time to rearrange the sourcing structure, reducing the number of outsourcers by selecting the ones that commit or support the objectives of having cloud contact center service.
2	Project management	Poorly defined roles and responsibility of relevant participants in cloud project	IT Team	Poor defined team structure and responsibilities may affect severely the whole project activities. Team members might become perplexed with their progress, causing milestone and deliverables are not timely and effectively achieved.	50	0.5	M	A roles and responsibilities matrix is formulated to identify the responsible parties on certain problem areas. This matrix should delineate the authority, responsibilities, and accountability of the project team for meeting the organization's needs.
		Inadequate change management plan	IT Team Philips CL Consumer Care Team	Poorly managing the change may result in increasing reluctances from participating parties while they cannot foresee how the change process will bring them value. This will consequently cause the desired outcomes hardly to be achieved on schedule.	100	0.75	H	A formal change management plan and procedure should be set up and include not only the infrastructure maintenance but also activities such as culture change, change leadership training, communication planning and execution.

No	Risk Category	Risk Description	Risk Owner	Consequences	Impact H/M/L	Probability H/M/L	Risk exposure	Risk Response
		Inability to align business process changes with the standardized cloud service options	IT Team Philips CL Consumer Care Team	The gap between business processes and cloud will be a symptom of failure of IT investment to deliver intended value and dissatisfied users with the services.	50	0.5	M	Sufficient knowledge and skills about the functionalities performed in the new system should be transferred to the end users. The business owners should adjust the way of working from existing business operation to the new system, such as the reporting, forecasting, performance evaluation, etc.
		Inadequate IT skills to manage cloud-based technologies	IT Team	Without having personnel with sufficient expertise and experience, the seamless integration of web services from cloud-based technologies is hardly to be achieved.	50	0.1	L	The project needs for certain positions should be determined clearly at the onset of the project, reviewing the skills of those who have already been or to be assigned. The mitigation toward the risk of lacking sufficient skills is by trying to get cross-project experience or external support for a temporary basis.
3	Vendor management	Inadequate vendor selection process: insufficient criteria and evaluation	IT Team	Selecting unmatched vendor may result to misalignment between company's goal and vendor strategy and capabilities.	100	0.1	L	Vendor selection should be performed in a fair and formal practice by establishing certain key criteria and to ensure that only the viable best fit based on the specified requirements.
		Lack of performance monitoring over cloud providers	IT Team Philips CL Consumer Care Team	Possibility of problems from ongoing process will remain undetected, causing correction or improvement actions fail to be performed immediately and deteriorating customer satisfaction.	50	0.1	L	The SLA for critical IT services should be defined based on customer requirements and the cloud capabilities. Some of the considerations should cover items such as availability, reliability, performance, capacity for growth, levels of support, continuity planning, security, and demand constraints. The monitoring toward the specified service level performance should be performed continuously and communicated in a format of a meaningful report to the respective stakeholders.
		Failure to formally define the availability level of cloud services	IT Team Philips CL Consumer Care Team	Without defining a clear basis of expected performance, it will be difficult to have the vendor committed to provide adequate quality of service.	50	0.1	L	
		Vendor lock-in that causes high dependency on vendor's product or services.	IT Team	This may cause substantial switching cost and complexities while management wants to use service from another vendor or to terminate cloud-based solutions.	75	1	H	The provider shall use open and published APIs to ensure the broadest support for interoperability between components and to facilitate migrating applications. The provider shall use secure (e.g., non-clear text and authenticated) standardized network protocols for the import and export of data and to manage the service, and shall make available a document to consumers (tenants) detailing the relevant interoperability and portability standards that are involved. The provider shall use an industry-recognized virtualization platform and standard virtualization formats (e.g., OVF) to help ensure interoperability, and shall have documented custom changes made to any hypervisor in use, and all solution-specific virtualization hooks, available for customer review.

No	Risk Category	Risk Description	Risk Owner	Consequences	Impact H/M/L	Probability H/M/L	Risk exposure	Risk Response
		Failure to update cloud contract accordingly with the operating changes over time	IT Team & Philips CL Consumer Care Team	The terms written in contract become unenforceable as it no longer reflects the actual situation or even worse that the operating changes have cause unintended conflicts with existing condition.	50	0.1	L	A procedure should be set up to manage the formulation, modification, and termination of the contracts with the respective suppliers. The SLA and underpinning contracts should be reviewed regularly and consulted with legal advisor to ensure that they are still up to date and effective to handle changes in requirements.
4	Finance	Failure to control cloud-related expenses due to the fact of ease of proliferation of cloud usage	Philips CL Consumer Care Team	While actual costs increase significantly from the initial estimation, it is difficult to sustain management commitment to continue with cloud initiatives.	50	1	M	Accountability for achieving the expected benefits and controlling the costs should be clearly assigned and monitored.
5	Delivery strategy and architecture	Wrong classification while determining which functionalities to be assigned to cloud- or premise-based operation	IT Team Philips CL Consumer Care Team Cloud Provider	This may lead to lack of proper architecture of cloud-based solution which in turn may cause failure to leverage security, scalability and maintain performance of overall solution.	100	0.1	L	This requires the creation of a technological infrastructure plan in which the architecture board sets and manages clear and realistic expectations of what the cloud service provider can deliver in term of products, services, and delivery mechanism.
		Significant performance degradation due to network latency	IT Team Network Provider Cloud Provider	Insufficient performance may cause slower response to consumers' calls and thus impact satisfaction over the service.	75	1	H	The availability, quality, and adequate capacity and resources shall be planned, prepared, and measured to deliver the required system performance in accordance with legal, statutory, and regulatory compliance obligations. Projections of future capacity requirements shall be made to mitigate the risk of system overload. Information security measures and redundancies shall be implemented to protect equipment from utility service outages (e.g., power failures and network disruptions).
6	Infrastructure security	Lack of timely security patches being deployed	Cloud provider	This will increase threat of having security vulnerability within the ongoing system	100	0.1	L	All related devices shall have the latest available security-related patches installed upon general release by the device manufacturer or carrier.

No	Risk Category	Risk Description	Risk Owner	Consequences	Impact H/M/L	Probability H/M/L	Risk exposure	Risk Response
		Failure to protect network traffic between distributed sites and cloud contact centers	IT Team Outsourcer	Possibility to have unauthorized access and hijacked session during the data transmission becomes higher.	100	0.5	M	Policies and procedures shall be established, and supporting business processes and technical measures implemented, to protect network environments, including the following: • Perimeter firewalls implemented and configured to restrict unauthorized traffic • Security settings enabled with strong encryption for authentication and transmission, replacing vendor default settings (e.g., encryption keys, passwords, and SNMP community strings) • User access to wireless network devices restricted to authorized personnel • The capability to detect the presence of unauthorized (rogue) wireless network devices for a timely disconnect from the network Each operating system shall be hardened to provide only necessary ports, protocols, and services to meet business needs and have in place supporting technical controls such as: antivirus, file integrity monitoring, and logging as part of their baseline operating build standard or template.
		Insecure interfacing among cloud-based applications and other end-user systems (ex. Workforce management, knowledge management)	IT Team Cloud provider	Failure in interfacing process may result to incomplete or redundant data transfer been performed, causing inaccurate data processed in the systems.	100	1	H	Providers shall assure reasonable information security across their information supply chain by performing a regular review. The review shall include all partners upon which their information supply chain depends.
		Inadequate facilities to capture and store application logs	IT Team Philips CL Consumer Care Team Cloud Provider	Unavailability of sufficient activity logs within the application will cause difficulties to monitor and detect unauthorized activities and to trace back the root causes while operational problems occur.	50	0.5	M	Access to, and use of, audit tools that interact with the organization's information systems shall be appropriately segmented and restricted to prevent compromise and misuse of log data.
7	Identity and access management	Failure to implement and manage proper access management for cloud-based application	Outsourcers of contact center service	Without having proper access management in place, threats of unauthorized access, which may lead to theft of consumer information or misuse of the systems, are heightened.	50	0.5	M	User access policies and procedures shall be established, and supporting business processes and technical measures implemented, for ensuring appropriate identity, entitlement, and access management for all internal corporate and customer (tenant) users with access to data and organizationally-owned or managed (physical and virtual) application interfaces and infrastructure network

No	Risk Category	Risk Description	Risk Owner	Consequences	Impact H/M/L	Probability H/M/L	Risk exposure	Risk Response
		Inability to implement segregation of duties in both application and system level	Outsourcers of contact center service	Privileged access, which has more capabilities to override the system setting or data, should be cautiously protected; otherwise illegitimate actions will be difficult to be prevented.	50	0.1	L	and systems components. User access shall be authorized and revalidated for entitlement appropriateness, at planned intervals, by the organization's business leadership or other accountable business role or function supported by evidence to demonstrate the organization is adhering to the rule of least privilege based on job function. For identified access violations, remediation must follow established user access policies and procedures.
8	Data management	Unauthorized access to data storage or inappropriate use of sensitive data (i.e. personal data, payment data, etc.)	IT Team Cloud provider Outsourcer	The theft or leakage of sensitive data may increase the possibility of fraud activities which will undermine company reputation and put customer trust at risk.	100	0.1	L	Confidential data that traverses public networks shall be appropriately classified and protected from fraudulent activity, unauthorized disclosure, or modification in such a manner to prevent contract dispute and compromise of data. Policies and procedures shall be established, and supporting business processes and technical measures implemented, for the use of encryption protocols for protection of sensitive data in storage (e.g., file servers, databases, and end-user workstations) and data in transmission (e.g., system interfaces, over public networks, and electronic messaging) as per applicable legal, statutory, and regulatory compliance obligations. The selected cloud service provider has adhered to the privacy, PCI law. The security certifications can be the starting point but not the "end-all" to justify the assurance about adequate security controls.
		Non-compliance with data privacy laws due to cross-jurisdictional data storage and transfer	IT Team Cloud provider	Non-compliance action may lead to legal issue or sanctions pushed by authorities. This can damage organization reputation and result in harm to the consumers.	100	0.1	L	
		Failure to properly retain data due to complexity of multiple data stores	IT Team Outsourcer	In the operation of contact center, one of the critical data to be retained properly is voice recordings. They are needed to comply with certain regulation and to improve internal performance. The insufficiency of data retention will cause difficulties in tracing back the activities while there are unfavorable events occurring, such as disputes with customers, delivery of incorrect information, poor performance of the agents, etc. .	50	1	M	Information security policies and procedures shall be established and made readily available for review by all impacted personnel and external business relationships. A formal disciplinary or sanction policy shall be established for parties who have violated security policies and procedures. All data shall be designated with stewardship, with assigned responsibilities defined, documented, and communicated.
		Failure to remove data securely from multiple sites	IT Team Outsourcer	This insecure data removal may increase threats of having misuse or unauthorized sensitive data exposure.	50	1	M	Policies and procedures shall be established, and supporting business processes and technical measures implemented, for the secure disposal and complete removal of data from all storage media, ensuring data is not recoverable by any computer forensic means.

No	Risk Category	Risk Description	Risk Owner	Consequences	Impact H/M/L	Probability H/M/L	Risk exposure	Risk Response
9	Business Resiliency and Availability	Cloud service failure in peak usage periods	IT Team Philips CL Consumer Care Team	This lack of reliability of cloud will cause downtime that may lead to several types of losses, such as loss of application service to consumers and potential loss of data	50	1	M	C1. A consistent unified framework for business continuity planning and plan development shall be established, documented and adopted to ensure all business continuity plans are consistent in addressing priorities for testing, maintenance, and information security requirements. Requirements for business continuity plans include the following: • Defined purpose and scope, aligned with relevant dependencies • Accessible to and understood by those who will use them • Owned by a named person(s) who is responsible for their review, update, and approval • Defined lines of communication, roles, and responsibilities • Detailed recovery procedures, manual work-around, and reference information • Method for plan invocation C2. Business continuity and security incident response plans shall be subject to testing at planned intervals or upon significant organizational or environmental changes. Incident response plans shall involve impacted customers (tenant) and other business relationships that represent critical intra-supply chain business process dependencies.
		Single point of failure while cloud contact center is down		Having main functionalities located in cloud may cause one fault or malfunction impairs an entire service to stop operating.	50	1	M	
		Lack of continuity plan to anticipate failure and change in cloud service		The inability to recover from or anticipate disruptive events may cause interruptions to delivery service to consumers, causing	50	0.5	M	
		Termination of cloud services due to critical survival concern and failure of the cloud provider	IT Team Cloud provider	To sustain the ongoing process, the company should seek another vendor to handle the cloud services and re-perform the analysis and integration phases to ensure compatibility of new services to the existing ones.	100	0.1	L	The provider shall use open and published APIs to ensure the broadest support for interoperability between components and to facilitate migrating applications. The provider shall use secure (e.g., non-clear text and authenticated) standardized network protocols for the import and export of data and to manage the service, and shall make available a document to consumers (tenants) detailing the relevant interoperability and portability standards that are involved. The provider shall use an industry-recognized virtualization platform and standard virtualization formats (e.g., OVF) to help ensure interoperability, and shall have documented custom changes made to any hypervisor in use, and all solution-specific virtualization hooks, available for customer review.

No	Risk Category	Risk Description	Risk Owner	Consequences	Impact H/M/L	Probability H/M/L	Risk exposure	Risk Response
10	IT operation	Unresponsiveness of cloud providers while handling problems	IT Team	The unreadiness to solve the problems quickly may result to interruptions in ongoing systems.	50	0.5	M	Policies and procedures shall be established, and supporting business processes and technical measures implemented, to triage security-related events and ensure timely and thorough incident management, as per established IT service management policies and procedures. The provider shall make security incident information available to all affected customers and providers periodically through electronic methods (e.g. portals).
		Ineffective incident investigation and troubleshoot due to impermanent of virtual systems	IT Team	Failure to remediate the incidents promptly may cause disruptions to ongoing systems, and even worse if it subsequently leads to another crucial issue.	50	0.5	M	Mechanisms shall be put in place to monitor and quantify the types, volumes, and costs of information security incidents.
		Lack of coordination of system maintenance	IT Team	This may result in conflicting changes and unintended disruptions within existing systems.	50	0.5	M	Policies and procedures shall be established, and supporting business processes and technical measures implemented, to ensure that: - The development of new changes in application, network, or other components should be informed to and authorized by the accountable business role - Quality evaluation and acceptance criteria for information systems, upgrades, and new versions shall be established and documented, and tests of the system(s) shall be carried out both during development and prior to acceptance to maintain security. - Restriction to the installation of unauthorized software on organizationally-owned or managed user end-point devices (e.g., issued workstations, laptops, and mobile devices) and IT infrastructure network and systems components.
		Inadequate monitoring over cloud resource utilization	IT Team Philips CL Consumer Care Team	Over-utilized service may cause unexpected latency in the system and networking. Meanwhile under-utilized service will be the indication of over capacity or unnecessary resources.	50	0.5	M	The availability, quality, and adequate capacity and resources shall be planned, prepared, and measured to deliver the required system performance in accordance with regulatory, contractual and business requirements. Projections of future capacity requirements shall be made to mitigate the risk of system under or overload
		Lower availability of cloud service than defined in SLA	IT Team Philips CL Consumer Care Team	Calls from consumers are not able to reach contact centers while the service is down.	50	0.5	M	The availability, quality, and adequate capacity and resources shall be planned, prepared, and measured to deliver the required system performance in accordance with legal, statutory, and regulatory compliance obligations. Projections of future capacity requirements shall be made to mitigate the risk of system overload.

No	Risk Category	Risk Description	Risk Owner	Consequences	Impact H/M/L	Probability H/M/L	Risk exposure	Risk Response
		Inability to provide adequate level of service globally	IT Team Philips CL Consumer Care Team	The inability to route the service globally may impact the availability and capability to route calls to achieve 24/7 service around the globe.	50	0.5	M	
		Inadequate physical safeguards for data storage locations	Outsourcers of contact center service	This may lead to insufficient actions to prevent data loss and unauthorized access to sensitive data in storage locations.	10	0.5	L	Providers shall review the risk management and governance processes of their partners to ensure that practices are consistent and aligned to account for risks inherited from other members of that partner's cloud supply chain.
		Lack of integration with CRM service cloud	IT Team Cloud provider	Reliance on a weak interface and APIs may expose organization to a variety of security issues concerning the data integrity, confidentiality, availability, and accountability.	100	0.75	H	A sufficient testing environment and plan should be established to support an effective and efficient feasibility and integration testing of the cloud components. Data input and output integrity routines (i.e., reconciliation and edit checks) shall be implemented for application interfaces and databases to prevent manual or systematic processing errors, corruption of data, or misuse.
		Failure to ensure ACID (Atomic, Consistent, Isolation, and Durability) while processing the message queuing	IT Team Cloud provider		100	0.75	H	
		Application risks - the related functionality is either not provided yet in the application or not configured properly.	IT Team Philips CL Consumer Care team Cloud provider	The users might not be satisfied by the quality or performance of cloud service. This might decrease the commitment or enthusiasm from the users towards the upcoming cloud implementation.	50	0.5	M	The testing plan is established based on organization-wide standard, specifying the roles, responsibilities, and exit criteria. The plan needs to be reviewed by the relevant parties in order to ensure that the specified requirements are tested properly.