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ICT Value Chain: the impact of the Cloud Computing paradigm on competitive dynamics

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Abstract

Cloud Computing technologies and ICT as-a-Service concepts deeply revolutionized the enterprise world. All the players involved in this revolution have had to deal with the new issues, challenges and opportunities offered by the Cloud and were forced to change, in order to stay alive. The classic ICT Value Chain models are not sufficient to represent a situation in which new actors, like Cloud Services Developers, cannot be assimilated to any of the categories mapped.

The aim of this study is to review in detail the ongoing dynamics inside the Cloud Value Chain. That is why a significant number of companies, placed all over the chain, has been analyzed with the scope of pointing out common tendencies of vertical integration and differentiation. A description of recurring strategic partnerships has been provided as well, for each category of players.

Moreover, relevant literature models have been studied, in particular the one proposed by the "Osservatorio Cloud Computing e ICT-as-a-Service" of the School of Management, Politecnico di Milano in 2015. Starting from this basis, and thanks to the analysis of the companies which work in the Cloud industry, it was possible to enhance the model, enriching it in the section related to IT consulting services and system integration.

Finally, an IT consulting firm based in Milan has been analyzed, gathering data through interviews, real offers provided by the company, other minor sources and a questionnaire. The analysis of this company was useful for the comprehension of the model.

Abstract e presentazione dei Capitoli

Il Cloud Computing sta rivoluzionando il mondo Enterprise. Tutti gli attori coinvolti in questa rivoluzione si trovano ad affrontare le nuove sfide, problemi ed opportunità offerti dal Cloud ed hanno dovuto cambiare ed evolversi, per sopravvivere. La classica catena del valore per l'ICT non è sufficiente per rappresentare una situazione in cui nuovi attori sono emersi e non possono essere assimilati a nessuna delle categorie già mappate.

L'obiettivo di questo studio è analizzare nel dettaglio le strategie in corso nella catena del valore del Cloud. Per farlo è stato analizzato un numero significativo di compagnie, provenienti da ogni sezione della catena del valore, con lo scopo di individuare tendenze ricorrenti di integrazione verticale e differenziazione. Inoltre è stata fornita una descrizione delle partnership strategiche più comuni, per ogni categoria di player.

In aggiunta, sono stati studiati modelli di catena di valore presenti in letteratura, in particolare quello proposto dall' Osservatorio e ICT as-a-Service della School of Management del Politecnico di Milano nel 2015. Partendo da questa base e grazie all'analisi citata in precedenza delle società che lavorano nella Cloud Industry è stato possibile potenziare il modello, arricchendolo nella sua sezione relativa a società di consulenza IT e system integrator.

Infine, una società di consulenza IT di Milano è stata analizzata, raccogliendo dati attraverso interviste, offerte reali della società, altre fonti minori ed un questionario. L'analisi di questa company è stata utile per la validazione del modello.

Entrando nel dettaglio dei capitoli, il Capitolo 1 introduce il concetto di Cloud Computing. Si parte con una breve storia dei trend tecnologici che hanno contribuito alla sua nascita, fino ad arrivare alla sua definizione. Il Capitolo 2 spiega le metodologie usate per portare a termine questo studio: analisi della letteratura, modelli utilizzati, interviste ed un questionario, presentato nel Capitolo 5. Nel Capitolo 3 alcuni modelli di catena del valore del Cloud vengono studiati, incluso quello presentato dall'Osservatorio Cloud Computing e ICT as-a-Service della School of Management del

Politecnico di Milano, nel 2015. Seguirà il modello potenziato in una delle sue sezioni, secondo quando emerso dallo studio delle company analizzate. Nel Capitolo 4 le 32 società selezionate tra quelle coinvolte nella catena del valore del Cloud vengono studiate e le loro strategie scomposte ed analizzate. Per ogni categoria di player si analizzano dinamiche ricorrenti. Infine, nel Capitolo 5 si ha un utilizzo pratico del modello, attraverso lo studio di una società di consulenza IT italiana e la sua rappresentazione nella catena del valore.

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Introduction

"I don't need a hard disk in my computer if I can get to the server faster. Carrying around these non-connected computers is byzantine by comparison".

What's non-surprising about the previous quote is it was spelled by a visionary like Steve Jobs. What is surprising, though, is that this quote is from 1997. The Cloud took a long time to arrive: underlying technologies had to be mature enough, while engineers had to create the concept of Cloud Computing and realize how revolutionary it would be in the enterprise (and consumer) market.

The ICT world has always been characterized by a high level of dynamicity: innovations are introduced rapidly, both at a technological and at a management level. Amongst the several evolutive trends, the commoditization of ICT and the creation of "as-a-Service" delivery models, servitization, are at the basis of the Cloud Computing.

The cloud, as defined by NIST, National Institute of Standards and Technology, is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

The Cloud Computing today represents a huge market, which sums up more than $400 billion worldwide (Statista, 2016) and will reach an estimate of € 587 million for the Public Cloud and €1185 million for the Cloud-enabling infrastructure in Italy (Osservatorio Cloud e ICT as-a-Service of the School of Management of Politecnico di Milano, 2016). Such numbers are mainly due to the revolution taken by the ICT as-a-Service, which potentially allows companies to be more flexible and make costs variable, paying only for resources used and reducing Capex and implementation time frames.

Such revolution implied a series of changes in the enterprise world: vendors have had to adapt their offer to the new paradigm, while companies making up the demand have had to develop new competencies of IT governance and define adoption strategies consistent with their requirements. Considerations like these led to the insufficiency of classic ICT Value Chain models to represent a situation in which new actors, like Cloud Services Developers, cannot be assimilated to any of the categories mapped.

This study is aimed at trying to provide a critical analysis of the current situation and giving an interpretation of how it can evolve, with particular references to the ongoing dynamics inside the Cloud Value Chain. Starting from the analysis of the models already present in literature and taking into consideration the one providing the most accurate synthesis between completion and simplicity (the 2015 model from the Osservatorio Cloud e ICT as-a-Service of the School of Management of Politecnico di Milano) such relationships and trends have been studied, making use of strategic information concerning 32 companies placed in the Value Chain, which helped redefine recurring partnerships, integration, differentiation and divesture trends and, in general, contributed to the observation of the dynamics inside the Chain. Moreover, such study led to the chance of providing an enhancement to the model in one of its parts..

In particular, in Chapter 1 the Cloud Computing will be introduced, starting from a brief history of the technological trends which contributed to its birth. Afterwards, relevant definitions will be reported, along with some taxonomy classifications proposed by the most important sources as for the Enterprise ICT. A synthesis of such taxonomies will follow, being this the one adopted in the following chapters.

In Chapter 2 the methods used in this study will be presented: analysis of the literature, models reviewed, how a questionnaire, presented in Chapter 5, has been designed and carried out.

Chapter 3 reviews the main models about the Cloud Value Chain, including the one from the "Osservatorio Cloud Computing e ICT as-a-Service" of the School of Management, Politecnico di Milano presented in 2015. This model will be enhanced in one of its parts.

In Chapter 4 the analysis of 32 enterprises working in the ICT sector and suitable for the Cloud Value Chain will be provided. For each category of players, recurring dynamics, including vertical integration, differentiation, divestures and strategic partnerships will be reviewed.

Finally, Chapter 5 validates the enhanced model through the review of an Italian IT consulting company, here called Milan Consulting. Such player has also been studied through the analysis of the questionnaire mentioned earlier, in order to map the strategy of the company in the introduced model, as is and to be.

Chapter 1

Introduction to the Cloud Computing

In Chapter 1 the Cloud Computing concept will be introduced. The first part will present a brief history of the technological trends which contributed to its birth, followed by relevant definitions of the phenomenon. There will also be a section related to the taxonomy used referring to the Cloud Computing. A synthesis of such taxonomies will follow, being this the one adopted in the following chapters. Finally, data and adoption forecasts, especially related to the Italian market, will be presented.

1.1 The long way to Cloud Computing

Cloud Computing is now possible thanks to a series of enabling technologies, but it has not always been the case. IT in the enterprise world has gone through many phases, that we are going to list in this paragraph. This so-called “eras”, obviously, do not start where the previous ends, but have overlapping periods, in which enterprises all around the world or even in the same street may still use mainframes rather than cloud computing. Roughly, the last 60 years produced the technology used in organizations today. We will now describe every and each of these eras.

The modern idea of computer was born in 1936, when Alan Touring presented the notion of a universal machine, that later took his name, capable of computing “anything that is computable”. Later fundamental milestones include the computer able to solve 29 equations simultaneously, designed by Atanasoff and Berry, the ENIAC calculator, grandfather of modern computers, which Mauchly and Eckert managed to fit in a 20 by 40 feet room, and the invention, from 1947, of the transistor, by Shockley, Bardeen and Brattain.

It was not until the 50’s that we saw elaboration systems gain their space inside enterprise organizations. We are talking about batch central computers, processing groups of punched cards which carry instructions, and giving results on tables in change. IBM dominated this market covering almost 90% of all punched cards. Stellar prices and bad elaboration time, though, limited the spread of such machines.

Mainframes were the next big thing in enterprise IT. The first ones, like the Manchester Mark 1 (1951), had no operating system and ran only a single preloaded program at a time. As the machines became more robust and demand grew big players, like IBM and UNIVAC, established service bureaus where they leased time to use their machines. Mainframe allowed users to input tasks, later computed by central real-time machines.

In 1965 Minicomputers arrived, providing compact machines for a small price, making a decentralized architecture possible, enabling it to be designed specifically according to specific

needs of business units rather than departments. Compared to the “big iron”, minicomputers were quite cheap, small and fast to build. Microcomputers (or PC’s) were still far and software applications were limited to large enterprises.

In the 70’s computer networks developed, thanks to data transmission technologies and to the creation of network protocols[1].

In the 90’s, Windows OS made it possible to connect PCs with each other inside networks[2]. In these years, the client-server structure was the most common: logic layers (data, business logic and presentation one) are distributed over two or three physical levels, carrying the name of tiers. The communication between tiers happens through standardized interfaces. Desktop or laptop PC’s represent the client side of the client-server structure, serving as a data-input tool, while the server side gives back communications services, information processing and data saving. With the word server we may refer to a mainframe, but also to a simple computer, programmed with the task to wait for inputs from other ones. The great advantage offered by the Client/Server structure is to distribute the load of work over several low-cost machines, giving all businesses the chance to use software applications. The new challenge was represented by the difficulty to integrate Local Area Networks (LAN’s) in a unique environment.

The internet arrival needed new communication standards, like TCP/IP, and the creation of middleware, which is software with the task to integrate different systems and the creation of systems distributed over more levels (N tiers) on a global scale. Standards like TCP/IP allowed the evolvement of IT infrastructures, through the creation of a interconnection between hardware made by several producers, and small networks, until then disconnected. Information can now run across the whole organization, thanks to the connection of mainframes, servers, computers and external infrastructures (the Internet).

[1] Mandrioli et al. (2008)
[2] Laudon (2006)

As we can notice, we went from a centralized architecture, an almost compulsory choice, for cost reasons, to departmental system, to then move back towards a central architecture, thanks to the client/server model and to Cloud Computing.

In the first years of the new century, some important factors enabled the Cloud Computing arrival, the first one being virtualization tools. Virtualization is the creation of a virtual version of a physical resource, including virtual hardware platforms, operating systems storage devices and computer network resources. Virtualization (represented in *Image 1*) is not the same as Cloud Computing, being the second the delivery of shared computing resources, made possible by the first. The main advantage of virtualization is optimization: while servers are often used way below their potential (on average about only at 15% of that), through this system many applications can be installed on a single server, running them as if they were mounted on a lot of them. Also, a variation in requisites for an organization can be handled much better, by simply reducing the virtual capability hired, rather than buying and then selling it. Other advantages include disaster recovery and backup mechanisms and better service efficiency, thanks to the dynamic allocation of resources over the virtual machines.

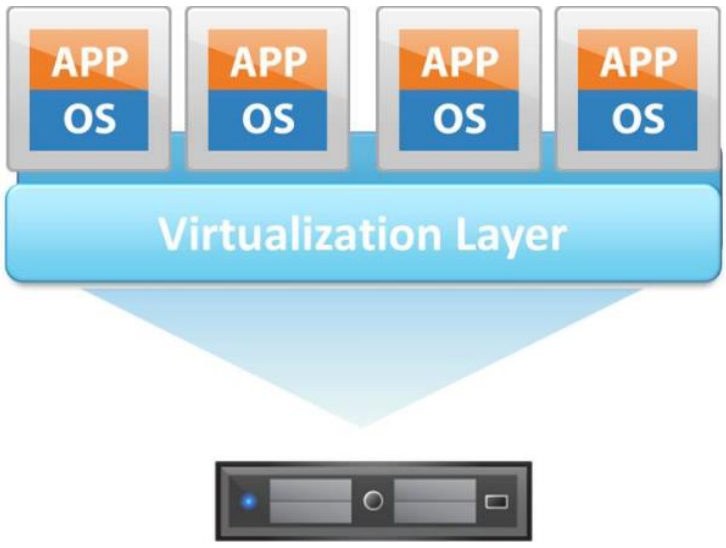


Image 1 - Virtualization allows many applications to be installed on a single server

Multitenancy is another factor which enabled the Cloud Computing technology. Multitenancy software is an architecture in which a single instance of a software runs on a server and serves multiple tenants, i.e. groups of users who share a common access to the software. While the same application, OS, hardware and data-storage are shared by multiple customers in a multitenancy environment, virtualization refers to the transformation of components, which enables each customer to appear to run on a separate virtual machine. Some advantages of this system include cost saving, release management (the package only needs to be installed, typically, on a single server) and data mining/aggregation from the provider's side, making it easier to run queries, mine data, look for trends etc. Below, *Image 2* graphically shows the difference between Virtualization and Multitenancy.

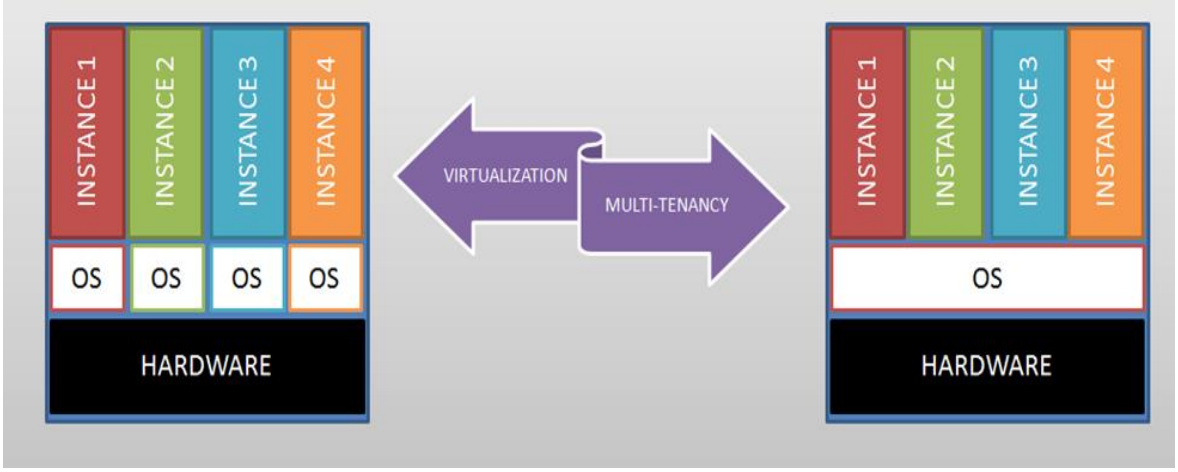


Image 2 – Virtualization vs Multitenancy

Cloud Computing was also made possible by SOA (Service Oriented Architecture). SOA is an architecture using a logic oriented to services, to support user needing, breaking single applications into elementary reusable elementary functions, called services.[3] Each service implement, as said, an elementary action, and exposes an interface through which it can be invoked, while delegating to a superior layer the task to coordinate the execution of the different services, according to the enterprise business workflows. The business process is, in this way, no

[3] IBM definition of SOA

longer tied to a specific action, rather turning into a component of a bigger framework to edit or reuse according to necessities. In a Manifesto for SOA, six core values were listed: business value (over tech strategies), strategic goals (over project-specific benefits), intrinsic inter-operability (over custom integration), shared services (over specific-purpose implementations), flexibility (over optimization) and evolutionary refinement (over pursuit of initial perfection).[4] This approach makes it easier, in a Cloud architecture, to turn on and off services. Some of its advantages include cost saving, reusability of services, interoperability between different technological platforms.

Together with the evolution of these architectures, two more trends contributed, in the last years, to the birth of Cloud Computing: ICT commoditization and the spread of new delivery models. The standardization and cost reduction of IT over the last years reduced its strategic value, making it, to the eyes of many, more and more comparable with electricity or fresh water. In other words, it is turning into a commodity, where it used to be a strategic factor[5].

A function which loses strategic value, and can be handled externally saving money should be, according to management principles, outsourced. *Image 3* highlights some drivers which lead to outsourcing. This cost reduction necessity pushed the deployment of new delivery models, like housing (customers rents a portion of a data center, with all related facilities where to install their own servers), hosting (resources come from the provider, which usually also offers some more services like backup and performance monitoring) or the Managed Services model (customers maintain the ownership of the ICT infrastructure, committing its handling to a third party.

4 soa-manifesto.org
5 Carr (2003)

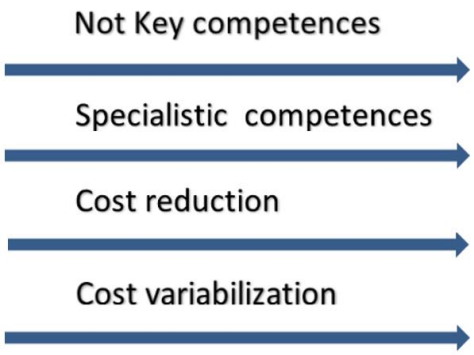


Image 3 - Competence and cost related outsourcing drivers[6]

Studying the Cloud Computing from another point of view, we may interpret it as an answer of IT to the need for quick answers coming from today's business world. Nowadays, the economic scenario is more dynamic than ever, and such uncertainty means the survival of an enterprise may depend on its capability to focus on its core business and adapt rapidly to the market demands. For this reason, Cloud is not just defined as a simple technology, but rather as an opportunity to embrace a new business model[7].

Cloud Computing is a big deal in IT world: reducing costs, increasing efficiency and taking a step towards a social and technological evolution, the Cloud favors the "Cloud Society", where everything will be accessible through the internet[8].

Cloud has been made possible by many technologies and trends. From an technological point of view, the Cloud is a natural evolution of previously existing technologies, turning IT into a distributed system on a global scale, starting from what used to be a big central system. At the same time, commoditization and new IT models made cloud mainstream, at the point where it has turned into a business opportunity, more than being a simple technology.

[6] La gestione dell'impresa, Gianluca Spina (2012)
[7] Xun Xu (2012)
[8] Sugang M. (2012)

Finally, we have to point out that cloud is here to stay: Gartner stated that, by 2020, a Corporate "No-Cloud" policy will be as rare as a "No-Internet" policy is today. This doesn't mean that all tech will be cloud-based, but that every enterprise will make use of at least some cloud based tech, and that the Hybrid model will be the most common.[9]

1.2 Cloud Computing taxonomy

Cloud computing is a big thing, but it is also a new technology. Before exploring how cloud is changing the enterprise world and, in particular, consultancy societies, we have to understand what cloud is. We will, in this Chapter, make use of some influential definitions.

1.2.1 NIST's definition

Defining a new technology is a big deal. A prove of that are the 15 drafts (and years of work) that NIST needed to publish the final version of their definition. NIST is an American federal agency, devoted to promoting innovation and industrial competitivity through the deployment of standard and new technologies. NIST's definition has gained a lot of support over the years, being widely accepted by other operators.

"The cloud – NIST writes – is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model is composed of five essential characteristics, three service models and four deployment models[10].

[9] Gartner (2016)
[10]NIST (2011)

The five essential characteristics listed by NIST (shown in *Image 4*) are:

- **On-demand self-service.** A consumer can use computing capabilities, such as server time and network storage, as needed automatically without requiring human interaction with each service provider.
- **Broad network access.** Capabilities are available over the network and accessed through standard mechanisms that promote use by heterogeneous thin or thick client platforms.
- **Resource pooling.** The provider's computing resources are pooled to serve multiple consumers using a multi-tenant model with different physical and virtual resources dynamically assigned and reassigned according to consumer demand. There is a sense of location independence in that customer generally has no control or knowledge over the exact location of the provided resources, but may be able to specify location at a higher level of abstraction. Example of resources include storage, processing, memory and network bandwidth.
- **Rapid elasticity.** Capabilities can be elastically provisioned and released, in some cases automatically, to scale rapidly outward and inward commensurate with demand. To the consumer, the capabilities available for provisioning often appear to be unlimited and can be appropriated in any quantity at any time.
- **Measured services.** Cloud systems automatically control and optimize resource use by leveraging a metering capability at some level of abstraction appropriate to the type of service (e.g., storage, processing, bandwidth and active user accounts). Resource usage can be monitored, controlled and reported, providing transparency for both the provider and consumer of the utilized service.

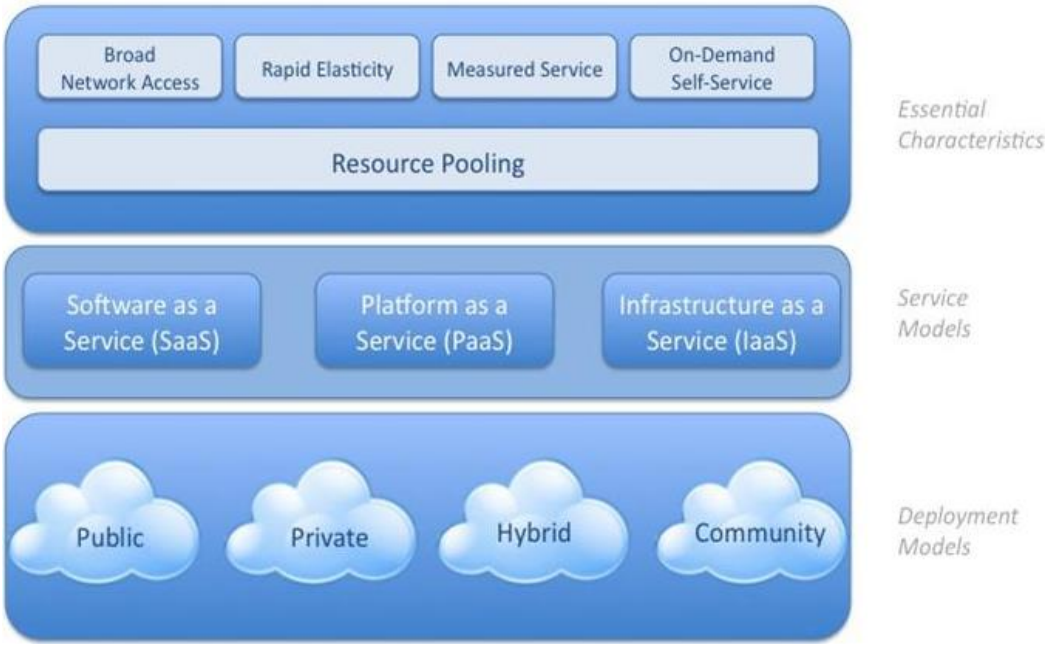


Image 4 - NIST's Cloud models representation

NIST moreover defines three service models and four deployment models. The service models are:

- **Software as a Service (SaaS).** The capability provided to the consumer to use the provider's applications running on a cloud infrastructure. The applications are accessible from various client devices through either a thin client interface, such as a web browser (e.g., web-based email) or a program interface. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, storage or even individual application capabilities, with the possible exception of limited user-specific application configuration settings.
- **Platform as a Service (PaaS).** The capability provided to the consumer is to deploy onto the cloud infrastructure consumer-created or acquired applications created using programming languages, libraries, services and tools supported by the provider. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems. But has control over the deployed applications and possibly configuration settings for the application-hosting environment.

- **Infrastructure as a Service (IaaS).** The capability provided to the consumer is to provision processing, storage, networks and other fundamental computing resources where the consumer is able to deploy and rum arbitrary software, which can include operating systems and applications. The consumer does not manage or control the underlying cloud infrastructure, but has control over operating systems., storage and deployed applications, and possibly limited control of selected network components (e.g., host firewalls).

The four deployment models proposed by NIST are:

- **Private cloud.** The cloud infrastructure is provisioned for exclusive use by a single organization comprising multiple consumers (e.g., business units). It may be owned, managed and operated by the organization, a third party or some combination of them, and it may exist on or off premises.
- **Community cloud.** The cloud infrastructure is provisioned for exclusive use by a specific community of consumers from organizations that have shared concerns (e.g.. mission, security requirements, policy and compliance considerations). It may be owned, managed and operated by one or more of the organizations in the community, a third party or some combination od them, and it may exist on or off premises.
- **Public cloud.** The cloud infrastructure is provisioned for open use by the general public. It may be owned, managed and operated by business, academic or government organization, or some combination of them. It exists on the premises of the cloud provider.
- **Hybrid cloud.** The cloud infrastructure is a composition of two or more distinct cloud infrastructures (private, community or public) that remain unique entities, but are bound together by standardized or proprietary technology that enables data and application portability (e.g. cloud bursting for load balancing between clouds).

Overall, NIST definition is very focused on the architectural aspect of Cloud, dividing services, with a low granularity model, into three macro-levels (Iaas, Paas and SaaS). Gartner's and

Forrester's definitions don't differ much from a deployment point of view, but are more business-focused, and go deeper into the service models.

1.2.2 Gartner's definition

Gartner is an American research and advisory firm, providing information technology related insight for IT and other business leaders. Gartner is a huge company, employing about 8k people over 85 countries in the world.

Gartner defines Cloud Computing as a computing style in which largely scalable IT-enabled functionalities are delivered "as a Service" to external customers through the Internet. The key point of this definition is the phrase "as a Service", which implies the payment of a fee and the definition of SLAs. As for service categories, Gartner adopts a model more detailed than NIST's, particularly about PaaS and SaaS[11].

The service model proposed by Gartner is composed of six categories:

- **Cloud system infrastructure services** (NIST's IaaS).
- **Cloud application infrastructure services** (NIST's PaaS)
- **Cloud application services** (partly corresponding to NIST's SaaS). Applications delivered through the Internet as a Service from multi-tenant architectures.
- **Cloud information services.** Research services or other mechanisms that grant access to external data and contents already existing in the Cloud.
- **Cloud business process services.** Business process (payroll, press, e-commerce)delivered as an elastic service through the Internet. The access happens through web interfaces and web-oriented mechanisms.
- **Cloud ecosystem management and security services.** Services for the management of Cloud access, configuration, security and delivery.

[11] Gartner (2010)

At a Saas level, Gartner lists three application services, that include the execution of some process activities and some support services for Cloud management, while NIST stays at a low-detail level, just defining the Saas category.

At a PaaS level too Gartner emphasizes the distinction among different service types. Within the Cloud application infrastructure services, two Paas typologies are highlighted: Application Paas (aPaas) and integration Paas (iPaas)[12].

- **aPaas:** an aPaas suite delivers to the end user an integrated platform for hosting and application and services management. These kinds of suite usually aggregate Cloud services such as deployment tools, data-management tools, application security tools, applications servers and orchetration tools.

- **iPaas:** an iPaas suite delivers to the end user a platform which enables integration and management, to allow the collaboration between collaboration services and application singularly deployed. An iPaas suite usually combines protocol bridging, message delivery, routing and virtualization Cloud services, besides orchestration, deployment tools, registry and repository. Cloud di protocol bridging, trasporto messaggi, routing, service virtualization e orchestrazione, strumenti di sviluppo, registry e repository.

1.2.3 Forrester's definition

Forrester defines Cloud Computing as a set of standardized IT resources, made available by a Service Provider, having the following features [13]:

- accessible through Internet protocols from any computer and always available;
- assigned resources scale automatically on demand;
- pay-per-use business model or advertising-based;

[12] Gartner (2011)
[13] Forrester (2008)

- Web management interfaces;
- complete self-service available to the user.

This definition, like Gartner's, emphasizes the business model and the ways its fruition is offered to end users. Forrester proposes a detailed taxonomic classification, by intersecting four different service models (Infrastructure, Middleware, Applications and Information & Processes – with three implementation models (Private Cloud, Hosted Cloud, Public Cloud)[14]. Twelve quadrants are then obtained, represented in *Image 5.*

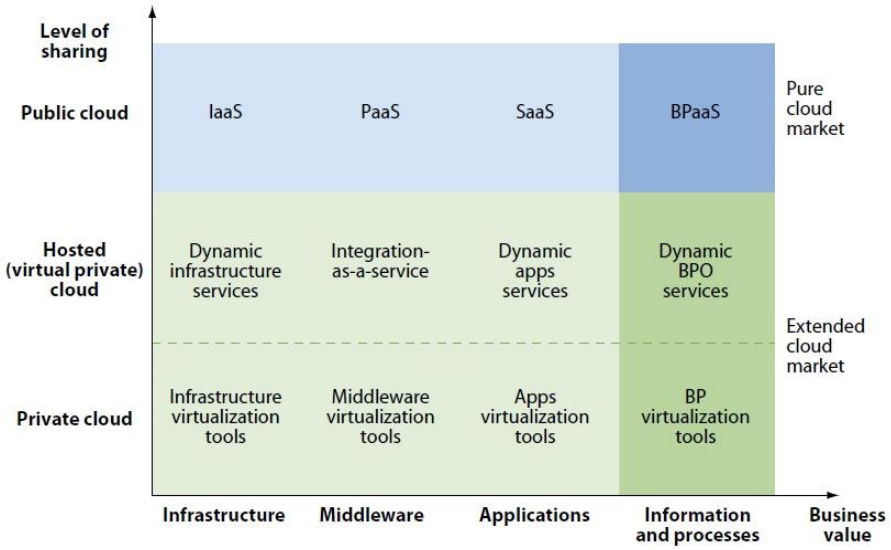


Image 5 - Cloud services taxonomy (Forrester, 2010)

1.2.4 Taxonomy adopted in this study

We will group Cloud services into three main categories: Iaas. Paas, Saas. This classification aims at providing a decent level of specificity, not far from the one offered by Gartner, while still maintaining a simple structure.

[14] Forrester (2010)

Services are grouped based on the contents they offer. They are represented in *Image 6.*

- **IaaS (Infrastructure as a Service**): this model refers to infrastructural services, including networking resourcing, storage, computing capacity, virtualization layer. These resources can be utilized in a scalable and flexible way, according to the user's real business requisites. The infrastructural resources are delivered by a provider which is external to the organization, or by the ICT Direction, based on agreed SLAs, leaving to the customer the possibility to install applications and manage them.
- **PaaS (Platform as a Service):** the PaaS model refers to a set of services that allow the customer to use platforms delivered by a provider, or by the ICT department, optimized for development, testing and delivery of different systems (application PaaS: aPaaS) and for the integration of different systems (integration PaaS: aPaaS). Tools typically included in such platform are Operating Systems, security systems, database management systems, application servers, integration services, BPM tools and software development environments. The customer controls and manages some aspects of the platform, while the underlying infrastructure is handled by the Service Provider.
- **SaaS (Software as a Service):** the final user has access to on-demand application services through the Internet technology. Applications typically delivered include individual productivity software, Enterprise Application or Unified Communication and Collaboration tools. Apps are delivered through an elastic and scalable approach by a Service Provider or by the internal ICT department to different users, both internal and external to the organization. The final user gets the software ignoring the underlying infrastructure, an can only make use of a limited set of personalization. Inside this category the Business Process as a Service (BPaaS) component was integrated, pushing SaaS to its limit, represented by a whole business process enjoyed as a service.

The NIST model will be taken into consideration concerning the implementation aspect of Cloud Computing:

- **Private Cloud:** the Cloud infrastructure is handled exclusively by the organization, which has full control of it and can satisfy even the most restrictive IT requisites. The realization

of a Private Cloud infrastructure requires big investments for the Data Center realization, besides the purchase of hardware and software resources.

- **Community Cloud:** the infrastructure us shared amongst a limited number of companies. Investments necessary to the realization of the infrastructure and its control are divided between the participants of the community.

  Hybrid Cloud: it is a combination of two or more Cloud systems.

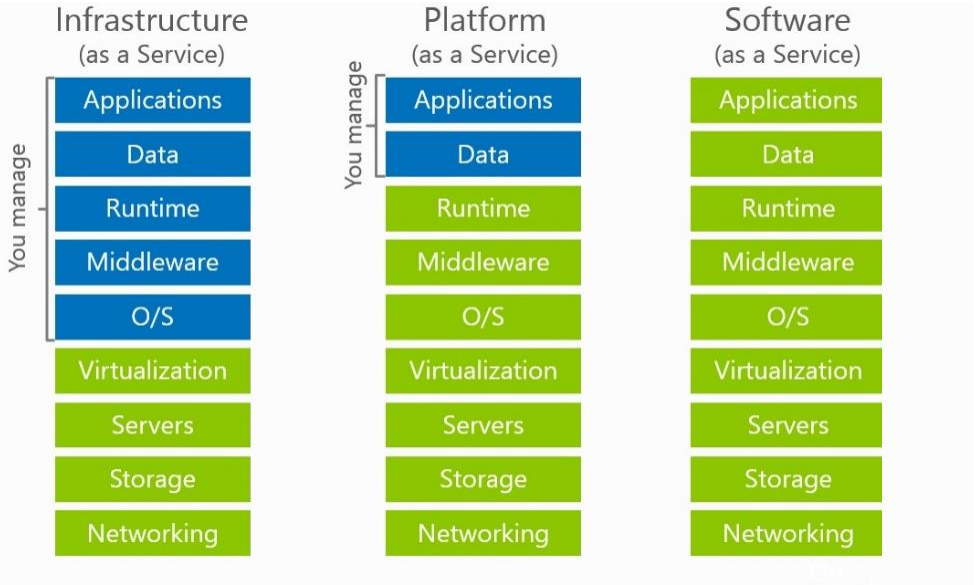


Image 6 – Service Models

1.3 The Cloud Hype Cycle

Hype is defined as "anticipatory excitement, especially when actual thing does not turn out to be as great as expected". Gartner's "Hype Cycle for Cloud Computing"[15], though, is more than a mere analysis of which things turned out to be not as great as expected; it is in fact a study

[15] Gartner (2016)

including a classification of Cloud technologies, a reflection of the expectations from the market and a review on the years we are far away from a mainstream adoption of these technologies.

Over the last few years, most organizations have become grounded in the practical benefits and risks of the Cloud. Despite continuing hype, there are ever-increasing examples of organizations achieving benefits from Cloud computing tech, regardless of industry, size and geographic region. Below, *Image 7* shows Gartner's Hype Cycle for Cloud Computing from August 2016.

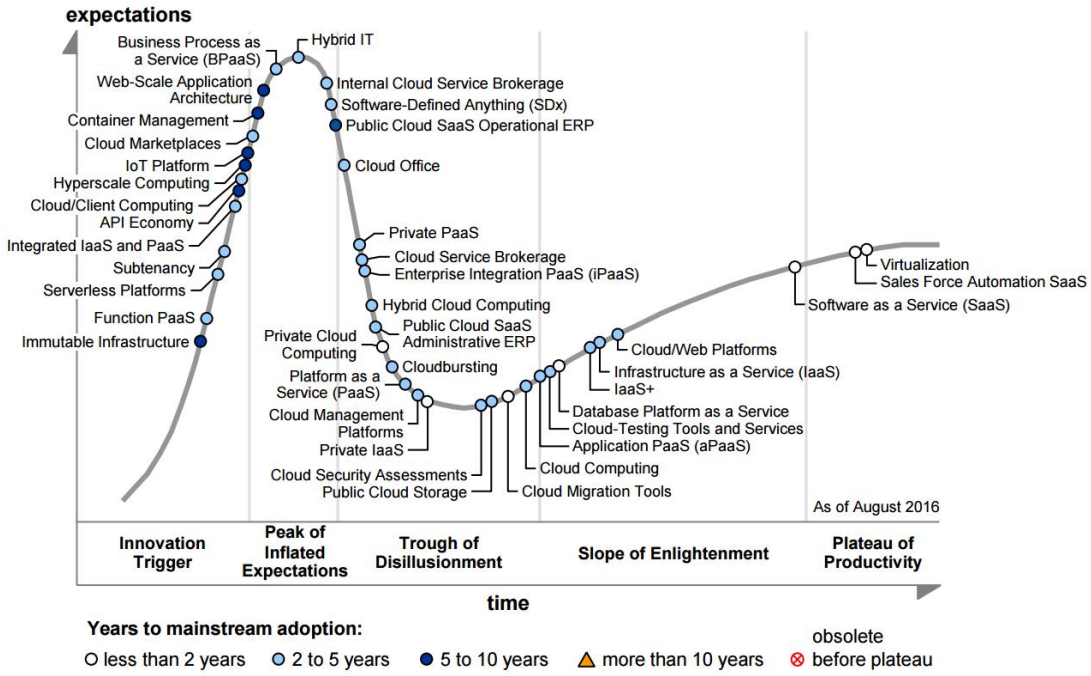


Image 7 – Gartner's Hype Cycle for Cloud Computing (2016)

On the *x*-axis we have time and on the *y*-axis expectations. The curve described is divided into five zones: Innovation Trigger, Peak of Inflated Expectations, Trough of Disillusionment, Slope of Enlightenment and Plateaus of Productivity.

We will now analyze some of the concepts represented in the graph, using punctual examples to achieve a better overall comprehension of the how the model works and why it matters

Integrated IaaS and PaaS (IaaS+PaaS) is the technology arrangement where IaaS and PaaS capabilities are offered as a unified portfolio of services. These two technologies are complementary, causing IaaS providers to expand into PaaS and vice versa. Services like AWS, Microsoft Azure and Google Cloud Platform are an example of this scenario. The awareness of the advantages of the integrated model is increasing, and more vendors are expected to jump into the market, with the inevitable inflation of promises and expectations. Once passed the hype stage, IaaS+PaaS are expected to become a common model in the Cloud industry. Mega-vendors will be the only able to provide the customer with complete suites, considering the complexity and level of investment required, while ecosystems allowing smaller PaaS specialists to be included in these offerings will be born. While the market penetration is still very low for this subset, the expected benefits for organizations are high, as a well-functioning combination of IaaS and PaaS will allow great flexibility with the balance of control and ease of use.

An IoT Platform is software that facilitates operations involving IoT endpoints (devices, sensors, multidevice systems) and enterprise resources. Enterprises' increasing adoption of IoT and digital technologies boosts the hype around IoT platforms, while the increased deployment of IoT projects pushes IoT towards the Peak of Inflated Expectations. Practical experience will eventually conduct the sector to mainstream productivity and maturity. The business impact of this kind of products and services will be great (or, as Gartner says, "transformational"): there is significant business opportunity to achieve greater value and make better decisions from the insights, information and data generated by instrumental devices, and to provide better control of things distributed across the enterprise and its external stakeholders. The maturity of the sector is very low and the market penetration is estimated to be lower than 5%.

Software-Defined Anything (SDx) is a term that encapsulates the market momentum for improved standards for infrastructure programmability and data center interoperability that are driven by automation inherent to the Cloud. Software defined networking (SDN) started the trend of SDx terminology. SDx is seen by vendors as a way to abstract the infrastructure away from the software, but true standards in the market are weak and so is interoperability, while mechanisms for defining and policing standards, which are emerging, are far from being mature.

One of the most advanced standards is OpenStack, which defines APIs and functionality of the infrastructure which is supported by many vendors. Even though vendors will always list openness as a target, their interpretations of SDx technologies may be anything but open. SDN, SDDC (software defined data center), SDS (software defined storage), SDC (software defined compute) and SDI (software defined infrastructure) technologies are all trying to maintain leadership and defend margin in their respective domains. The benefit is expected to be overall high for the Cloud industry, but the market penetration is estimated to be between 5% and 20% of the target.

Integration platform as a Service (iPaaS) is a cloud service that supports application, data and process integration projects, usually involving a combination of cloud services, mobile and on-premises systems. iPaaS offerings are mainly used for Cloud service integration (CSI), but some organizations have also adopted iPaaS as a complement to traditional on premise integration platforms. While many providers supply stand-alone iPaaS offerings, the functionality is also often provided as an embedded feature. Thousands of companies every year adopt iPaaS offerings, while the revenues are growing at a high rate, but the offer fragmentation, with 50 main iPaaS providers, the lack of skills on the market and the not consolidated best practices will slow down the sector. The maturity of the technology is low, while the benefit rating Gartner attributes is high.

We have already defined IaaS in this study. Cloud IaaS is used to address a broad range of use cases and in some companies may get to the point to eliminate the traditional data center. We can thus consider IaaS as a mainstream technology with transformational potential impacts on companies. IaaS is frequently used as test and development infrastructures for pilot projects, rapid application development environments and formal lab environments. Although global demand is robust, the offer is fast growing only in the North-American market, due to the lack of strong competitors outside of the continent. From the customer's side, benefits are expected to be significant especially for small or midsize businesses, while larger enterprises will benefit mainly from greater flexibility rather than cost reductions. Over the long term, more system management tasks will be automated, leading to more efficient infrastructure management.

Sales Force Automation (SFA) applications provide capabilities for managing accounts, contacts, opportunities, pipelines, marketing and selling processes. The provider delivers an application consumed by all contracted customers at any time on a pay-per-use basis. Companies with low budget and that want to get a system simply and quickly deployed should consider SFA SaaS. The benefits of SFA SaaS include fast deployment time, improved sales visibility and integration with external data systems. The market penetration is high and the sector is mature.

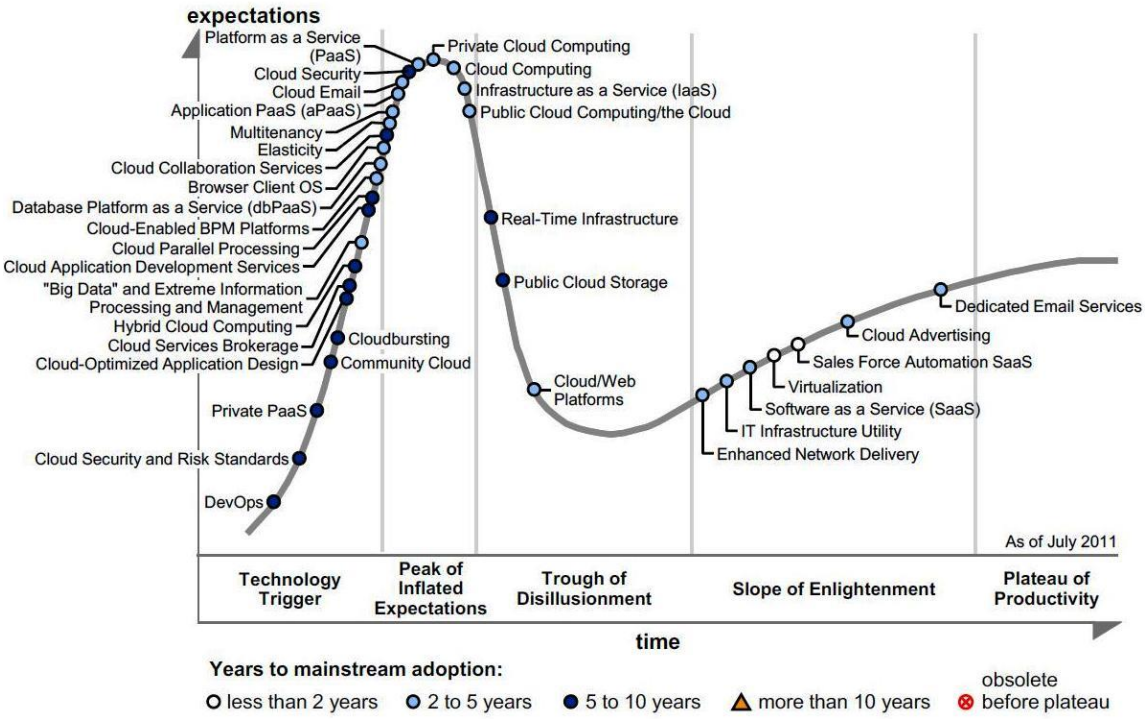


Image 8 – Gartner's Hype Cycle for Cloud Computing (2011)

From a quick comparison with the Hype Cycle for Cloud Computing proposed by Gartner in 2011[16], shown in *Image 8,* we can understand how the level of interest towards a determined technology has changed over time. For example, IaaS has left the peak of the curve, leaving the spot to other concepts like SDx and Internal Cloud Service Brokerage, which is about the same that happened to the PaaS services. No technology has reached the right part of the graph out of the blue: Virtualization, SFA and SaaS, which are (or are getting to) the Plateau of Productivity

[16] Gartner (2011)

section, were almost there in the 2011 version of the curve, too. SaaS joined the other two concepts in the "white circles" group, estimated to be less than two years from mainstream adoption. In the same paper Garter presents a "Priority Matrix", which is a table providing a classification of the same technologies introduced in the Hype Cycle, classified according to the expected benefit to the end users and the years missing to mainstream adoption. What this graph adds to the previous one is the expected benefit. Below in *Image 9* is the 2016 version.

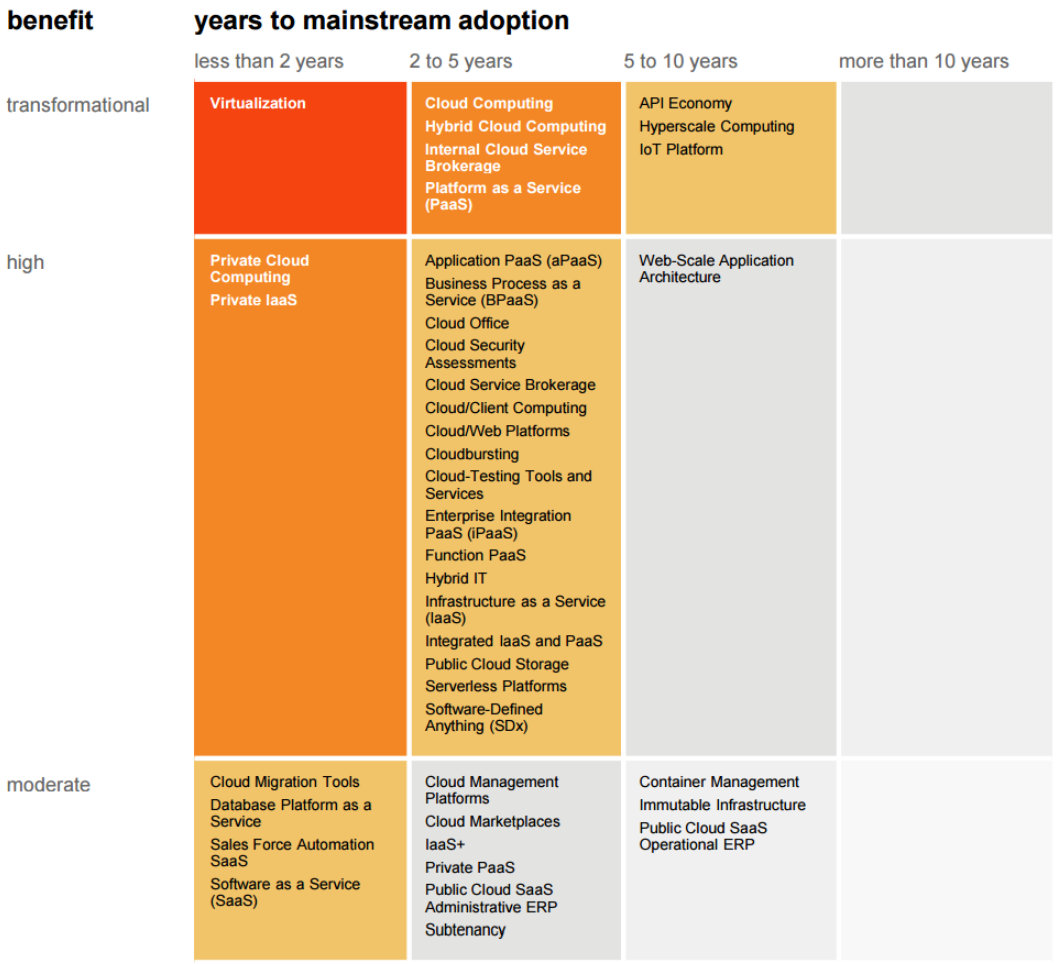


Image 9 – Gartner's Priority Matrix for Cloud Computing (2016)

Most Cloud concepts are two to five years away from mainstream adoption. Comparing this version with the one from 2011, we notice that both of them place Virtualization in the hot zone, top-priority for companies. Virtualization is the abstraction of IT resources that masks the

physical nature of those resources from the end users (an IT resource can be a server, a client, storage, network, app or OS). Gartner thus suggests companies to pay attention to this concept and to implement virtualization technologies in a proactive way.

1.4 Market Trends and Adoption Levels

Calculating the exact rate of adoption of Cloud systems inside organizations is not as easy as may seem, due to different research approaches, compositions of data sample, survey structures, taxonomies, time frames during which the research was performed and numerous other factors.

1.4.1 Worldwide Estimates

Trend figures for the Cloud adoption are often double digits: according to Forbes, worldwide spending on Public Cloud services will grow at 19.4% compound annual growth rate from nearly $70B to more than $141B in 2019, while IDC (International Data Corporation) says that vendor revenue from sales of infrastructure products (server, storage and Ethernet switch) for Cloud IT, both public and private, grew by 23.0% year over year to $7.6B in the third quarter of 2015.

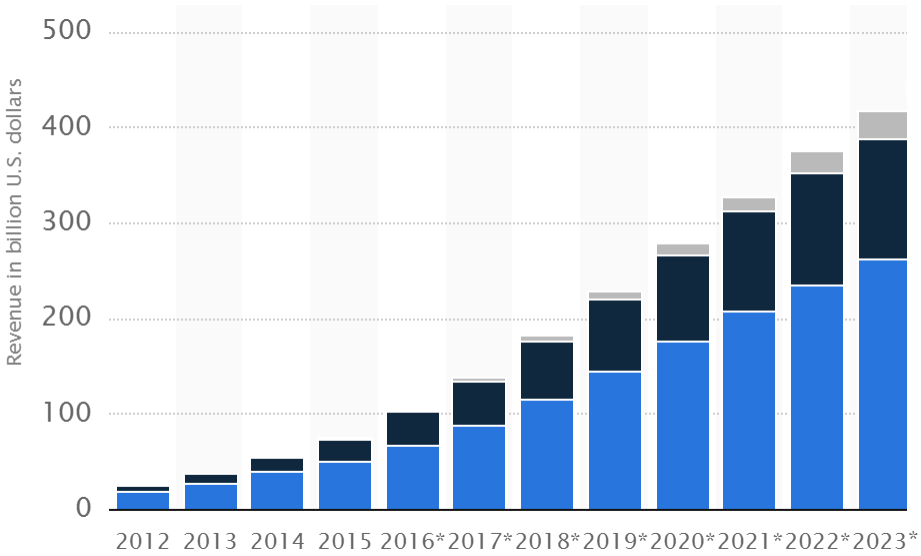


Image 10 - Revenue (actual and estimated) in billion $ for Cloud technologies

Image 10 provides a visual proportion of how SaaS, IaaS and PaaS are behaving in the market, and their prediction for the next years to come.[17]

According to a study of Gartner's from 2016, the highest growing market is represented by IaaS, projected to grow 38.4% in 2016. The graph above seems to confirm the forecast, with the darker blue rectangle growing larger faster than the other sections.

Cloud advertising (not in the graph), which is the largest segment of the global cloud services market, is estimated to be growing 13.6% in 2016, to reach $90.3B. Far behind in terms of revenue we have BPaaS, an extreme form of SaaS (they are, in fact, grouped together in the same lighter blue section of the graph). BPaaS is a market worth $42.6B. SaaS ($37.7B in revenues expected in 2016) is thought to be growing 20.3% in 2016: as software vendors shift their business models from on-premises licenses to public cloud-based offerings, the trend will continue. Moreover, the entry of some big software vendors into the public cloud in the recent years will fuel growth of the SaaS market going on.

After taking a look at absolute figures, some surveys give us the chance to analyze internal dynamics: for example, it is quite impressive that the whole Private Cloud market is worth $7B in implementations, even smaller than the IaaS Public Cloud leader AWS ($7.9B in 2015)[18].

[17] Statista (2016)
[18] Wikibon (2016)

IDC predicts external cloud adoption will increase from 22% to 32.1% in 24 months, a 45.7% growth in just 2 years: as prices go down and the offer grows wider, managers tend to abandon their fears about sending their data outside of the organization.

Taking a look at numbers from market leaders, Morgan Stanley predicts Microsoft cloud products will be 30% of its revenue by 2018, while in 2015 AWS generated $7.88B in revenue with Q4 2015, up 69% over last year.

1.4.2 The Italian situation

In this section we will analyze the Italian situation, working on data provided by the "Osservatorio Cloud Computing e ICT-as-a-Service" of the School of Management, Politecnico di Milano (2016)[19].

These data come from the analysis of 910 companies, of which 12% had a big size (more than 249 employees), 43% a medium size (from 50 to 249 employees) and 45% a small size (less than 50 employees). The most represented sector (50% of the sample), in line with the segmentation of the Italian market, is the manufacturing industry.

[19] "Osservatorio Cloud Computing e ICT-as-a-Service" of the School of Management, Politecnico di Milano (2016)

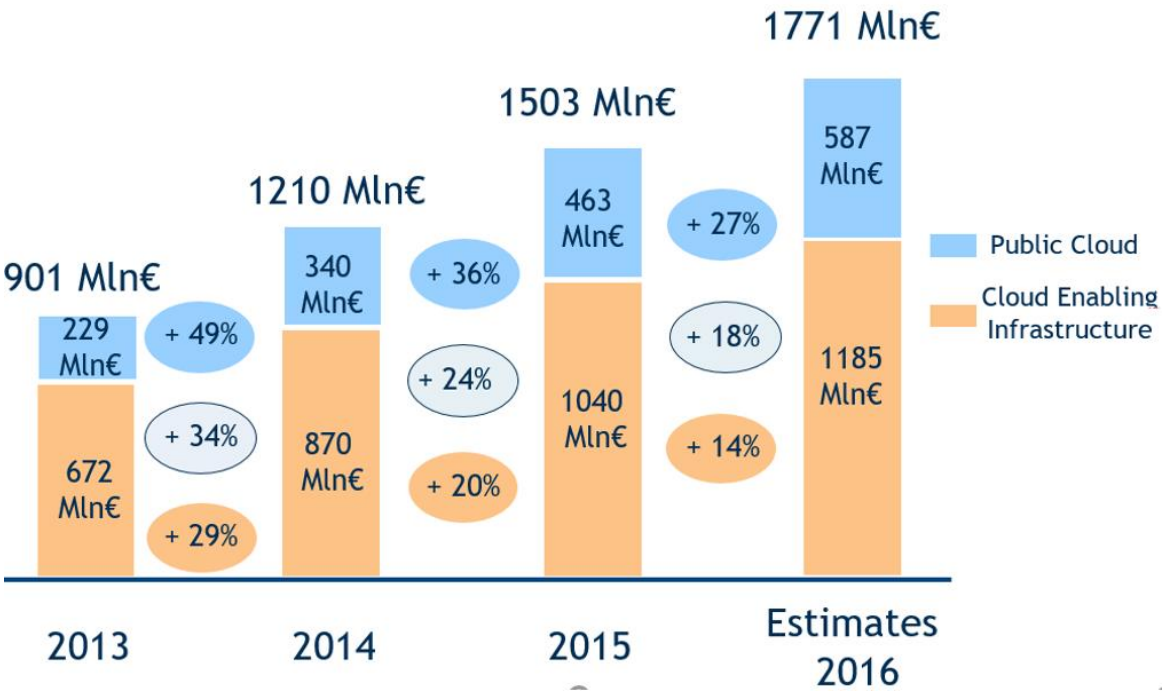


Image 11 – Actual and estimated Cloud market growth, Osservatorio Cloud Computing e ICT-as-a-Service of the School of Management, Politecnico di Milano (2016)

Image 11 shows the growth of the market, both in hardware/software enabling infrastructure and in the Public Cloud sector. Even though the market is still growing at high rate, the gain is slowing down, showing a situation in which Cloud Computing adoption is starting to be more mature than its early adoption stages.

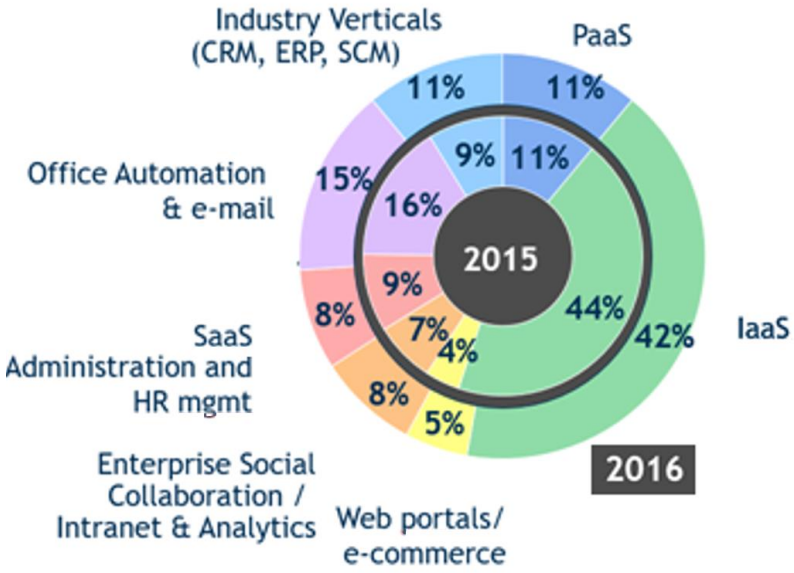


Image 12 – 2015 and 2016 market segmentation Osservatorio Cloud Computing e ICT-as-a-Service of the School of Management, Politecnico di Milano (2016)

Image 12 shows how in year 2016 no major variation in the distribution of the segmentation of Public Cloud is expected. The difference between the two years is not substantial, so no real trend can be foreseen.

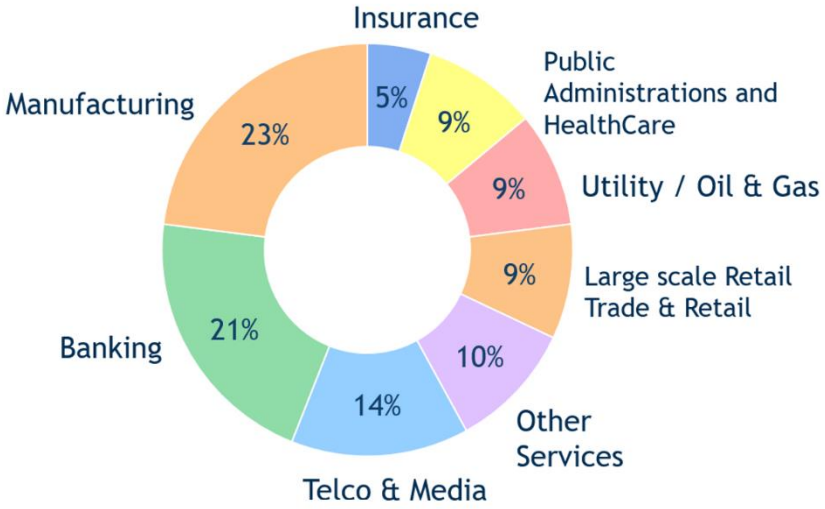


Image 13 – 2016 market segmentation, Osservatorio Cloud Computing e ICT-as-a-Service of the School of Management, Politecnico di Milano (2016)

Image 13 shows how 23% of the Public Cloud is related to the manufacturing sector. Let's keep in mind that this sector represented 50% of our sample, so this datum is quite low. This is no surprise, as sectors like banks, telco and medias, services or insurances are by nature more oriented to IT innovation, especially because of data analysis requirements. Also, the manufacturing industry is dominated by small and medium sized organizations, which, as already discussed in this study, are less keen on sending data outside of the perimeter of the organization.

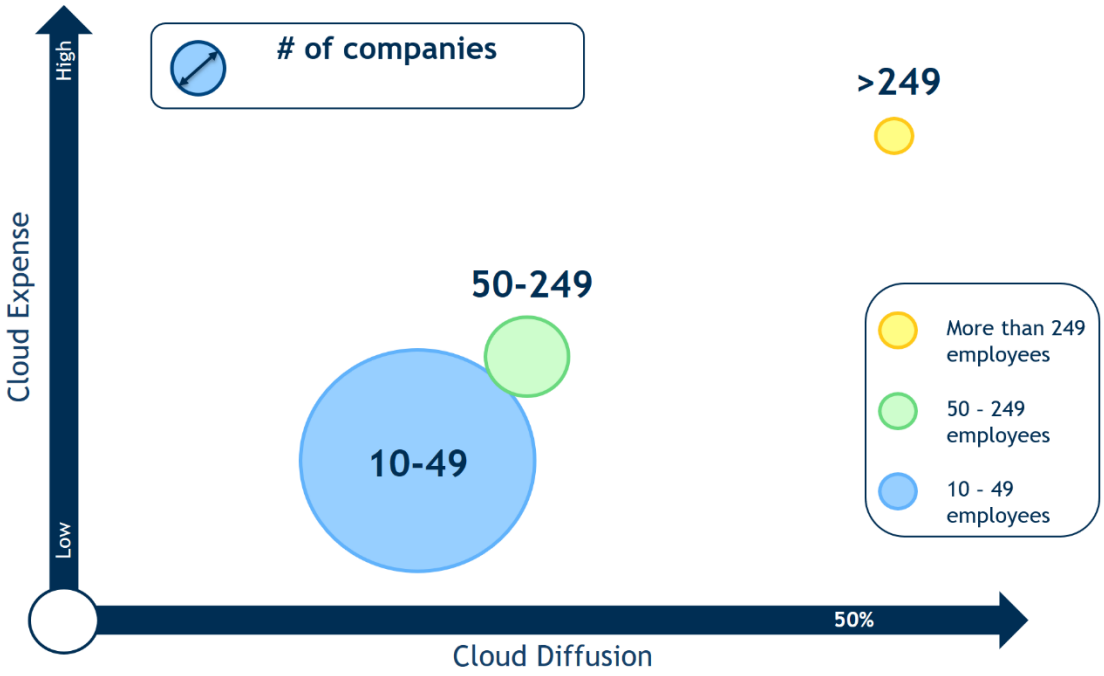


Image 14 – Cloud Expense and Cloud diffusion, Osservatorio Cloud Computing e ICT-as-a-Service of the School of Management, Politecnico di Milano (2016)

As we would expect, expenses in Cloud Computing and its diffusion are mainly proportional *(Image 14).* The diameter of the circles shows how small sized companies are dominant in the Italian market.

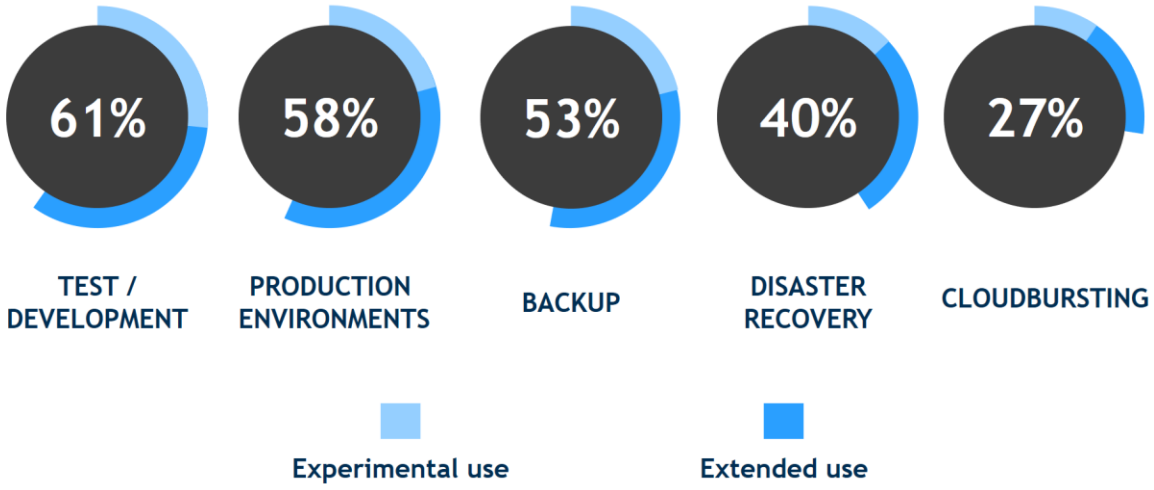


Image 15 – IaaS utilization, Osservatorio Cloud Computing e ICT-as-a-Service of the School of Management, Politecnico di Milano (2016)

Cloud bursting[20] is mainly used extensively, while experimental use is very limited, as shown in *Image 15.* This could mean that a big part of the potential audience for this use of IaaS has been already reached. On the other hand, about half of the test/development, production and backup use is related to an experimental use, which could mean that these uses will have high growth rates in the years to come.

[20] Cloud Bursting is an application deployment model in which an application runs in a private cloud or data center and bursts into a public cloud when the demand for computing capacity spikes. The advantage of such a hybrid cloud deployment is that an organization only pays for extra compute resources when they are needed.

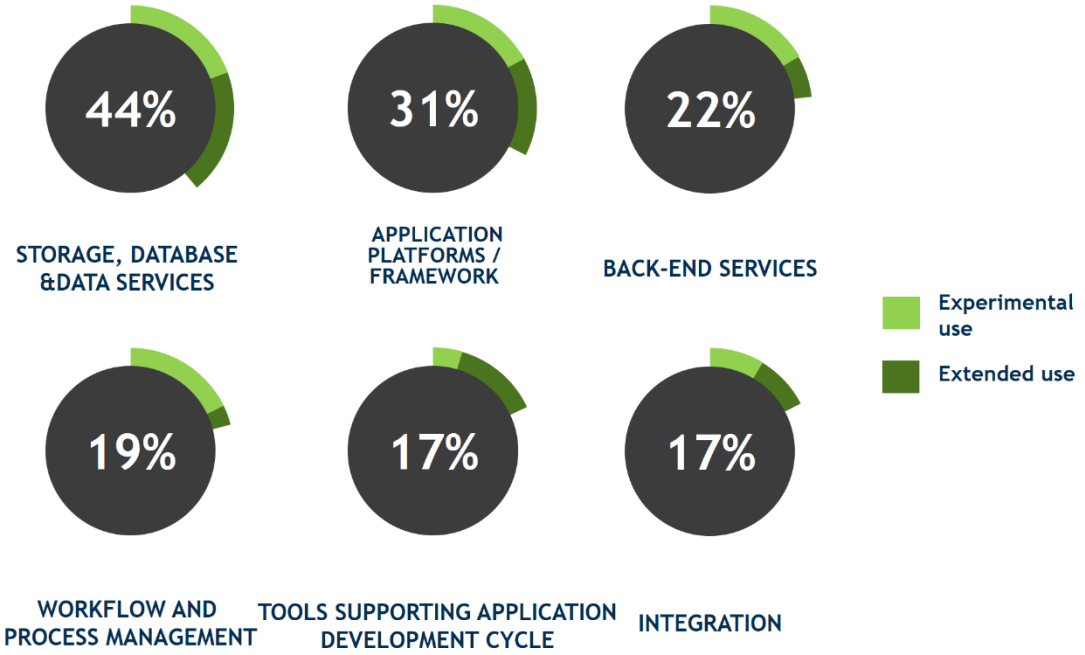


Image 16 - PaaS utilization, Osservatorio Cloud Computing e ICT-as-a-Service of the School of Management, Politecnico di Milano (2016)

With similar considerations, in regard of PaaS we can predict that back-end, workflow and process management services, mostly explored with an experimental use, still have a long way to go (*Image 16*). Vice versa, the tools supporting the application development cycle might have reached a plateau.

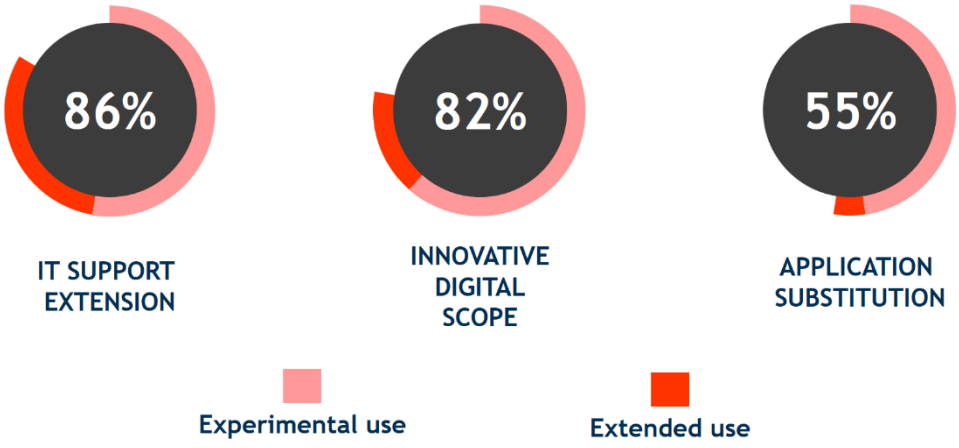


Image 17 – SaaS utilization, Osservatorio Cloud Computing e ICT-as-a-Service of the School of Management, Politecnico di Milano (2016)

Talking about SaaS, the complete substitution of application through Cloud Services is still unexplored, meaning that 55% is going to grow a lot over the next few years (*Image 17*).

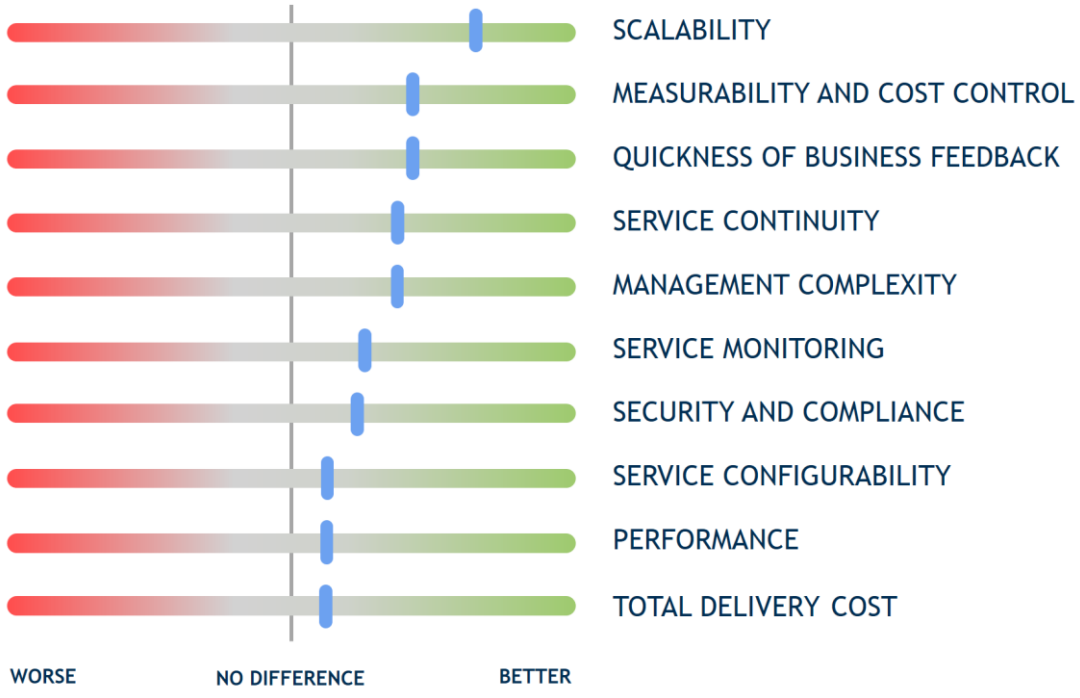


Image 18 – IaaS as perceived by managers, Osservatorio Cloud Computing e ICT-as-a-Service of the School of Management, Politecnico di Milano (2016)

Image 18 shows how companies interviewed perceive IaaS, compared with on premise services. Overall, no criteria is perceived as pejorative. The possibility to have more or less capacity based on the business requisites is the most appreciated quality of Cloud Computing: the switch to Public Cloud solutions results in fact in minor investments in physical resources, allowing enterprises to pass from Capex investments to variable operative costs (Opex) in a pay-per-use model. Scalability is followed by the chance to measure and control costs, while the possibility to deliver quick feedback to business functions is also considered a big plus.

Managers also refer a decrease in the level of complexity of the system: this allows IT departments to have a lighter structure and reducing overall costs. Many activities such as IT resources management, maintenance and system updates are not necessary. Companies can so refocus on core competencies: resources that would be used to maintain an IT department can work on other essential areas of business.

Total delivery cost, on paper a big advantage of Cloud Computing, is surprisingly perceived as almost unchanged between the two technologies. This may be related to non-optimized utilization of the system, or to the gap in competencies many companies still have.

Analyzing some aspects not deepened in the survey, besides their inherited features of mobility and accessibility, cloud-based systems can also boast higher levels of user friendliness and usability. For example, Salesforce provides users with a mobile app version of its SaaS platform called Salesforce1, allowing the management of Sales and Customer Service modules in mobility. As for disaster recovery and system availability, Cloud providers in many cases ensure tools such as backup routines, fallback and recovery procedures of higher quality than most on premise systems. Finally, the pay per use model allows final customers to “pay-as-you-go”, transferring the risk related to complexity, sizing and realization of Cloud systems to providers, who must

adapt to the new revenue models and develop effective strategies to make the most of the investments sustained.

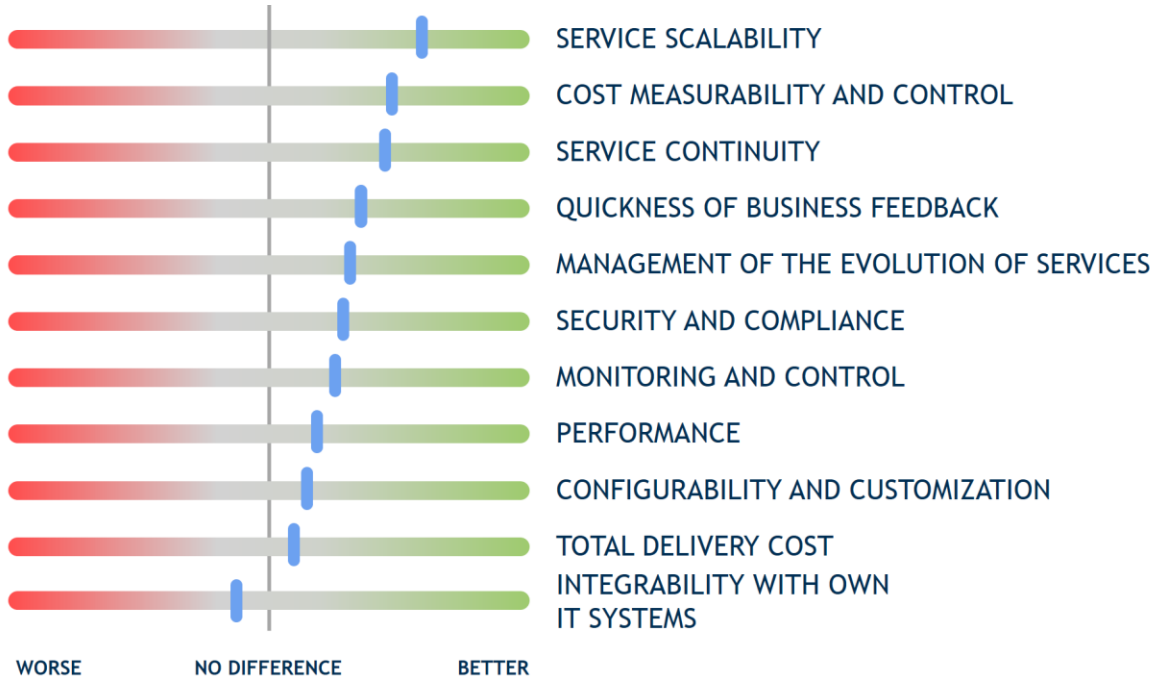


Image 19 – PaaS and SaaS as perceived by managers, Osservatorio Cloud Computing e ICT-as-a-Service of the School of Management, Politecnico di Milano (2016)

For SaaS and PaaS, the same considerations are applied to the factors analyzed in the previous paragraph, as shown in *Image 19.* Scalability is still the most appreciated characteristic of Cloud Computing, while companies still find it difficult to integrate Cloud systems with on premise already in use systems. In this regard, 46% of companies still have no integration at all between said systems. Cloud technologies still have a long way to go when we talk about integrability with on premise software and architectures.

The localization of data centers and doubts related to privacy and security, especially for small and medium sized organizations, are among reasons slowing down the adoption of Cloud technologies.

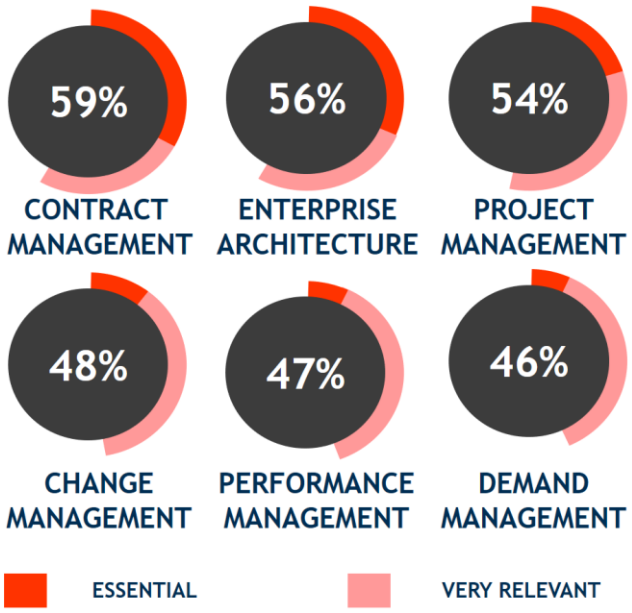


Image 20 - Urge for new competencies as perceived by managers, Osservatorio Cloud Computing e ICT-as-a-Service of the School of Management, Politecnico di Milano (2016)

55% of interviewed managers declared the urge to have new competencies in the company (*Image 20*) . Unsurprisingly, most of them, as show in the graph, are not "coding" competencies. In Chapter 4 (see Salesforce case study) we will see that many Cloud applications are *de facto* reducing companies' need for programmers, providing an easy configurable system.

As Public Cloud is by definition a Service provided by an external society, contracts are an important piece of the puzzle. It's no surprise, then, that contract management is an essential skill required by most companies.

Chapter 2

Research methods and data analysis

The goals of the research and the methodology used in this study will be presented in the following Chapter. In particular, a review of the survey performed by the "Osservatorio Cloud Computing e ICT as-a-Service" of the School of Management of Politecnico di Milano, which led to the results and data presented in Chapter 1, will be performed. Finally, the methods of research applied during the submission of the questionnaire presented inside Milan Consulting will be discussed.

2.1 Research Goals

Following is a list of the purposes of this study:

- analyze the elements of discontinuity that the Cloud Computing takes to the Enterprise IT world;
- analyze the level of diffusion of elements delivered "as a Service" and delivery choices;
- analyze the elements of discontinuity Cloud Computing takes to the different players of the market and represent such elements in a chain model;
- analyze how companies positioned at different levels of the model are reacting to the Cloud innovations and the relationships among them;
- represent such relationships in the chain model;
- make the representation dynamic, through the observation of differentiation and integration strategies and relevant partnerships;
- validate the model through the case study of a medium sized Italian IT consulting company.

2.2 Analysis of Literature

The first Chapter of this study was based on academic papers, studies and surveys already present in the literature. We went through definitions of the Cloud Computing provided by influential organizations and later we briefly analyzed the worldwide diffusion of such technologies and estimates for the years to come. Much more space was then given to the same considerations, at an Italian level. In chapter three, relevant models for the Cloud Computing chain will be reviewed, while an enhanced model of the one presented by the "Osservatorio Cloud Computing e ICT-as-a-Service" of the School of Management, Politecnico di Milano, will be presented. The same institution also provided the survey material for the above cited analysis of the Italian situation (deepened in next paragraph), while other sources include academic papers, studies

and data from influential companies and institutes (like NIST, Gartner and Forrester) and information gathered during workshops.

2.3 Survey data

In Chapter 1 we had an overview of the Italian Cloud situation and the perception of the new technologies. Data were provided by the "Osservatorio Cloud Computing e ICT-as-a-Service" of the School of Management, Politecnico di Milano. The survey was conducted in 2016 and the sample of companies was composed of 910 participants.

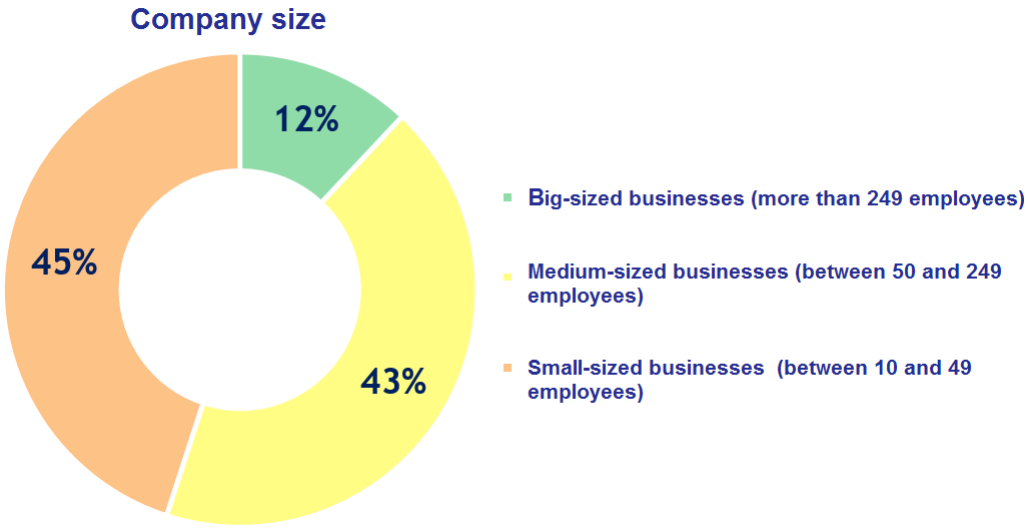


Image 21 – Size of surveyed companies

Proportionally with the Italian pattern, where "PMI" are prevalent, big-sized businesses with more than 249 employees were a minority, while the biggest slice of the cake was equally occupied by medium-sized and small-sized businesses, as shown in *Image 21.*

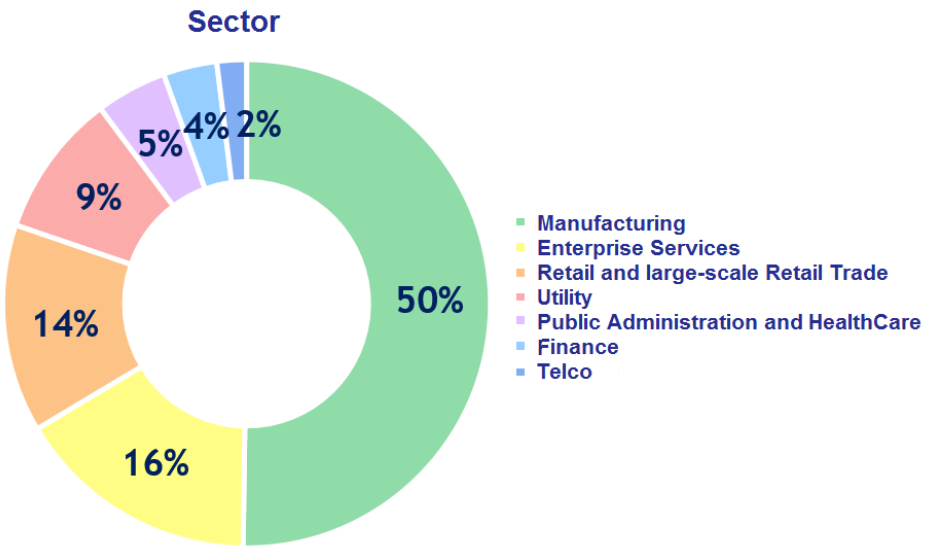


Image 22 – Sector of surveyed companies

Manufacturing companies represent as much as 50% of the surveyed sample. The other half is populated by enterprise services, retail and large-scale retail trade, utility companies, public administration and healthcare, finance and telco industries. Data are displayed in *Image 22.*

As for the part of this huge survey which was discussed in this study, the results were used to analyze several aspect of the impact of the Cloud industry in Italy, like adoption levels, with historical data and forecast for the current year, the proportions amongst the sector to which the companies utilizing the cloud belong, the use cases for Cloud technologies (both experimental and extended), the value perceived by managers over on-demand systems and the new competencies needed in the enterprise.

2.4 Analysis of Companies in each sector of the Chain

Chapter 4 represents the core of this study. It will analyze in deep strategies of players positioned all over the Chain. The sample was composed of thirty-two players, of which twelve which

provide technologies enabling the Cloud Computing paradigm, ten whose core business is represented by the development, integration, aggregation or delivery of Cloud Services and other ten actors specialized on system integration and training or IT consulting services.

In particular, for each of them there will be:

- a brief description;
- a review of the strategy of the society, in regards of the Cloud Computing (this may include acquisitions or divestures, new products developed, partnerships with other players in the Chain);
- a textual and graphical mapping of the company in the new enhanced model introduced in this study.

The sources reviewed to sketch such strategies include:

- academic papers;
- analyst's reviews;
- websites of the companies and Company Profiles;
- articles by specialized websites and magazines;
- news articles.

2.5 Milan Consulting

An IT consulting company based in Milan has proactively participated in the supplying of project-related data, relevant for this study. The company name has been anonymized in "Milan Consulting".

In particular, the material needed to carry out this study has been gathered through:

- analysis of public material;
- interviews with Milan Consulting's management;
- analysis of real anonymized contract proposals provided by Milan Consulting;
- data and figures directly provided by Milan Consulting's management.

The company's website provides basic information, like a presentation section, an overview of the relevant partnerships with the Service Providers, a list of the customers that Milan Consulting has worked with. Milan Consulting is not listed in the public exchange market, which means no sensible or financial related information is displayed on the website, nor a real Company Profile can be found online.

Milan Consulting's management provided information about the company through interviews with the management. Real offers and contracts presented to the customers were also made available, depurated of company names and financial data. This helped discussing the business model of the company, creating a couple of contract templates that a big part of Milan Consulting's offer can refer to (configuration / development offers and maintenance offers) and mapping the company on the enhanced Cloud Value Chain model.

2.6 Questionnaire about Milan Consulting's strategy

To map Milan Consulting's strategy on the Cloud Value Chain model, a questionnaire has been proposed. As the questionnaire concerns the company's strategy, it has only been delivered to management figures. Due to the uniformity of the sample, no user profiling has been necessary.

The questionnaire is composed of 16 questions, aimed at mapping the company's strategy *as is* and *to be.* That's why each question was basically repeated twice, once in regards of the current situation of the company and once in regards of the future strategy.

The questionnaire is divided into three sections: the first aimed at mapping Milan Consulting's strategy on the "Providing" column of the model, the second aimed at mapping it on the "Deploying" column and the third one concerning current and future partnerships. The first two sections are composed of closed single-answer questions (Yes – No – I don't know), while the third part just presents two questions, with the possibility of selecting none, one or more answers.

The questionnaire was completed by nineteen managers and the results will be presented in Chapter 5. The questionnaire is available in the attachment section of this study.

Chapter 3

Analysis of existing models for the Cloud Value Chain and critical points

Chapter 3 reviews the main models about the Cloud Value Chain, including the one from the "Osservatorio Cloud Computing e ICT as-a-Service" of the School of Management of Politecnico di Milano of 2015. This model will also be presented in its enhanced version, in the last part of the Chapter. These models have been compared and critical points have been highlighted. Such review is preceded by the definition of the Value Chain and by a brief review of the "traditional" ICT Value Chain, which does not take into consideration the revolution of the Cloud Computing.

3.1 Definition of Value Chain

In this chapter several Cloud Computing Value Chains will be reviewed, after analyzing the ICT Value Chain as it was before the Cloud Computing. Before that, the concept of Value Chain has to be studied. A value chain is a set of activities that a firm operating in a specific industry performs in order to deliver a valuable product or service for the market[21]. The concept comes from business management and was first described and popularized by Michael Porter in his 1985 best-seller, Competitive Advantage: Creating and Sustaining Superior Performance.

In this publication, Porter presented what is today famous as Porter's Value Chain, represented in *Image 23.* Most organizations engage in hundreds, even thousands, of activities in the process of converting inputs to outputs. These activities can be classified generally as either primary or support activities that all businesses must undertake in some form.

According to Porter, the primary activities are:

- **Inbound Logistics** - involve relationships with suppliers and include all the activities required to receive, store, and disseminate inputs.
- **Operations** - are all the activities required to transform inputs into outputs (products and services).
- **Outbound Logistics** - include all the activities required to collect, store, and distribute the output.
- **Marketing and Sales** - activities inform buyers about products and services, induce buyers to purchase them, and facilitate their purchase.
- **Service** - includes all the activities required to keep the product or service working effectively for the buyer after it is sold and delivered.

Secondary activities are:

[21] Porter, Michael E. (1985). Competitive Advantage: Creating and Sustaining Superior Performance.

- **Procurement** - is the acquisition of inputs, or resources, for the firm.
- **Human Resource management** - consists of all activities involved in recruiting, hiring, training, developing, compensating and (if necessary) dismissing or laying off personnel.
- **Technological Development** - pertains to the equipment, hardware, software, procedures and technical knowledge brought to bear in the firm's transformation of inputs into outputs.
- **Infrastructure** - serves the company's needs and ties its various parts together, it consists of functions or departments such as accounting, legal, finance, planning, public affairs, government relations, quality assurance and general management.

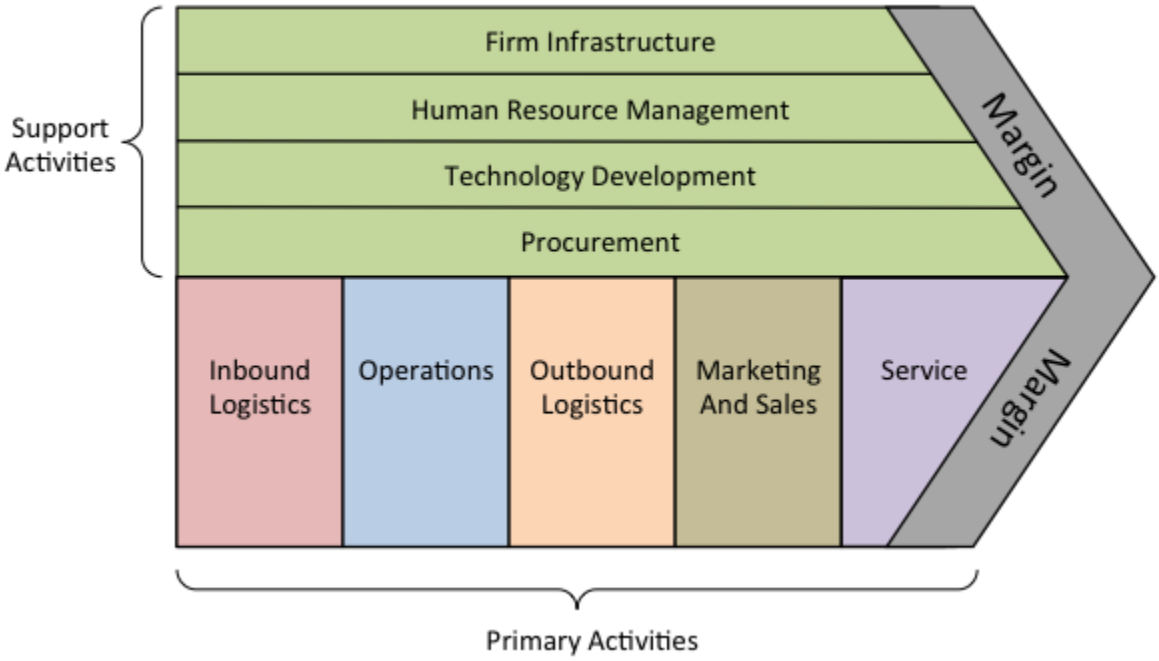


Image 23 – Porter's Value Chain (1985)

In most industries, it is rare that a single company is completely integrated vertically. Most times, organizations, are parts of a system, the Value Chain, which can be seen as a set of individual companies' Value Chains. Porter calls this the Extended Value Chain (see *Image 24*).

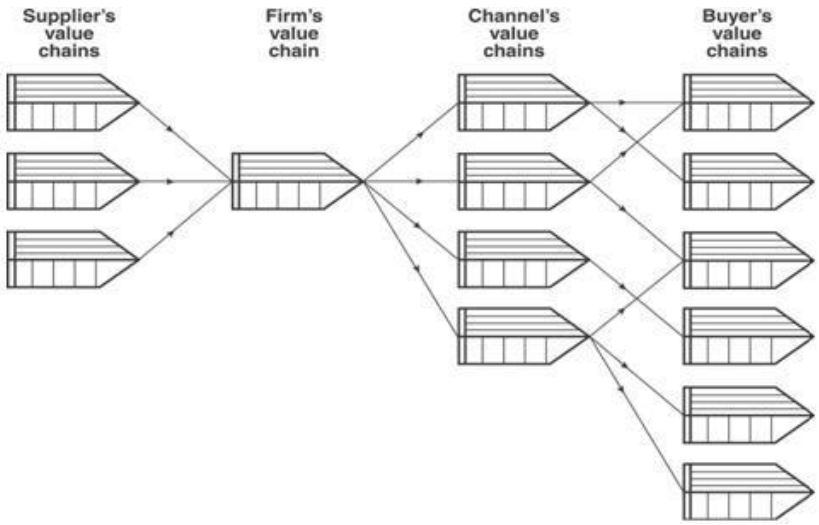


Image 24 – Example of Extended Value Chain

3.2 Traditional ICT value chain

The Cloud Computing consists of a new paradigm that allows the use of whichever informatic resource is required, delivered as a Service. This kind of revolution implies the metamorphosis of the traditional IT value chain and the transformation of the relationships between actors in the chain. It is necessary, nevertheless, to take a picture of the situation as it was before the Cloud revolutionized the IT.

First, let's take a look at the main players which have always populated the offer market. Main roles of the chain include Hardware Producers, Software Producers, Independent Software Vendors, Hardware and Software Resellers, System Integrators and Consultants, represented in

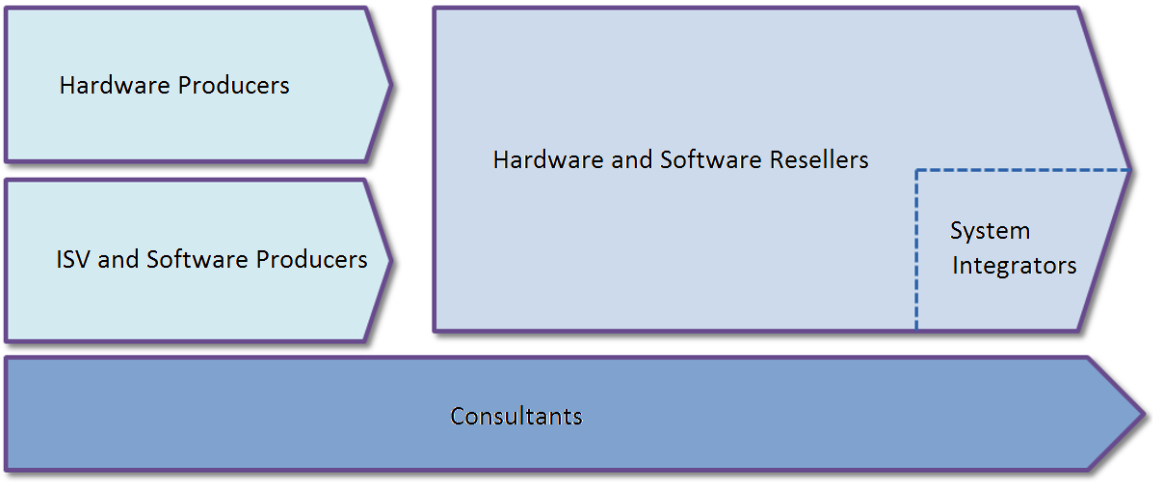


Image 25 - The traditional IT Value Chain according to the Osservatorio Cloud Computing e ICT-as-a-Service of the School of Management, Politecnico di Milano (2009)

- Hardware Producers build components like computers, servers, networking systems and other components necessary to build a data center
- Software Producers develop Enterprise Applications, some of which based on customers' requests. These actors need to know very well the sectors of their target customers and to adapt their applications to the context.
- Independent Software Vendors, starting from applications developed ad hoc for a company, later included such applications in packages in order to propose them to new customers.
- Hardware and Software Resellers trade hardware and software products or simple software packages. Moreover, they provide configuration, installation, assistance and maintenance. Applications are developed by ISV, of which this category represents the selling channel.
- System integrators take care of the integration of different systems with the goal to create a new functional structure which can used the potentiality of the starting system. The integration can be performed at an application level.
- IT Consultants support companies in the choice of how to use ICT. They have an important role and support the customer along all the steps of the project, like

requisites analysis, architecture choice, vendor selection, implementation and management. Consulting societies also provide their customers with competencies and tools they don't have internally.

3.3 Cloud Computing disruption

Cloud Computing radically changed, with its IT as-a-Service model, the Enterprise IT market. The traditional IT models need to be revised, as they cannot map correctly the changes emerged and the metamorphosis of the roles played by actors in the IT chain.

We are going to analyze this massive change, interpret it and finally understand how the Cloud changed traditional chain dynamics. The starting point of this analysis will be the problems and gaps taken to traditional IT models by the Cloud.

The first analysis might be about the duration of projects: Cloud has made implementation projects much shorter, reducing new modules and functionalities time-to-market (a survey from Sky High Networks estimated a 20% reduction in time-to-market for new functionalities)[22] and making this a primary selection driver among potential customers[23]. This is due to the fact that what before had to be done by scratch, involving the customer into the technical aspects of the solution, is now "part of the package". The customer no longer needs to care about the underlying aspects of the solution, as the big design phase takes place even before the sale of the service to the end user.

Analyzing the change in the average duration of projects, we have already introduced the second point to be taken into consideration, which is the typology of such projects: heavy technical aspects in a Cloud system implementation are usually developed by the provider, during the construction of its offer. They are transparent to the customer, which is often involved in a

[22] Sky High Networks (2015)
[23] Wall Street and Tech (2011)

personalization phase, with the consultancy of the provider, of a third party or, more and more often (thanks to the configurability of Cloud systems) on its own. This allows the company buying the service to focus more on business goals obtainable through the solution, rather than on the solution itself. Proof of this is the fact that, even though companies look for Cloud specialized IT resources, actual coding capabilities are generally less requested, while on the other hand professional figures all over the organization (even Sales, Marketing etc.) are requested some level of Cloud Computing knowledge[24].

Finally, the Cloud Computing model is responsible for the companies' shift in IT expenses of part of the Capex (Capital Expenses) to Opex (Operational Expenses), transferring *de facto* part of the investment risk from the end user to the Service Provider[25].

Such factors are leading to a reassessment of the traditional IT chain: roles have to be redefined, competitive dynamics as well, while relationships between players must be redefined. The market is just approaching a maturity phase and actors in the market are gradually getting into the new dynamics, with many of them having already identified new strategies to reposition themselves and differentiate in regard of Cloud Computing offers.

Each player has to be redesigned in this model, which will be significantly different from the traditional chain presented in the first part of this Chapter. The real element of innovation produced by the Cloud, it is important to point out, is not the fact that the infrastructure lays outside of the company's walls. In outsourcing models, in fact, this was already managed by an external provider, being virtual private Cloud models just an evolution in terms of efficiency of outsourcing ones. The real evolution is represented by IT delivered as a Service. The advantage from a customer's point of view concerns the alignment of the IT with the business requisites, besides better flexibility and cost variabilization[26]. Such revolutions imply the redefinition of

[24] Forbes (2012)
[25] Computer Weekly (2010)
[26] PwC (2010)

bargaining power between players and the needing of new competencies inside the company, as seen in Chapter 1.

3.4 Redefined chain models after the Cloud Computing revolution

In the previous paragraph we went through the problems and gaps taken to traditional IT models by the Cloud. Here, the models proposed in the literature will be reviewed. Such models have been provided by NIST, which has the goal to defined technology standards, by academic institutions and by private consulting companies. After analyzing them in deep, conclusions will be taken in a comparative final paragraph.

3.4.1 NIST's "Cloud Reference Architecture"

The National Institute of Standard & Technology (NIST) designed in 2011 a model called Cloud Reference Architecture, with the aim of defining the main actors, roles and activities inside the chain of Cloud Computing. The model is represented in *Image 26.*

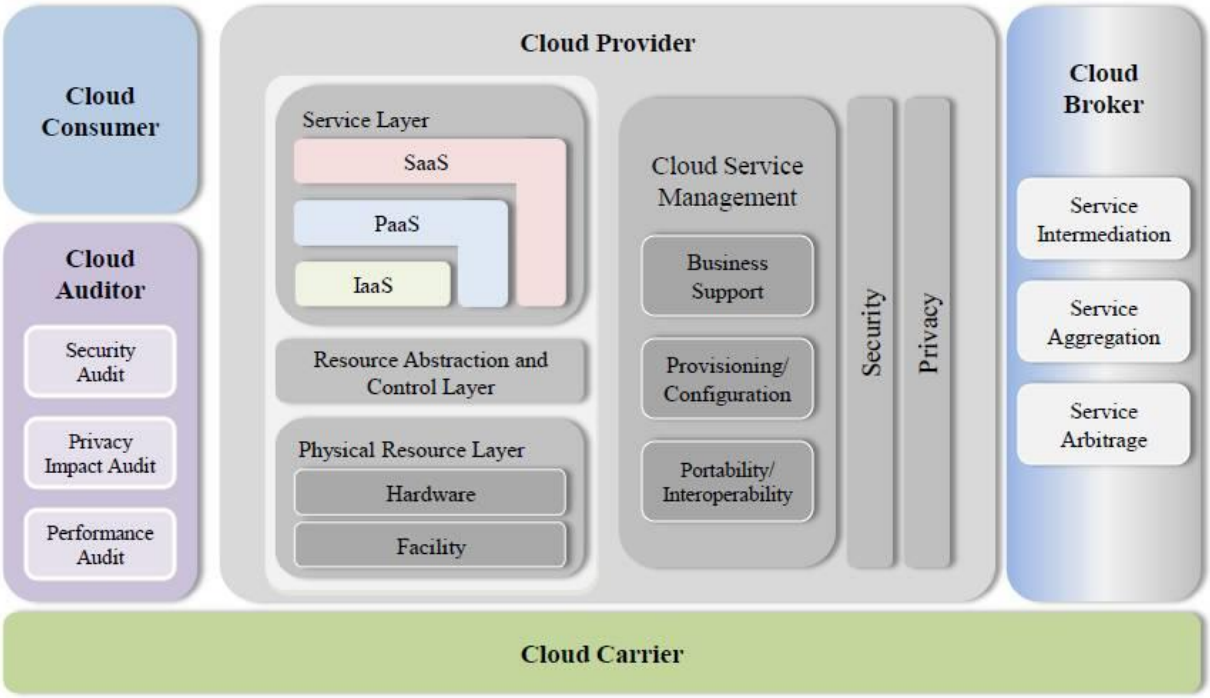


Image 26 – Cloud Reference Architecture (NIST, 2011)

Each macro block represents a main role in the new model: we have the Cloud Provided, surrounded by the Cloud Consumer, the Cloud Auditor, the Cloud Carrier and the Cloud Broker.

- The Cloud Consumer is the final user, individual or organization which buys and uses Cloud services directly from a Cloud Provider or through a Cloud Broker. The end customer typically chooses services he needs through catalogues and the parameters for the choice will include price and SLA. These components are usually not negotiable. The customer pays according to factors such as number of users, number of IP addresses used, usage time (virtual machine CPU, database, platforms), and, in general, of the used resource.
- The Cloud Provider provides Cloud services and has the responsibility to make the service available to the end customer. According to the type of service, the task is to configure and update the application, guarantee the functioning of the infrastructure and respect

the SLA. The activities of the Cloud Provider are grouped into five main categories: service deployment, service orchestration, cloud service management, security and privacy.

- The Cloud Broker takes care of the intermediation and management of the relationship between the Cloud Consumer and the Cloud Provider. With the growth of services delivered as a Service, the integration between the different options is getting more and more difficult for the end user to manage. This subject can, thus, turn to brokers to overcome this difficulties. The categories of Cloud Brokers are, according to NIST, three: the Brokers who offer Service Intermediation (it consists of a value added service through the personalization of a feature of an existing Cloud service), those who provide the end customer with Service Aggregation (integration of multiple Cloud-based Services) and Service Arbitrage (similar to aggregation, but the Broker chooses the services to aggregate, without having them imposed by the end customer, for which they may even be transparent),
- The Cloud Auditor offers the precious service of controlling Cloud Services. The revision concerns aspects such as security, privacy and performance. The security auditing is a fundamental service, consisting of the verification of the normative and of the rules about data confidentiality and integrity. This control can result in actions both towards the customer and the provider[27].
- The Cloud Carrier is considered as the vector of the Service, because it enables the connectivity and the data transfer between customer and provider, through its own network and telco infrastructure. The Cloud carrier has to respect levels of service agreed with the provider, which in turn has to rely on them to respect their own, agreed with the final user.

Image 27 represents NIST's "SLA chain".

[27] Chief Information Officers Council (2010)

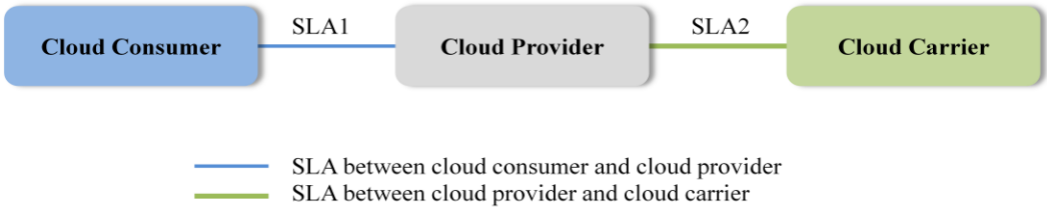


Image 27 – "SLA chain" (NIST, 2011)

NIST summarized these considerations in the graph reported below (*Image 28*), which represents its idea of Cloud value chain.

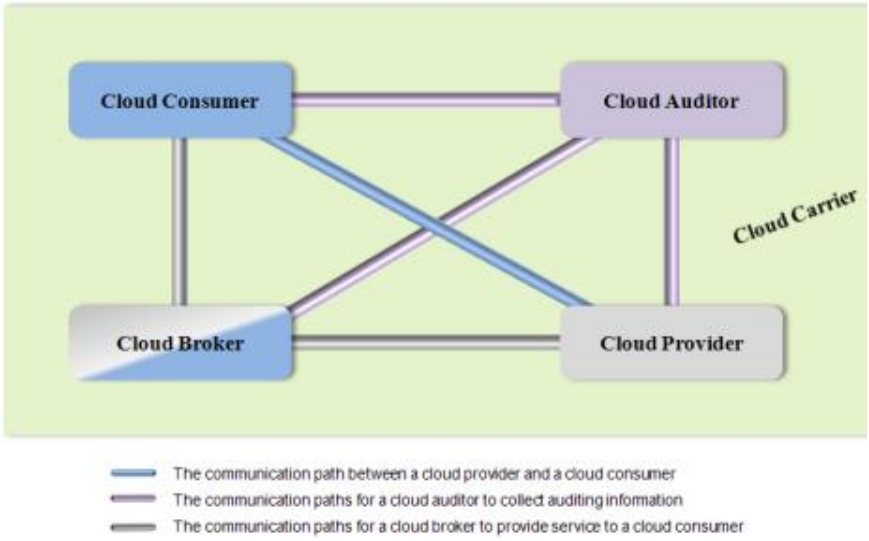


Image 28 – Cloud Computing market relationships (NIST, 2011)

3.4.2 IBM's Cloud Reference Architecture

IBM gave to its model the same name[28] as NIST's, but the differences are noticeable. Being IBM a consulting company, its model was developed analyzing Cloud projects performed by the company over the users and shows roles and functionalities of the main actors of the market. First of all, the model defines the architectural elements and the guide lines to realize a Cloud

[28] IBM (2014)

environment. The definition of “Cloud Service” given is any IT service delivered by a Cloud Provider to a Cloud Service Consumer.

Such services are defined as self-service, on-demand, based on shared resources, elastic and easily measurable. Besides the classic IaaS, PaaS and SaaS, IBM includes in its classification BPaaS, defining them as business processes delivered through the Cloud. IBM defines three main actors and their roles in the Cloud Computing chain. *Image 29* shows IBM’s model and actors.

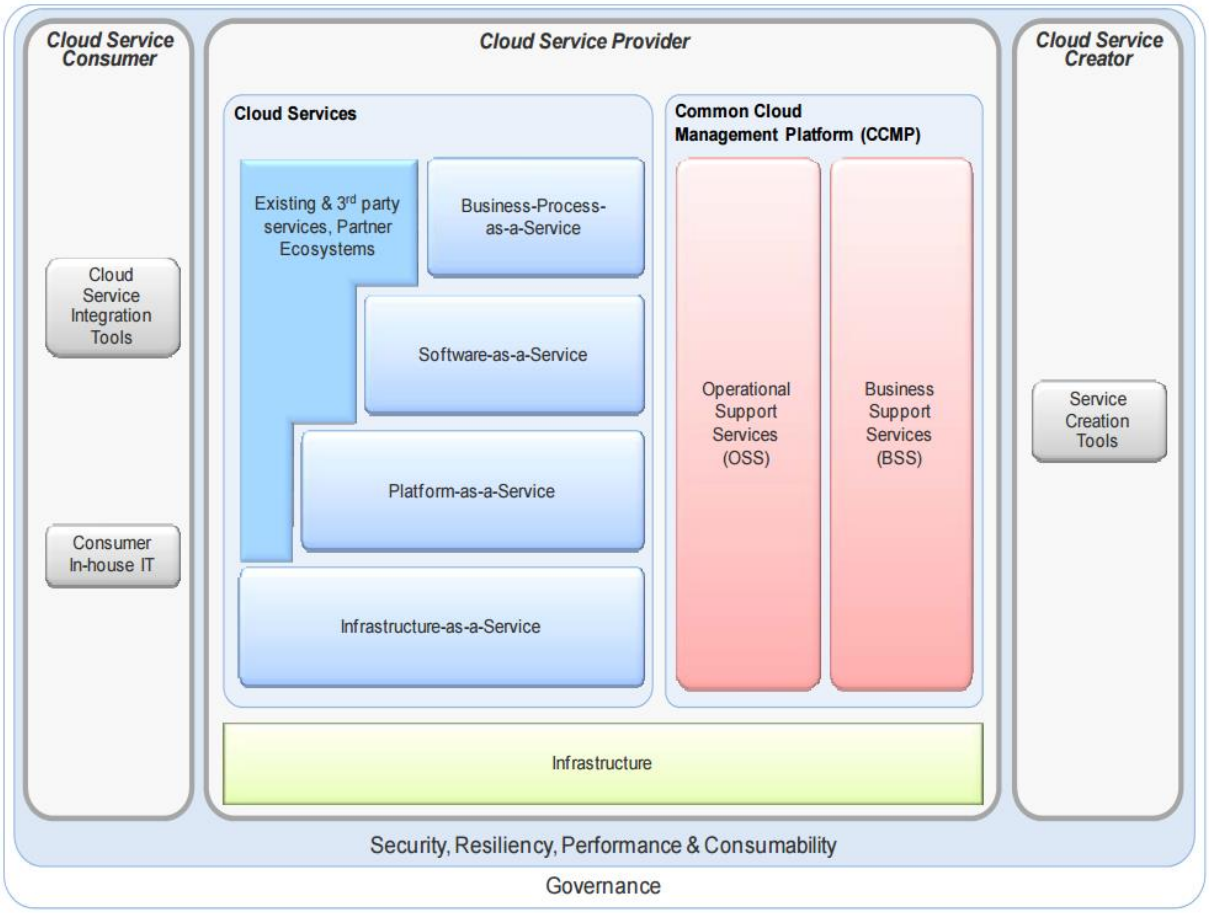


Image 29 – Cloud Reference Architecture (IBM, 2014)

The model defines three main roles:

- The Cloud Service Consumer uses the Services provided by the Provider. The Cloud Service Consumer can use a Cloud Service Integration Tool to integrate the in house infrastructure.
- The Cloud Service Provider offers Cloud Services to the Consumer. Such Services are implemented over the Common Cloud Management Platform. The Common Cloud Management Platform defines a set of support services, both at an Operational level and at a Business one. Operational Support Services represent the operative and technical management set and the necessary to the Cloud Service Creator to implement a Cloud platform, while Business Support Services include the user's interfaces (like the Service Consume Portal), usable by the consumer for the self-service management of the product.
- The Cloud Service Creator is responsible for the creation of the Cloud Service, which can be delivered on the Provider's platform. The Cloud Service Creator defines, implements and maintains the software and tools specific to the Clous Service. Service Creation Tools are used by the Creator to develop new Services.

3.4.3 Experton's Cloud Value Chain

In Experton's model[29], consulting projects have been the main source of information as well. The model was presented inside a market research conducted about German vendors in 2012. The model is composed of six main actors: Cloud Service Providers, Cloud Technology Vendors, Cloud Consulting subjects, Cloud Infrastructure Providers, Cloud Integrators and end users. Experton represented these roles in the image reported below (*Image 30*).

[29] Experton Group (2012)

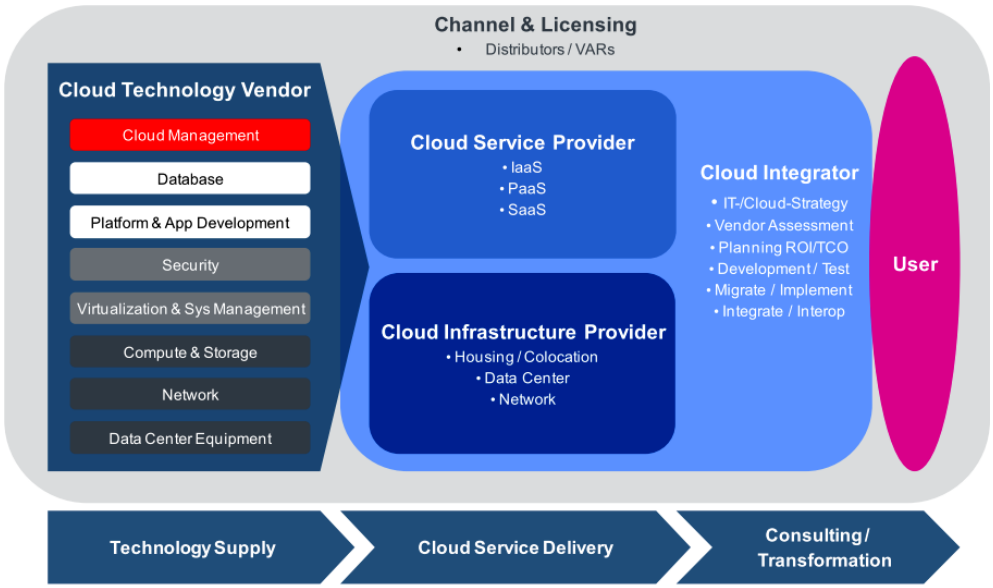


Image 30 – Experton's Cloud Value Chain (2012)

- Cloud Service Providers provide Cloud Services to end customers.
- Cloud Technology Vendors offer products and services necessary to the creation and functioning of Cloud infrastructure. Such service include: Cloud Management, Cloud Middleware and Infrastructure Cloud.
- Cloud Infrastructure Providers offer the infrastructure necessary to the delivery of Cloud Services, like the network and the Data Centers.
- Cloud Consulting subjects manage Cloud projects: the management of the processes of planning and analysis, the definition of TCO and ROI, the analysis of the architecture, the selection of Vendors, the Change Management and the analysis in regard of security and compliance.
- Cloud Integrators are actors whose activities include solution testing and development, solution implementation and integration and Data Migration. The implementation of Cloud services is challenging both at an organizational level and at a technological one. According to Experton's analysis, the implementation and integration of Cloud Services is the segment of the market with higher growth rates.

- End users most times just need to login through a web portal to access the services they pay for.

3.4.4 Gartner's "Cloud Service Value Chain"

Gartner proposes a simple and intuitive model, represented in *Image 31*, representing just three main roles. The first role is the Cloud Service Provider, providing Cloud Services such as SaaS, PaaS and IaaS, while the second category is composed of so-called Cloud Service Brokers (CSBs), which act as intermediaries between Providers and end users. Finally, there are the Cloud Service Consumers.

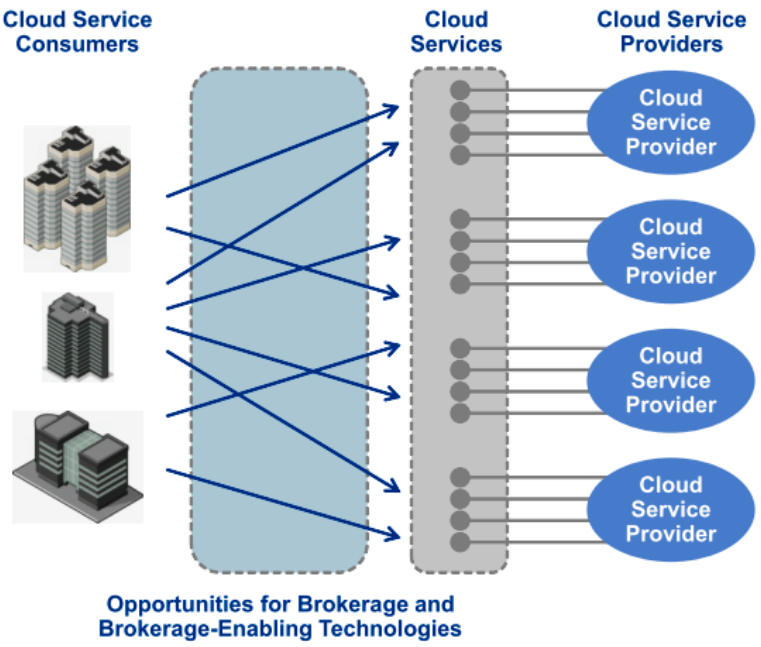


Image 31 – The Cloud Service Value Chain (Gartner, 2011)

- Cloud Service Consumers pay for the service they get.
- Cloud Service Providers provide Cloud Services to end customers.

- Cloud Service Brokers represent a business model for which a company adds value to an existing Cloud Service[30] The CSB role is born because of the low control that consumers have of services, making them unsure about their efficacy. In fact, from a customer's point of view, the responsibility of the results of the solutions of the different Service Providers is transferred to CSBs. Their role is to favor the approaching of customers to the Cloud. In the IT industry intermediaries have always existed (among them System Integrators, outsourcers, VARs and more in general hardware and software resellers). In the Cloud Computing industry, though, a big change is in progress, because the intermediation requirement is increasing, due to two main factors: the presence of more providers and stakeholders and the major granularity of Cloud Services in comparison with traditional ones.

3.4.5 Technische Universitat Munchen's "Value Network"

The model [31] proposed by the German university had the goal to identify new business opportunities. The Value Network defines eight roles. *Image 32* shows the graphical description of the model and the details of the role described.

[30] Gartner (2010)
[31] Bohm et al. (2010)

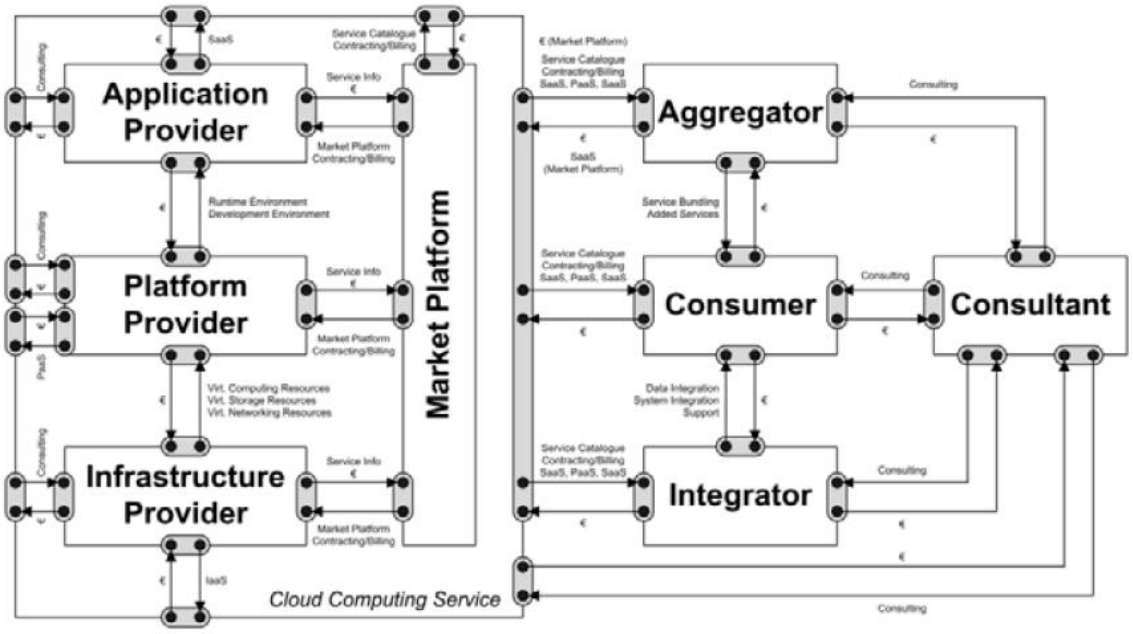


Image 32 – Value Network (Technische Universitat Munchen, 2010)

- Application Providers deliver SaaS, hosting apps in their Public Cloud. This role has to perform tasks such as the monitoring of the service levels, resource management and the handling and maintenance of the system, besides data security.
- Platform Providers provide PaaS, with the same tasks as Application Providers
- Infrastructure Providers provide IaaS, leaving to the customer the responsibility of managing virtual machines. A fundamental aspect of the offer is the disaster recovery.
- Market Platforms provide a virtual marketplace where different Cloud Services are offered. The task of this role is to make demand and offer meet.
- Integrators take care of the conversion of data present in on premise infrastructure, to migrate them to the Cloud. Besides Cloud solutions might have to be integrated with on premise incumbent applications.
- Aggregators take care of Cloud-based Services aggregation (more granular than normal IT Services), to be able to create value for the end customer. The study distinguishes three subsets of aggregators: those aggregating Service Cloud existing Services, those adding a specific capability to an existing Cloud Service and those cataloguing and comparing

Services from different Providers, allowing the customer to make a research with determined selection criteria.

- Consultants help the customer in managing the Cloud project, especially in initial steps. They study the processes of the company to identify the solution more suitable for the customer. They can perform a costs benefits analysis to understand how profitable it would be to implement a Cloud project.
- Finally, the customer is the final user, which pays and gets the Service.

An analysis conducted by München University highlights two more roles. The first is the Data Provider, which generates data and information useful for the actors in the chain, while the second is called Monitor, which has the task to manage privacy and data security.

3.4.6 Business School of Greenwich's "Cloud Supply Chain"

The research conducted by the Business School of Greenwich in 2012[32] had the goal to identify the best strategy for the adoption of Cloud Computing services in regard of the Supply Chain Management. Nonetheless, in this study the institute designed a model for the Cloud Chain, whose results are interesting. Said model shows the kind of players that a company on the demand side has to collaborate with.

As shown in *Image 33,* two main roles are identified: the Service Provider and the Service Aggregator. The Service Provider is described as the vendor which delivers virtual resources (like computing capacities, storage, networking) while the Service Aggregator is the operator specialized in the field of software in the chain management. The Service Aggregator also has to manage the SLA and the billing of the service.

[32] Business School University of Greenwich (2012)

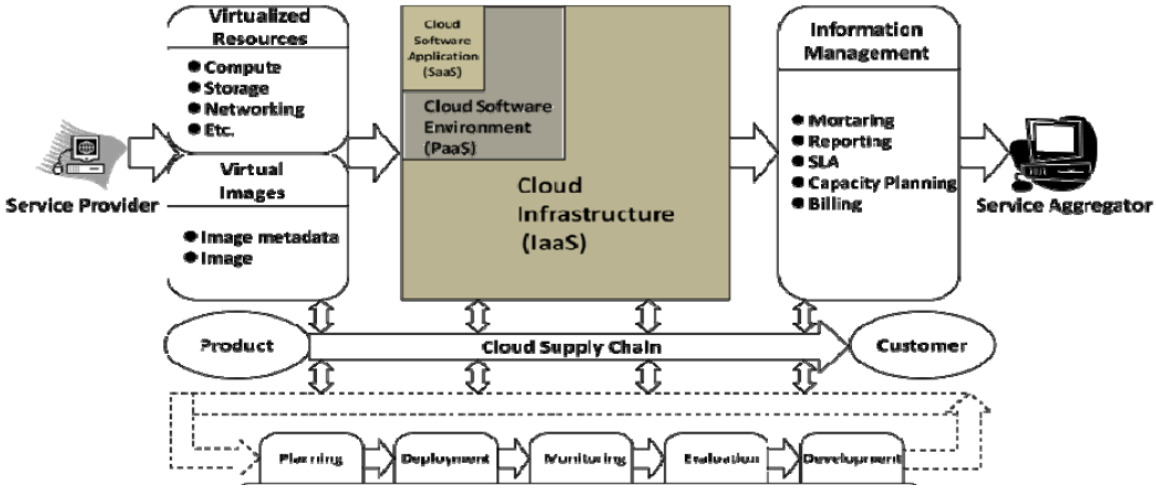


Image 33 – Cloud Supply Chain (Business School of Greenwich, 2012)

3.4.7 University of Passau's "Cloud Computing Ecosystem Model"

The model[33] provided by the University of Passau is very complicated, comprising 26 roles and including the basic service flows between them. The model has been analyzed because it can be interesting to review a more complicated model.

[33] University of Passau (2016)

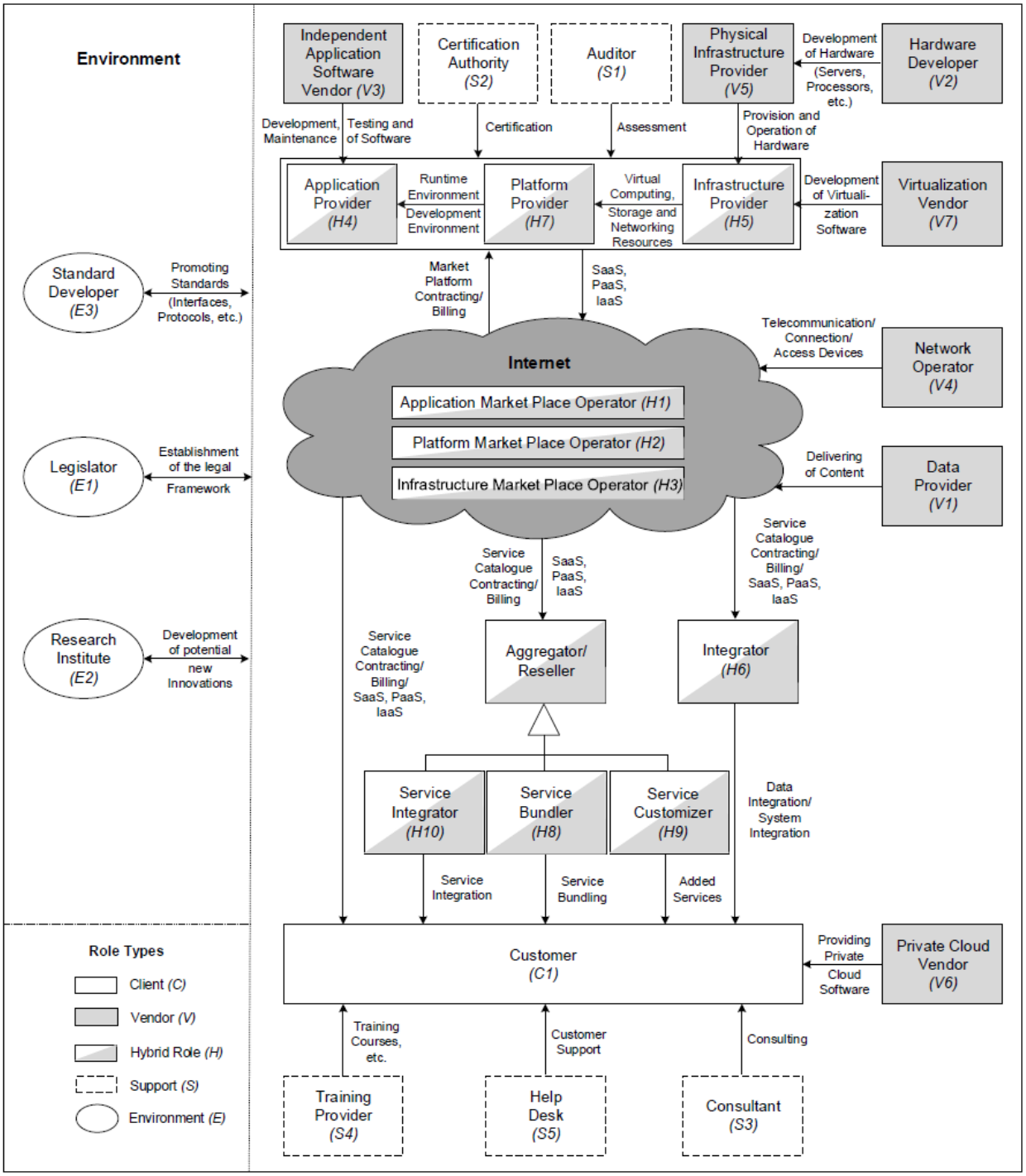


Image 34 - University of Passau's "Cloud Computing Ecosystem Model" (2016)

The roles shown in *Image 34* can be grouped into five categories: Client, Vendor, Hybrid Role, Support and Environment.

- Client: the customer is the starting point of any service request and the end point of the service delivery and directly or indirectly pays for all value adding activities in the ecosystem[34]. Customers can either buy services directly from a service provider, from one of the Marketplace operators of rom aggregators/resellers.
- Vendor: this category includes data providers (responsible for generating, aggregating and delivering data and information for other entities in the ecosystem), hardware developers (they develop and sell dedicated hardware, such as servers and processors, which is needed for providing IaaS), independent application software vendors (they develop, test and maintain the software offered as a Service), network operators (they offer connectivity and ubiquitous access to cloud services), physical infrastructure providers (they provision and operate the physical infrastructure and, therefore, act as suppliers of Infrastructure Providers), private cloud vendors (they develop and sell the software necessary to enrich a server with IaaS functions), virtualization vendors (they develop and sell virtualization software).
- Hybrid Role: the three roles Application, Platform and Infrastructure marketplace operator are responsible for marketplaces, where various cloud services are offered by different players. An Application Provider deploys, configures, maintains and updates applications on its own or outsourced cloud infrastructure. An infrastructure Provider provisions storage, computing capacity, network access and other resources. Customers deploy and run applications and have control over the hosting environment and operating systems, but do not control the underlying infrastructure. An Integrator converts existing data and migrates it into the Cloud, but also integrates Cloud computing solutions into the existing customer's IT infrastructure by developing interfaces to on premise applications. A Platform Provider is responsible for managing the Cloud infrastructure assigned to a platform and provides tools and resources for customers to develop, test, deploy and administrate applications. A Service Bundler offers simple bundling or a complex composition of Cloud services without adding new functions, but in combination with a single point of access, billing and identity management. A Service Customizer

[34] Bohm et al. (2010)

enhances or adapts given external services by improving existing features and, therefore, provides added value to Customers. A Service Integrator provisions a vertical connection of existing Cloud services from various providers across the three layers of the Cloud computing stack.

- Support: an Auditor offers independent evaluation of Cloud services, operations, as well as performance and security management of a Cloud implementation. A Certification Authority assesses a service regarding the fulfilment of quality criteria, including legal, security or functional requirements, as well as the business processes and the data center infrastructure. A certificate is issued upon the fulfilment of the requirements for a predefined timeframe and is, contrary to the Auditor case, made available to the public. The offers of the various providers are, thus, easier to compare for Customers. A Consultant provides fundamental knowledge about the Cloud market and analyses the Customer's processes and requirements to identify and introduce suitable Cloud services. Consulting services are also related to providers, for instance, to solve technical problems. Evaluate service offerings or analyze customer needs. A Training Provider offers different types of employee training programs. A Help Desk is responsible for professional customer support and acts as the primary contact point for Customers in case of problems.
- Environment: a Legislator establishes the legal framework for any business and related activities. A Research Institute is a source for potential new innovations, influencing the Cloud computing ecosystem. A Standard Developer promotes standards related to interfaces, protocols or SLAs and, hence, has an impact over the Cloud computing ecosystem as a whole.

3.4.8 School of Management of Politecnico di Milano's Cloud Computing Chain (2012)

The School of Management of Politecnico di Milano proposed, in 2012, the model[35] that will be discussed in this paragraph. Below is the graph of the model *(Image 35*).

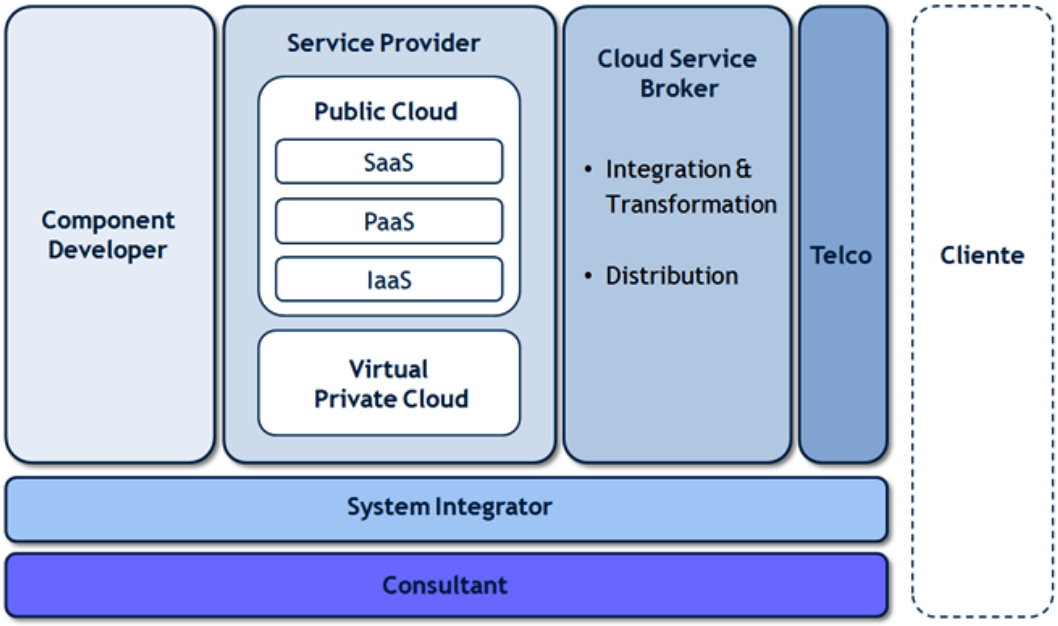


Image 35 – Osservatorio Cloud Computing e ICT-as-a-Service of the School of Management, Politecnico di Milano's Cloud Computing Chain (2012)

Six roles have being identified in this model:

- Component Developers develop and provide the hardware and software technologies enabling the realization of Cloud systems. Due to the diversity of technologies, high investments and high level of know-how needed, most companies have a narrow offer, concentrated on few components.
- System Integrators integrate infrastructural components and realizes integrated solutions with system (Cloud or on premise) already in use in the company.
- Service Providers provide Public Cloud as a Service. Their services are usually standardized, to be able to satisfy as many customers as possible

[35] School of Management of Politecnico di Milano (2012)

- Cloud Service Brokers select, configure, aggregate, redistribute and personalize Cloud Services, hiding their complexity from the final customer.
- Telco operators manage the network and data centers necessary to provide the service to end users.
- Consultants support companies in the choice of the system, its implementation and maintenance.

3.4.9 School of Management of Politecnico di Milano's Cloud Computing Chain (2015)

In 2015, the Osservatorio e ICT as a Service of the School of Management of Politecnico di Milano presented a new model. This model will serve as a basis for the Value Chain presented in chapter four, where it will be deeply analyzed, and that is why it will not be reviewed in detail in this paragraph.

Below is the graphic representation of the model (*Image 36*).

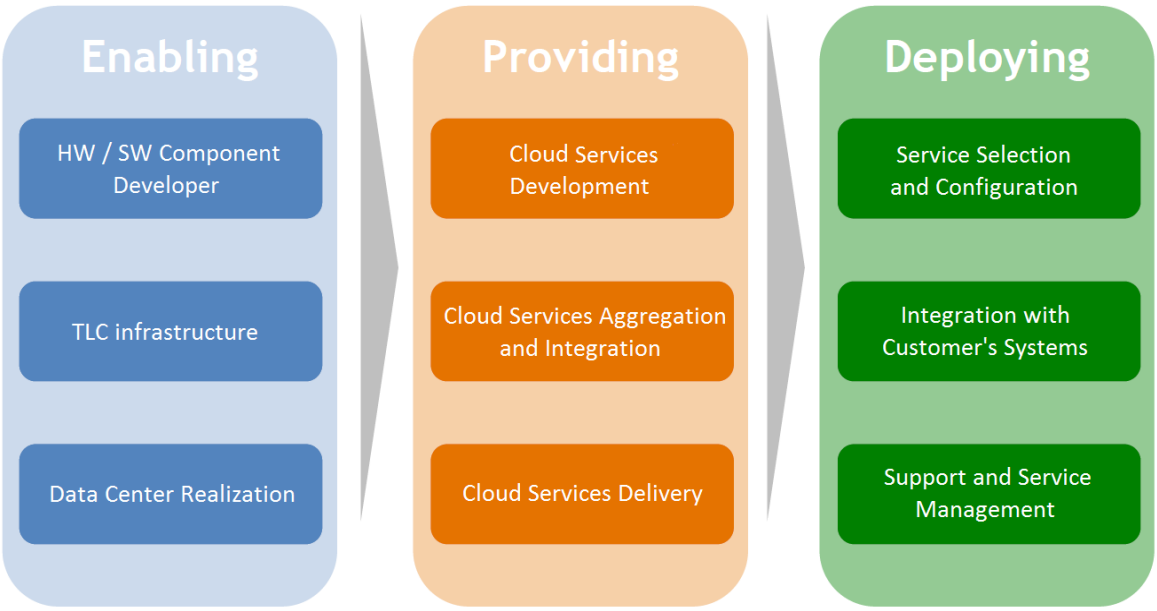


Image 36 – Osservatorio Cloud Computing e ICT-as-a-Service of the School of Management, Politecnico di Milano, Cloud Value Chain(2015)

The model has an overall flatter structure than the one from 2012. Mapping between the models is represented in *Image 37*. The first column aggregates the "Component Developer" and the "Telco" section of the previous chain, which were far away and now are in the same section. An emphasis has been posed over the fact that they enable the service, and that is way they have been grouped together. The Data Center Realization section has been added *ex novo.*

The "Providing" column aggregates what in the model from 2012 was represented by the "Service Provider" section (split into the Development and the Delivery components) and the Cloud Service Broker (Cloud Services Aggregation and Integration). On the model the direct references to the type of service (IaaS, PaaS or SaaS) have disappeared.

Finally, the Consultant and System Integrator players, once represented at the basis of the model, have now their own column. The consulting process has been split into "Service Selection and Configuration" and "Support and Service Management".

One last consideration is that the taxonomy and focus of the model shifted from the players (ex. "System Integrator") to the service provided (ex. "Integration with Customer's systems").

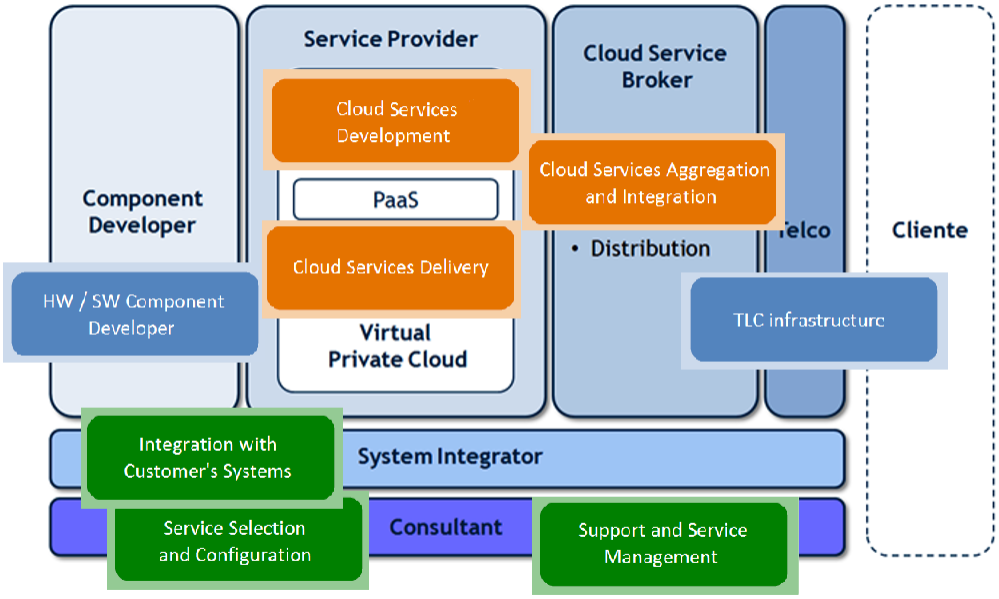


Image 37 – Mapping of the new model over the previous one (Osservatorio e ICT as a Service of the School of Management of Politecnico di Milano's Cloud Computing Chain, 2015 vs 2012)

3.5 Comments on the models analyzed

All models reviewed present good elements of analysis. Each model reported in this chapter has an element of criticality, which does not make it the best candidate to represent the Cloud Chain Value.

In particular:

- NIST's model does not take into consideration at all hardware and software developers. This is a big flaw, because such players have a fundamental role in providing the technologies necessary for the creation of Cloud systems. Despite its overall good level of detail and punctual analysis, thus, this model cannot be considered complete.

- Same problem in IBM's model: hardware and software developers are not present in the model at all. Moreover, the intermediation between Provider and end Customer is not analyzed in depth. On the contrary, the model explores very well the tools actors need to survive in a Cloud Value Chain.
- Experton Group's model provides us with a good level of completeness. It considers all roles in the chain, but does not analyzes the different types of actors intermediating between the Customer and the Provider.
- The model proposed by the University of Munich has the same issue as IBM's and NIST's models: no reference to HW / SW developers. The plus of this model is it reviews the chain from the customer's point of view, actually pointing out all sources of added value.
- The Business School of Greenwich's chain only details the roles of Service Providers and Service Aggregators, an excessive simplification. This is due to the fact that the model was designed in a study which actually had different goals (identify the best strategy for the adoption of Cloud Computing services in regard of the Supply Chain Management)
- The model provided by the University of Passau is completed, but way too complicated, with too many subsets of actors that make the model too dispersive. However, it introduced the player called "Training Provider", which will be also introduced as an enhancement in the model presented in this study.
- The model provided by the Osservatorio e ICT as a Service of the School of Management of Politecnico di Milano in 2012 presents a good level of detail, but does not take into consideration activities such the design of data centers nor highlights any difference between Service Providers and Service Developers.
- The model provided by the Osservatorio e ICT as a Service of the School of Management of Politecnico di Milano in 2016 is an overall good compromise between complexity and easiness. Nonetheless, it does not take into consideration the Training and Knowledge Management.
- Finally, some models include the environment and the customer in the chain. As this is a Value Chain, the environment should not be included, while the customer presence is not influent.

3.6 The enhanced model proposed for the Cloud Computing Chain Value

This study will make use, as a basis, of the model provided by the Osservatorio e ICT as a Service of the School of Management of Politecnico di Milano, designed in 2015, reported in *Image 38.*

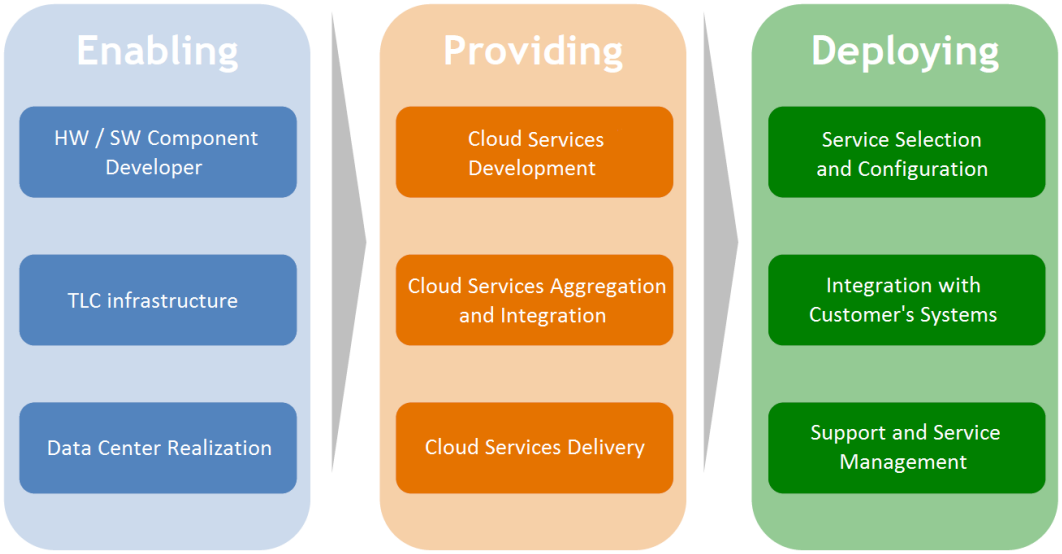


Image 38 – Cloud Computing Value Chain (2015) proposed by the Osservatorio e ICT as a Service of the School of Management, Politecnico di Milano

Following (*Image 39*) is the graphic of the model proposed in this study, enhanced in the "Deploying" column. The "Enabling" and "Providing" columns already provide a complete representation of the Chain, and therefore will not be modified.

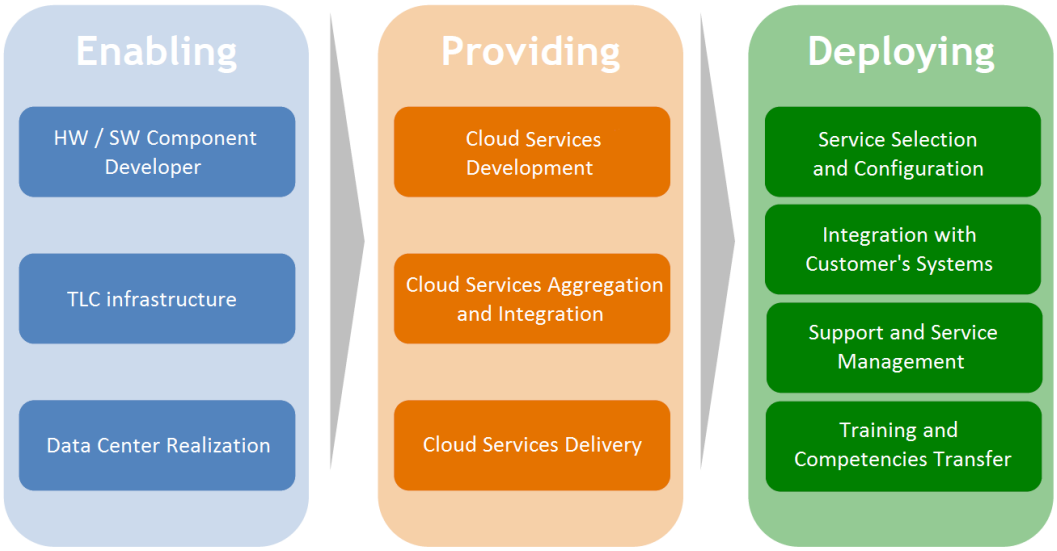


Image 39 – The Cloud Computing Value Chain proposed in this study (2016)

As noticeable, the "Deploying" column has one more box, called "Training and Competencies Transfer".

Referring to the model analyzed, the majority of them takes into consideration categories comparable to the third column of our model, without, though, providing a further subset classification:

- NIST's Cloud Reference Architecture (2011) which, accordingly to this model's taxonomy, defines a "Service Deployment" set of players. However, the sector is not further investigated and no subset is identified;
- IBM's Cloud Reference Architecture (2014) identifies a "Common Cloud Management Platform" set of actors, which is not further divided into subsets, only providing a categorization into processes and not players (Operational Support Services and Business Support Services);
- Experton's Cloud Value Chain (2012) also identifies a unique set of actors (Cloud Integrators) and a list of processes (Cloud Strategy, Vendor Assessment, Planning ROI / TCO, Development and Testing ,Migration, Implementation and Integration);

- Technische Universitat Munchen's Value Network (2010) identifies a generic "Consultant" set of players.

One of the models analyzed, University of Passau's Cloud Computing Ecosystem Model (2016), identifies a set of players in the Chain conceptually close to the "Deploying" column of the model presented in this study. This set of actors in the Cloud Computing Ecosystem model is called "Support". The differences from our model are the following:

- The System Integrator is out of this set of players, having its own category ("Service Integrator");
- "Service Selection and Configuration" and "Support and Service Management" are not differentiated. The model, instead, splits the consulting services between Help Desk (internal to the end user organization) and the Consultant (external subject);
- The model presents a "Training Provider" subset

The literature analysis showed that the only model, among those proposed, which split the set of players dedicated to consulting and support services into more detailed subsets also introduced a "Training Provider" section. This is excluding School of Management's model, which is the one trying to get enhanced in this study.

In the following part of this chapter it will be highlighted how there are players (called in this study "Education Centers") whose core business is represented by training services (they also sometimes offer consulting services, which however do not represent their core business), while other players in the Chain move towards this section, in particular Consultants and Service Providers.

Having provided a valid reference in the literature and identified both companies focused on this sector and others which expand towards it, the addition of the "Training and Competencies Transfer" box can be considered a valuable enhancement for the original model from the Osservatorio e ICT as a Service of the School of Management of Politecnico di Milano (2016).

Such enhancement is thought to be, besides valuable, durable in time. This is because of how vital training services are to any company, useful for making resources more efficient (and less in need of supervision), avoiding mistake expensive to fix, improving the level of satisfaction of employees and increasing the competitiveness of the company[36], leaving no doubt that training services will continue to be delivered in the future.

3.7 Training and Competencies Transfer

Inside the "Training and Competencies Transfer" sector we generally find three kinds of players:

- Service Providers
- Consulting companies
- Education Centers / Firms specialized on Enterprise Classes

Service Providers normally present a lot of training material on their websites, to make their products as known and as wide-spread as possible. They generally build certification paths, which serve the purpose of standardizing the skills and knowledge of users. Also, consulting companies might want to attract new customers starting from the delivery of Training Classes.

Finally, we have Education Centers and firms specialized on Enterprise Classes. The border between this category and the Consulting company one can sometimes be weak, but for clarity we will only include in this last category companies whose core business (and the biggest part of their revenue) is represented by Training activities.

[36] Surana College (2013)

Chapter 4

The Cloud Value Chain

In this chapter the result of the analysis of 32 enterprises working in the ICT sector and suitable for the Cloud Value Chain will be provided. For each category of players, recurring dynamics, including vertical integration, differentiation, divestures and strategic partnerships will be reviewed.

4.1 The "Enabling" column

Enable means "to make someone able to do something, or to make something possible".[37] Players positioned in this part of the model, thus, provide the market with a product or service which makes the development and use of Cloud Computing possible. This category includes Hardware and Software Components Developers, Telcos and players specialized in the realization of Data Centers. In particular, the last of these three categories is not included in any other model reviewed. Nevertheless, without companies able to design and make operative a Data Center, the Cloud Computing market would not exist: such a fundamental segment needed to be mapped in the model.

4.1.1 Hardware and Software Components Developers

The component developer section is made up of all players able to provide the market with technological solutions which make the realization of Cloud systems possible. Among the others, such products include software defined data centers, software defined storage, virtualization software, networking components, data-base management and integration tools. As better discussed in the analysis presented in the following part of the chapter, players we find here are usually big companies. Some smaller enterprises may be there, but they do not normally have the resources necessary to offer a wide gamma of products and services.

It will be also highlighted how the risk of commoditization is strong here. The least these companies should do is take into consideration the Cloud paradigm and adapt their offer to be able to mitigate profit erosion as a result of said commoditization, while a boldest move consists in expand into the Cloud provider segment, partnering with System Integrators or realizing Private Cloud themselves for big enterprises.

[37] Cambridge Dictionary (2016)

In the dedicated section, some players' strategies will be reviewed and common patterns highlighted, in order to understand how such companies are trying to position themselves in the Cloud Value Chain in terms of differentiation / partnerships.

4.1.2 TLC Infrastructure

Here we find all companies of the Telco sector. In comparison to the model that was presented in 2012, this segment shifted to the opposite side of the Chain. Actually, both positions would still be correct today: in the model presented in this study they have been moved to the "Enabling" section, meaning that they have fundamental assets necessary to deliver the service to end customers. On the other hand, they really are close to the consumer, being the main responsible for the level of service that they get.

As will be deeply discussed in the following part of the study, the strategic role of Telcos has been totally reconsidered over the years. Once thought to be condemned to commoditization, their importance in the respect of SLAs towards end customer really made the market reevaluate their position. Such considerations will be reported after, like for the previous section, a review of the strategies being carried out by some major players.

4.1.3 Data Center realization

Players positioned here offer Data Center services, meaning that they implement or maintain a data center, while other Data Center services may help to provide better results for what comes out of a data center. Consulting for data center includes many tasks, like interviews, risk analysis and design phase. After the erection of the structure, admins will need to adjust or improve specific processes, and as they will not probably have the required competencies, the consulting company which helped build the center will also take part in this maintenance processes.

In this segment, players usually have a big size as well. Considerations about dynamics in the Value Chain will be expressed after the review of the strategies of such companies.

4.2 The "Providing" column

Providing: to give someone something that they need[38]. Called "Cloud Provider" in the previous model, this segment is now split into the Development of Cloud services, their Delivery and, possibly, their Aggregation and Integration. While the Deploying column is basically populated by Cloud Providers and the Enabling players provide the hardware, software and infrastructure necessary for the existence of the service , this column is the core of our model, what we think about when talking about the Cloud.

Being in the center of the model, such players show dynamics related both to the Enabling and to the Deploying column. Mostly, we anticipate that the Enabling actors tend to the Providing market more than Providing actors do vice versa, while Cloud Providers tend towards consultancy more than the contrary. Overall, it will be demonstrated how the tendency of the chain is to slip to the right.

4.2.1 Cloud Services Development

Cloud Service Developers provide the market with a product, usually standardized, to be able to satisfy an extended crowd of customers. They are the Core of the Cloud Value Chain, as they build the Service at the center of our study. Usually, Service Developers also deliver what they build: this is why many players tend to occupy both this segment of the Chain and the Delivery one. There are some exceptions, though: infrastructure service providers trying to differentiate also installing and delivering SaaS applications are an example. Unlike the first column of the model, here we start to notice the presence, together with IT giants, of smaller players as well.

As usual, a review of the strategy of some of the most important players will follow. The overall analysis of the segment dynamics will be based on such observations.

[38] Cambridge Dictionary (2016)

4.2.2 Cloud Services Aggregation / Integration

This is a really heterogeneous point of the model. A category of Services that will also be discussed in other paragraphs is the one of the Marketplaces: virtual stores where applications can be purchased by the end customer and used through a pay-per-use model. Other players which occupy this section of the model are called Cloud Services Brokers. The definition of Cloud Services Brokers can be very variable; as done other times in this study, we will consider Gartner's definition. Gartner defines Cloud Brokers as companies which add value to one or more (Public or Private) Cloud Services on behalf of one or more consumers of that Service, via three primary roles including aggregation, integration and customization brokerage[39].

Finally, still making reference to Gartner's accurate definitions, we also include in this central block of the model iPaaS, which are Services enabling development, execution and governance of integration flows connecting any combination of premises and Cloud-based processes, services, applications and data within individual or across multiple organizations.

4.2.3 Cloud Services Delivery

Finally, in this central part of the model, at the basis of the Providing column, the Delivery of Cloud Services makes its appearance. Being the last step before the customer, it is an interesting role. Mostly, it is covered by Cloud Services Developers. Some exceptions will be discussed in the relative paragraph.

A detailed discussion of the Cloud Services Delivery role will be introduced after the analysis of the players populating this segment of the Chain.

[39] Gartner (2016), IT Glossary

4.3 The "Deploying" column

"Deploying" means using something or someone, especially in an effective way[40]. In the logical scheme provided by our Cloud Value Chain, Cloud Computing has been enabled, provided and must now be deployed, which means configured, integrated, made functional and usable to the end user. We are in the consulting companies' territory.

This section of the model is the only one which makes a difference from the original proposed by the Osservatorio e ICT as a Service of the School of Management of Polimi (2015).

We had three sections there:

- Service Selection and Configuration;
- Integration with Customer's Systems
- Support and Service Management

In the model proposed in this study, these three sections remain unchanged, with the addition of a fourth one, called "Training and Competencies Transfer"

4.3.1 Service Selection and Configuration

The Service Selection and Configuration includes some steps, such as:

- Feasibility study;
- Requisites analysis;
- Design of the system;
- Development / Personalization / Configuration of the system, according to the system level of standardization and customization possibilities;

[40] Cambridge Dictionary (2016)

- Testing and deployment.

This segment of the Value Chain, despite being conceptually close to the "Support and Service Management" one, differs for its major value. In particular, these activities require project management activities, which are more expensive to the end customer.

4.3.2 Integration with Customer's Systems

The next segment remained unchanged as well: Integration with Customer's Systems. System Integrators are intermediaries which help the customer choose, if necessary, products and services specific for integration purposes and design / deploy an effective solution.

Like for all sections, a brief overview of some players will lead us to a complete analysis of the segment. After this overview, the dynamics of this section in the model will be analyzed at the end of this chapter.

4.3.3 Support and Service Management

Of the four segments of the Deploying part of the model, the Support and Service Management is the one with a lower a value. It does not usually require heavy project management activities. Respecting rigorously the definition of Support, even minor upgrades and new functionalities added should be included in the Service Selection and Configuration section.

4.3.4 Training and Competencies Transfer

The Cloud Value Chain provided by the Osservatorio e ICT as a Service of the School of Management of Politecnico di Milano's Cloud Computing Chain (2015) includes all players and processes, starting from the design and production of hardware components until the consultant's intervention, which finally delivers the system to the end user. In the perspective of providing an enhanced version of the model, the possibility of the creation of a new section in

the “Deploying” column, called “Training and Competencies Transfer”, has emerged. In the final sections of this Chapter this last step will be reviewed in detail, explaining the different typologies of actors which play a role here.

4.4 Component developers: strategies of the players in the segment

The component developer section of the chain includes actors which provide technological solutions enabling the realization of Cloud systems, like software defined data centers, software defined storage, virtualization software, networking components, data base management and integration tools.

4.4.1 NetApp

NetApp is an American multinational storage and data management company headquartered in California, which produces software, systems and services to manage and store data, including its proprietary Data ONTAP operating system. Netapp is amongst the world leaders in its sector, thanks to the quality of its products, providing top level performance, to patented proprietary technologies and to a high level of compatibility with solutions provided by other actors in the market.

Netapp is aware of the strategic importance of Cloud and its strategy is highly focused on Cloud enabling technologies. The company’s first products were storage servers, and they still represent its core business. In our model, it is classified as a Component Developer, in the Cloud Enabling column.

The offer also includes storage systems, storage virtualization and automation software and connectors with the rest of the architecture which virtualize the service. Many of its products are the result of partnerships aimed at realizing optimized “validated design” technologies in which NetApp’s contribute is embedded in the final solution. This model, transparent for the final customer, is one of the reasons of the success of the company. One of NetApp’s most popular

products, FlexPod, has been developed in partnership with Cisco. It is an integrated computing, networking and storage solution able to scale resources and adapt to numerous environments.

Its most successful product, though, is called NetApp Ontap. Version 9 of the software, presented in 2016, is compatible not only with NetApp Flash, coherently with its software defined strategy, but is claimed to be one of the most adaptable in the market. Latest version introduced the FlexGroup functionality, making it easier to use the storage infrastructure in a NAS environment and creating an enormous container with 20 PB of capacity. In 2016 Ontap Coud has been made compatible with Amazon Web Services, giving the chance to personalize storage solutions in Amazon's Public Cloud with NetApp's operating system. Months later, the same functionality has been activated for Microsoft Azure, purchasable both from Azure's marketplace and from NetApp's license store. Ontap allows to manage workloads, with the chance to switch them from one of the Clouds to the other. Latest partners also include Zaloni, a company which provides data lake management technologies. Another partnership with the distributor Arrow gave life to a data analytics product.

The society is also a pioneer in security solutions, taking inside the OS the possibility to encrypt data by managing keys inside the system at a volume level, without compromising efficiency when we talk about deduplication, compression and compaction.

To conclude, NetApp is neither trying to integrate nor differentiate its offer. It is, instead, betting on partnerships aimed at making its products compatible with the players of the Providing section of the chain. This strategy , represented in *Image 40,* (not differentiate and offer directly Cloud services) faces the risk of commoditization, mitigated by NetApp's ability to adapt its products to the Cloud paradigm.

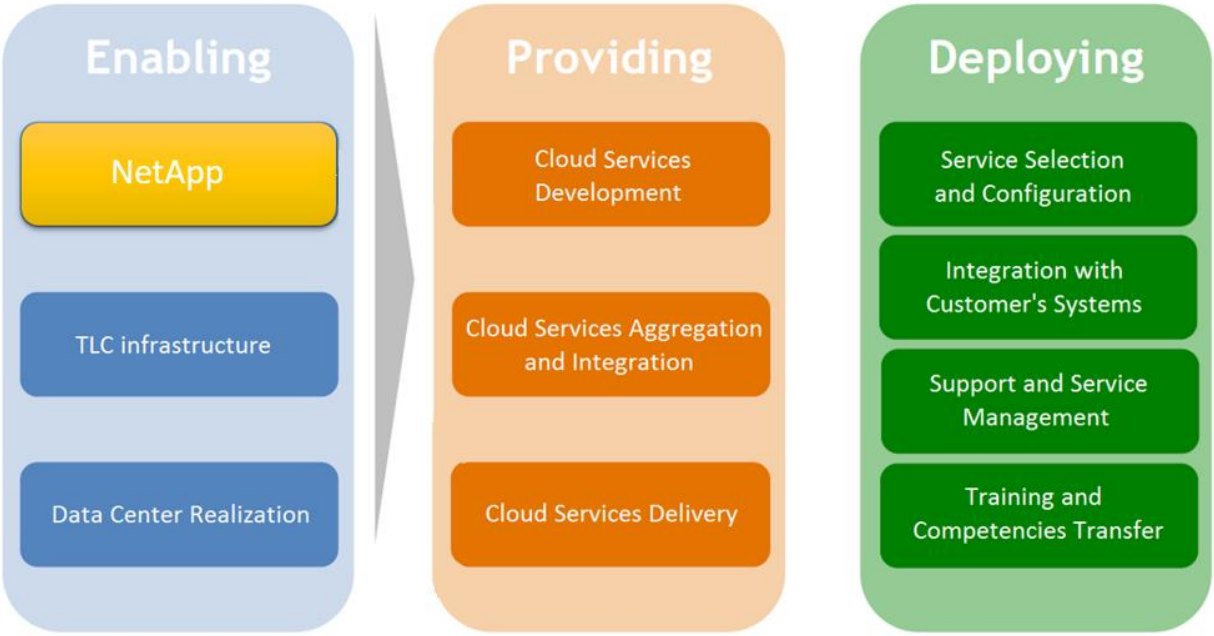


Image 40 – Mapping of NetApp on the Cloud Chain Value model proposed in this study

4.4.2 Dell Technologies

The new Dell Technologies was born on 7 Sep 2016, when Dell and EMC Corporation merged into a unique company which employs about 140.000 people globally, performing the biggest M&A operations in the tech industry of all times. The combined business is expected to address the markets for scale-out architecture, converged infrastructure and private Cloud computing.

Before this M&A, Dell had sold its IT consulting division, Dell Systems, to NTT Data, a Japanese telco giant. Dell had acquired this BU in 2009 (it was called Perot Systems), but divested this business to pay down its debt being used to finance the agreement with EMC. These two operation defines Dell's new strategy to divest from the consulting sector, preferring partnerships, while instead gaining presence in the Cloud-enabling software department, in which EMC excels.

EMC, unlike most big corporations with internal divisions operating under a single corporate structure, was a federation of affiliated and sometimes independent companies. Chief among them is VMWare, run as a separate company, having even its own traded stock. VMWare, which is a tech giant in the virtualization sector, is an active company when we talk about partnerships. In 2016, in fact, VMWare announced the launch of a new product called VMWare Cloud on AWS: through this new service, VMWare's data center management tools gathered under the name of "Cloud Foundation" will be available on Amazon's platform. The leader in virtualization management and the one in the Public Cloud chose to protect the fence, by providing, as declared "the best of both worlds". Another innovative product announced in 2016 is Workspace ONE, a solution through which the "Bring your own device" policy is finally more than futuristic: the product provides a virtual work environment, accessible from computers, tablets or smartphones, through which with one single authentication the user can access an increasing number of Cloud services. IT admins gain security besides deployment and update flexibility.

Back to Dell Technologies, one of the first announcements by the new-born society concerns storage and Cloud, with the launch of a software update able to improve the efficiency of storage and the release of an analytics platform called CloudIQ. CloudIQ analyzes data to make predictions, thanks to artificial intelligence. What's interesting is the tool will allow tiering of data on Public Cloud platforms (like Virtualstream, AWS and Microsoft Azure). Other news concern data security, with both software and hardware improvements.

A strong focus in the strategy of the new company will be Hybrid Cloud: Dell claims they will provide the software to help living in a multi-Cloud world. This will be accomplished through two concepts: the first one is an integrated approach that involves hyper-converged infrastructure and the second sees Dell EMC providing the building blocks, with new storage products.

While VMWare just announced a big partnership with Amazon, as seen above, Dell EMC has just unveiled a suite of new apps called Azure Cloud Services, which enables customers to easily adopt hybrid Cloud services in Microsoft's Public Cloud.

To conclude, Dell thought it was too differentiated, with an offer too wide to be good at all levels. Dell sold its consulting division to acquire EMC and refocus on the production of hardware and, especially, software. Dell bets big on the aggregation of Cloud services, preparing to provide tools to survive in what they predict to be a multi-Cloud world. Dell also maintains in its portfolio IaaS and SaaS services. Such considerations are sketched in *Image 41*.

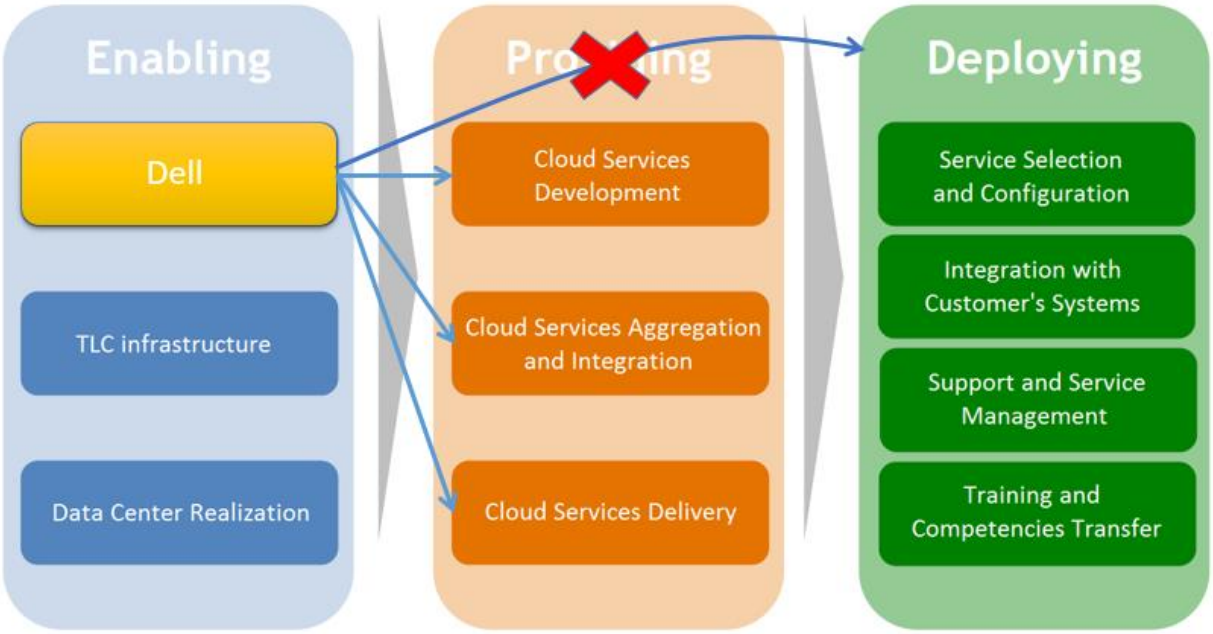


Image 41 – Mapping of Dell on the Cloud Chain Value model proposed in this study

4.4.3 Cisco Systems

Cisco Systems is a US-based multinational company that designs and sells networking equipment worldwide. The company's portfolio includes operating systems, VoIP software and VPN/Remote connectivity tools, but its core business remains hardware.

In 2013 Cisco overtook IBM as top Cloud hardware provider; this is mostly due to the tendency of the market to be more and more focused on the networking functions in the Cloud. In fact, compute server sales have been dropping along the years, while networking and storage market

equipment is growing. Cisco, besides consolidating its position as a leader in the Cloud-enabling hardware department, announced a new strategy which also focuses on a couple new trends: the first one is a new architecture for Internet applications, where micro-services running in containers on Cloud infrastructure vastly improve hardware utilization and accelerate app dev and deployment. The other is the proliferation of analytics and machine learning, which will enable self-optimizing infrastructure, enhanced security and better business decision-making.

Cisco has a vast partnership program, with a big Service Provider like Salesforce being one of the latest to join. Cisco's collaboration infrastructure, IoT and contact center will be integrated with Salesforce's Sales Cloud and Service Cloud. In Salesforce's Sales and Service Cloud models, video and voice chats will be available without leaving the dashboard, using Cisco's technologies, while in the IoT sector Cisco Jasper will gather data and manage devices, while Salesforce will analyze what Jasper sends. Speaking about IoT, Cisco is very active in this segment, at the point that the company's contribute is considered crucial to the construction of future Smart Cities[41].

As seen for other component developers, security is also a big opportunity for Cisco, with products such as Security for Video, VideoGuard Everywhere and Infrastructure Security being forefront in the market. To reference our model, Cisco is expanding from the Component Provider section towards the Providing section of the chain, both through its numerous partnerships and also with its own IaaS and PaaS products. Cisco's offer is graphically represented in *Image 42*.

[41] ETCIO (2016)

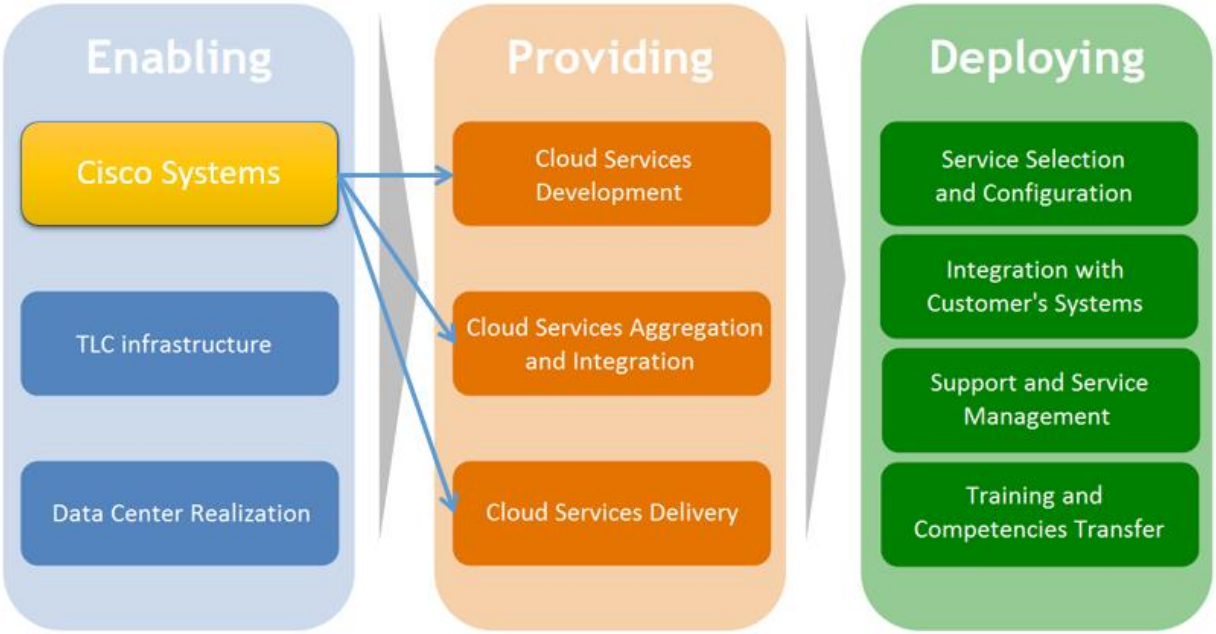


Image 42 – Mapping of Cisco Systems on the Cloud Chain Value model proposed in this study

4.4.4 IBM

IBM is an American multinational technology company with operations in over 170 countries. We actually find IBM all across the Cloud chain model we presented: the company also serves as a Cloud Service Provider (with its IaaS service SofLayer, its PaaS service BlueMix and almost every software also delivered as a service) while being both a system integrator and a consultant player as well.

Nevertheless, IBM's journey to the Cloud has been a complicated process. Like many other enterprise technology companies, IBM has had to balance its need to keep up on-premises revenue with its desire to satisfy customers' demands for Cloud services. IBM is not abandoning on-premises solutions though, rather, based on customer demand and use cases, software will continue to be delivered on premises. There is plenty of evidence that many customers will continue to demand that core applications operate on premises. Today, however, priority is given to the Cloud, at the point that every new software is first delivered as a service.

Being both a PaaS and SaaS provider gives IBM the advantage to be able to deliver software based on its proprietary platform. Taking into account IaaS alone, IBM had the fourth-largest Cloud market share in 2015, with an estimated $583 million in revenue. For the sake of comparison, AWS raked in $7.88 billion, while Microsoft Azure is estimated to have made $1.209 billion.

IBM's Cloud offering is probably the widest on the market, with the SaaS part of the gamma being continuously improved through several acquisitions. Even SoftLayer, its IaaS product, had been acquired in 2013.

The company's declared strategy bets bit on Hybrid Cloud as the way that IBM will bring its myriad of offerings together to support customer demands, while cognitive services that add deep learning algorithms combined with industry-specific knowledge and data is IBM's key differentiator.

A cognitive Cloud could be profound because it is not just focused on compute and storage but also on advanced data analytics. It would surprise no one to say that nearly all businesses are run on their data and that the most successful businesses have a deep understanding of their data. Businesses have become pretty good at analyzing their structured data to better understand customers – who they are and what they buy. In recent years, with the advent of predictive analytics and near real-time capabilities, businesses have gotten much better at predicting customer behaviors and presenting customized offers.

IBM's data center presence is massive. Huge investments in this sense are continuous: for example, a $50B data center has recently been finalized in Italy, in the zone of Milan. Based on SoftLayer, it has been designed to enable technological advances for Public Administration companies.

One of IBM's competitive advantages is given by the patent division, with Cloud-related patents being the most relevants. A recent patent plans to use software defined networking to ensure

virtual machines give consistent network performance even if one application on the host server is slurping up all the bandwith.

Partnerships, as for most companies of this study, are essential. We will just cite the ones with local telcos on launching data centers. Besides having a partner familiar with the local market, partnering with a telco also means the partner will be incentivized to invest in new infrastructure to ensure the venture succeeds. Not only data center launches, but also regular service delivery benefits from partnerships with telcos. For example, in 2012 IBM collaborated with AT&T, in order to provide Public IBM Cloud's customers with the services they wanted through private networks.

Taking a look, finally, at IBM's consulting services, we found a relatively rare concept, which is "brand agnosticism". The society has been brand agnostic since the 90s, which means that in cases where IBM hardware or software is not the best option for a client, the services division is free to sell products from other companies.

In the Cloud sector, for many companies, low-cost IaaS providers like Amazon Web Services may be a better fit than IBM's SoftLayer. In those cases, IBM would lose business if it failed to offer the best solution for a client, and that's why the consultants offer the best product possible, even outside the company's portfolio. IBM offers a few examples of this price comparison for prospective clients, and in some cases, Amazon Web Services offers the lowest price. Of course, IBM would prefer clients to choose SoftLayer, but its services business only truly works if it's able to put together the best solution possible.

To summarize the strategy and sketch it on our model (*Image 43*), born as a Component Enabler, IBM has now an extensive presence in all the three subsets of the Providers' section. As said before, the swift to the Cloud has been long and difficult, but IBM is now one of the main actors in the game. Besides that, partnerships with telco companies also plays an important role in IBM's strategy, to deliver real end to end services to the customers and to exploit the relationships telcos have with the local market. Finally, consulting services represent a huge part of IBM's

revenues, both in the Deploying column and in Data Center Services, which will be discussed later in this study.

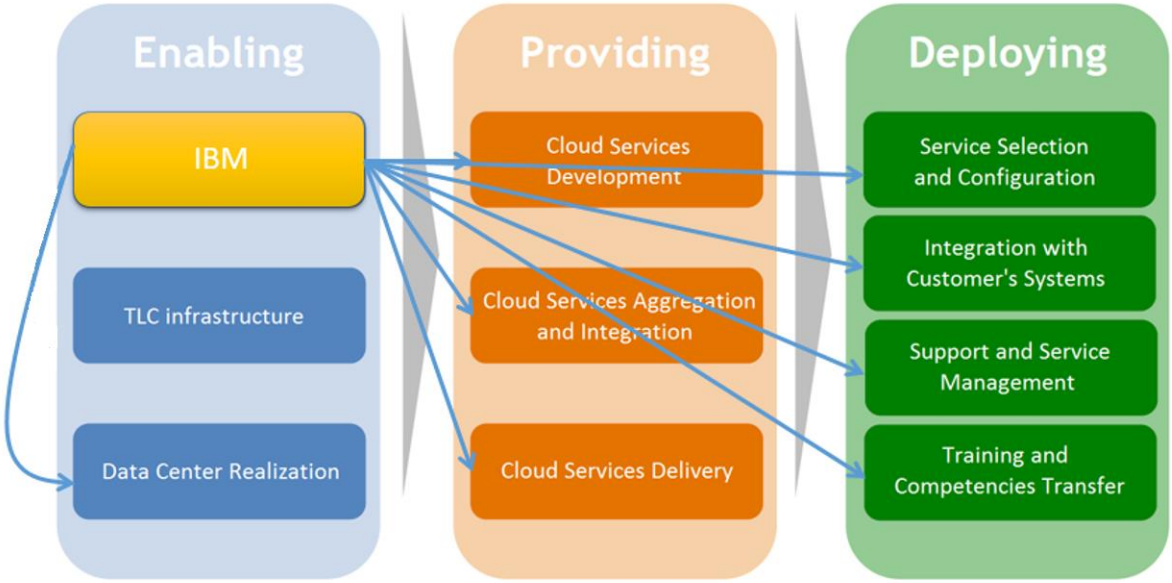


Image 43 – Mapping of IBM on the Cloud Chain Value model proposed in this study

4.4.5 HPE

Hewlett Packard Enterprise is an American multinational enterprise information technology company based in Palo Alto, California, founded on 1 November 2015 as part of splitting of the Hewlett-Packard company. One of the leaders in the Cloud-enabling hardware market, HPE is an example of how an aggressive strategy does not always pay off, especially in the Public Cloud market.

HPE's plan included a holistic presence in every Cloud market. Being a giant in the infrastructural portion of the market, the company never succeeded in proposing convincing Public Cloud solutions. By the time that HP got into the game, in fact, the market was already split among Amazon, Google and Microsoft. HP came too late, offered little in terms of unmistakable advantage and its split into two companies did not afford any new benefits. HPE's Public Cloud

was well engineered and came from a company with private Cloud services that were well regarded by its customers, but against incumbents it never had a chance. The company bet big on open source with OpenStack, but the promises of “no lock-in” must not have gathered customer’s interest. That’s why, in 2015, the company announced the closure of its HP Helion Public Cloud services.

HPE is now refocusing on Private and Hybrid Cloud, with partnerships, as always, being fundamental. For example, HP bought Eucaplyptus, a tool able to provide AWS-compatible Private or Hybrid Cloud architecture.

As for Private Cloud, Forrester found in late 2013 that HP had been valued consistently highly for what it offered customers wanting to build a private Cloud; also, Forrester gave the nod to HPE as a leading provider of private Cloud solutions in China. HPE’s Private and Hybrid Cloud are valid products, and the company is trying to reinforce them through partnerships, enhanced compatibility and better performance. In December 2015, HPE teamed up with Microsoft to allow businesses to build private Clouds using software that underpins Azure.

HPE is also a leader in consulting services, scoring a 3/3 presence in the right part of our model. To sum up, HPE, Component Developer, pushed hard on the Cloud, delivering IaaS, PaaS (Stackato, acquired in 2015) and SaaS. Its Public Cloud arrived late and was shut down, unable to compete against the incumbents. HPE also masters Data Center Services, which will be discussed later in this study. HPE’s offer is represented in *Image 44.*

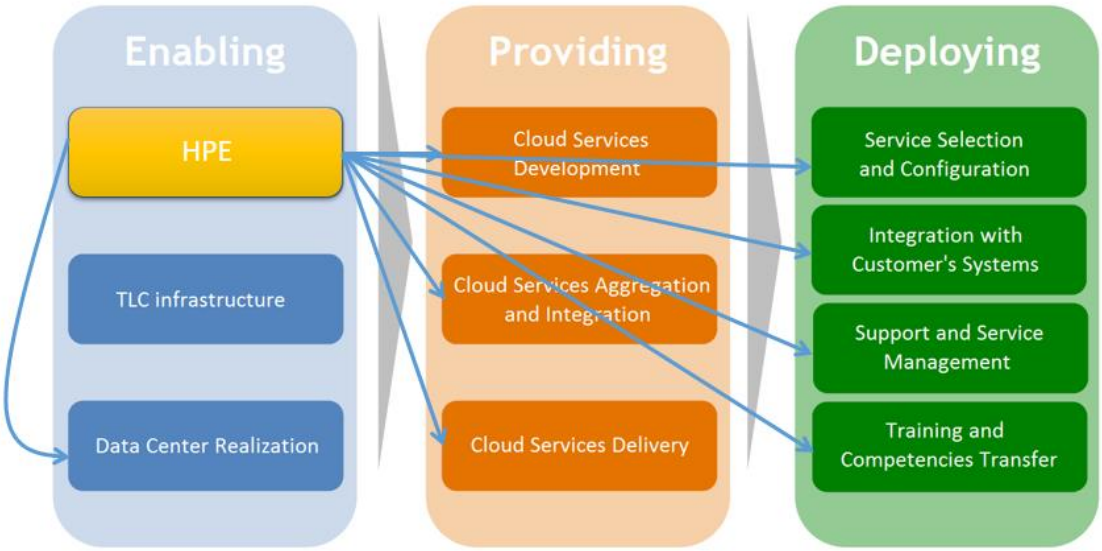


Image 44 – Mapping of HPE on the Cloud Chain Value model proposed in this study

4.5 Component Developers: segment review

Scale economies, learning curves, high investments: such factors translate into a narrow offer for most companies, while few giants can survive with a wide gamma of hardware and software products.

The risk of a market commoditization in this section of the chain is strong. Customers just want a Cloud that works, which has to be scalable, reliable and cost effective; they don't care the material from which the Cloud is made. Cloud companies such as Amazon and Google have built their servers and data centers for years, and those who buy hardware instead, buy in bulk, which means thinner margins for the resellers and, often, made-to-order hardware.

Some companies try to assimilate the Cloud quake by just adapting their offers to its paradigms: this does not eliminate the margin erosion and dumb-pipe risk, but at least it is mitigated. Their business model is not upset, as they keep producing and distributing hardware and software

components, but concepts like virtualization, multitenancy and SOA[42] must be assimilated, and new competencies have to be gained. NetApp, which we analyzed, falls in this first group: a safe strategy, potentially taking to margin erosion, but not upsetting the company focus.

This choice is more justifiable when the society is more focused on networking and storage equipment, whose demand is going up in the Cloud market, while compute server sales are going down, and companies focused on this second subset of components should probably integrate and look for some better margins in the central and right part of the chain.

The commoditization reached a peak in March 2016, when Google's VP of Infrastructure requested to computer hardware manufacturers to develop less reliable (and cheaper) hard drives. How does this make sense? Nowadays, Cloud companies duplicate data all over the globe, because they need security copies of all information. In this situation, it is important to have a lot of cheap space, rather than long living drives.

As opposed to the first group, some other components vendors take bigger risks and expand into the Cloud provider market, whether by realizing private Clouds themselves for big organizations or by partnering with a system integrator. The development of complete architectures, vertically integrated, through partnerships or acquisitions is a common reaction. This is the case of Dell, IBM or HP. This strategy, forced by the fear of profit loss, is also more risky: HP, for example, ditched its Public Cloud in 2015, with a big loss in investments and company image.

Components developers are not very keen on providing consulting services, unless their size allows it: of the companies we analyzed, HPE and IBM have a strong consulting game, while the others prefer to partner when it is necessary. Dell even renounced to Dell Systems, in order to refocus on hardware and software.

[42] ICT4Executive (2012)

Security is a competitive advantage component developers can provide, with all the companies analyzed being forefront in data safety, whether obtained by software or hardware product characteristics.

4.6 TLC infrastructure: strategies of the players in the segment

The telco industry is made up of all Telecommunications companies and Internet service providers and plays the crucial role in the evolution of mobile communications and the information society. Traditional telephone calls continue to be the industry's biggest revenue generator, but thanks to advances in network technology, telcos today are less about voice and messages and increasingly data. Let's analyze where some big telco companies are going and how they want to get there.

4.6.1 Telecom Italia

Telecom Italia is a big player in the Italian market. Its traditional businesses are land lines and mobile phone lines, besides Internet connectivity. Telecom owns a lot of Data Centers in Italy, besides having its own Internet network. Its data center have good reputation, thanks to their own network, that allow them to be fast and responsive. The brand is famous and the commercial partnerships very strong.

Customers feel safe committing their data to Telecom, as they feel that they will remain in Italy. This is a big deal for small Italian enterprises, which often beware of big multinational companies, feeling uncomfortable in sending their data abroad. Telecom can offer a real end to end service, guaranteeing SLAs, thanks to the proprietary network.

In 2010, Telecom started its new project "Nuvola Italiana". The focus of this solution is to provide professionals with a MarketPlace containing apps suitable for their requirements, often proposed

through the Try&Buy formula. As an example, in 2015 Telecom launched a service enabling digital invoicing, for small enterprises which had to conform to the new law. Other apps proposed in the store are the complete suite of Microsoft Office 365, Cloud storage services, tools for the creation and management of websites and security related services. In October 2016 Tim announced a new platform called Tim Open. This service allows startups and developers to configure their own Cloud app and make it available for Italian enterprises through Tim's Marketplace. Tim Open offers tools including infrastructural resources, API (Application Programming Interfaces), functionalities for the management of orders, promotions and billing processes. For customers with determined Internet plans, the data traffic used to access the apps is free of charge.

Telecom found it difficult, along the years, to establish itself as a trusted IT provider, which is a problem common with the vast majority of telco companies. The way of partnerships is almost inevitable then, granting access, through its network, to proprietary and other companies' Cloud services. Consulting companies often partner with Telecom too, to be able to provide decent SLAs to the end customer, proposing in turn the know-how Telecom lacks in. In summer 2016, Telecom switched on its new data center, a 30 million € investments distributed over a 4000 square meters area. This is a clear example of how Telecom tends to integrate vertically in the left part of the chain, while moving to the right partnerships are more common.

Telecom also finds customers in the public sector. In July 2016 TIM won, together with HPE Services Italia, a 500 million € contract which, over the five next years, will enable a wide gamma of Cloud services to Consip (company owned by the Italian Minister of Economy and Finance) provided through Telecom's data centers. The contract includes IaaS. SaaS and PaaS services. In particular, IaaS services concern virtual machines, virtual data centers, virtual networks and virtual storage and backup; SaaS services concern applications for the management and storage of documents, collaboration tools, audio and video conference service, data analysis. In October 2016, Telecom also obtained a contract to move the European Commission IT to the Cloud, providing the network to enable access to AWS's platform.

To conclude, referring to our model (*Image 45*), Telecom Italia, from the Telco section, is expanding to the Providing model, both as a Service Aggregator (Nuvola Italiana) and as a Service Provider. The Deploying section is being managed mostly through partnerships, as Telecom Italia finds it hard to be believable as a System Integrator to the eyes of end customers.

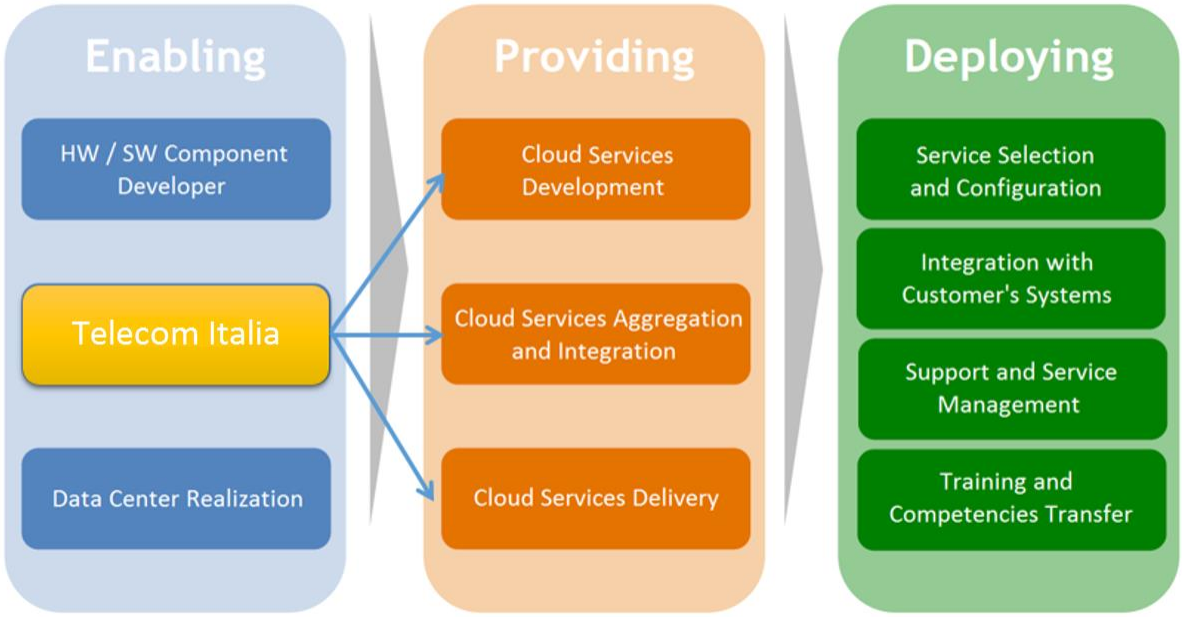


Image 45 – Mapping of Telecom Italia on the Cloud Chain Value model proposed in this study

4.6.2 Fastweb

Fastweb is an Italian company, part of the Swiss telco group Swisscom. It specializes in landline and Internet connections, while also operating in the mobile sector as a virtual operator, using 3 Italia's network. In 2010 Fastweb was the first operator in Italy to launch on the market a 100 megabit per second connection in selected cities. In January 2011, Fastweb and Sky Italia signed an agreement to combine Sky's TV offer with the telco's network services. Due to the European Antitrust decision to permit the fusion between 3 Italia and Wind only along with the cession of some of their assets, permitting the entry of the French group Free into the Italian market, Fastweb's future is currently very uncertain: analysts say Free will also acquire Fastweb, while Fastweb can avoid only with a strong partnership with Telecom.

Talking about Cloud strategies, in October 2016 Fastweb and Ditigal Magica launched Call4Innovation, a project aimed at startups and small enterprises developing innovative technological services in the industry of software, call centers, education and e-learning, logistic, tourism, finance and pharmacy. The selected projects will have the possibility to be delivered through Fastweb's Cloud network, getting to be a part of the telco's services. As for asset management, over the last two years, Fastweb invested 25 million € in the realization of two new Data Centers (in Milan and Rome), which will host Enterprise Customer's services. Fastweb aims at reassuring their customers that data will remain in Italy, and granting elevated SLAs for their Value Added Services. The data center of Milan has been operative since 2015 and got the Tier IV certification, joining only other 20 in the world and 7 in Europe with this validation. The infrastructure has been developed with the goal to support mission critical services, that are services which can never interrupt. The structure can grant 100 hours of autonomy in case of total black out. Until the realization of this center, housing and hosting services were mostly provided, while this data center allows better IaaS services.

About IaaS, in 2016 Fastweb migrated to the Openstack platform, provided by Red Hat, to innovate its enterprise offer. This offer, called FASTCloud, is an end-to-end proposal to deliver computing resources and applications. FASTCoud is available in both Public and Private modalities, and besides IaaS provides PaaS solutions enabling the use and customization of operating systems, web services, databases and development environments .

Fastweb's network is the fruit of 9 billion € in investments since 1999 and includes 41000 km of optic fiber all over Italy. Fastweb and Telecom have moreover given life, in 2016, to a joint venture to deliver ultrabroadband (Ftth modality, goal of 1 Gigabit per second) to 3 million houses. Their joint venture is one of the two faces of what seems to be taking the form of a bipolar market, the other side being occupied by Enel and its controlled Metroweb.

In August 2016, researchers from Queen Mary University in London discovered that Fastweb, together with Linkem, hosts Netflix services in its servers. "Discovered" because this kind of information is part of industrial secrets, so not publicly available. Moreover, Fastweb has been

partnering since 2011 with Sky, providing Sky Online Cloud TV service through its network. Since 2016, Fastweb has been including Dropbox data storage in its network packages.

Fastweb is then a Telco operator in oud model, with a really strong network and data center presence. Fastweb also acts a Service Provider, with IaaS (like virtual machines) and SaaS (like storage management, backup and disaster recovery software configurable by the customer) services. In the last year Fastweb also launched a new category of SaaS which can be named as DaaS: these services provide customers with data making them available in many formats and to different applications as if they were on the local drive. Aggregation services are also part of the enteprise's portfolio (we have talked about Call4Innovation). Such considerations are represented in *Image 46.*

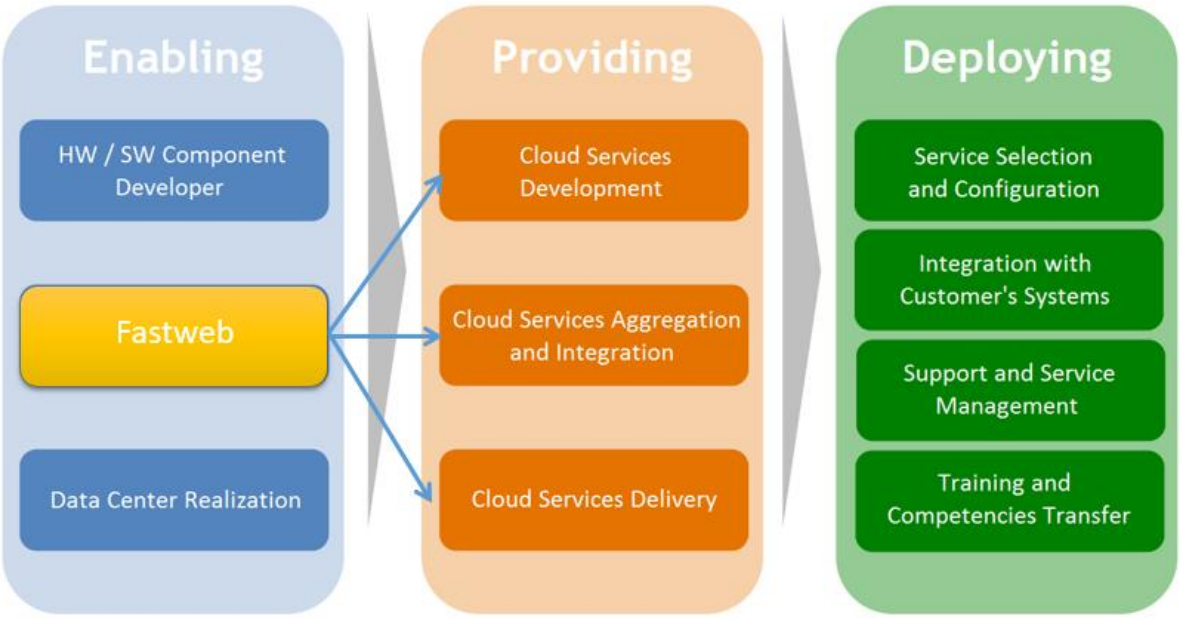


Image 46 – Mapping of Fastweb on the Cloud Chain Value model proposed in this study

4.6.3 Cloud Italia

Cloud Italia is an Italian society, born in 2012, specialized in the offer of integrated telco and Cloud services, focused on the market of small and medium sized businesses. The company was once part of the Eutelia Spa telco BU. It owns 15000 km of optic fiber along the Italian territory, besides two Datacenters in Arezzo and Rome, designed with the consulting of Emerson Network Power. Its services are guaranteed by important partnerships with companies like VMware, Cisco Systems, CommVault, Zerto, Acronis, NetApp, Spamina, Zimbra and Alcatel-Lucent Enterprise.The turnaround was performed in 2015, with the approval of the first positive balance of the company. In the years to come, many investments are being planned: first of all, the inauguration of the new data center being built in Milan, then, as CEO Marco Iannucci announced in 2016, two or three acquisitions will be performed every year (although it is not clear to which sector the target companies will belong).

After the turnaround, the company declaredly keeps on looking for partnerships, as the telco sector is going toward major concentration, but is not a priority any longer. In short, Cloud Italia, through its data centers and networks, can offer real end to end Cloud services to its enterprise customers, providing them with products designed by the company or by one of its partners.

Cloud Italia's offer also includes the integration of Cloud Services on an infrastructural model and UCaaS Services (Unified Communications as a Service). Its strategy is graphically reported in *Image 47.*

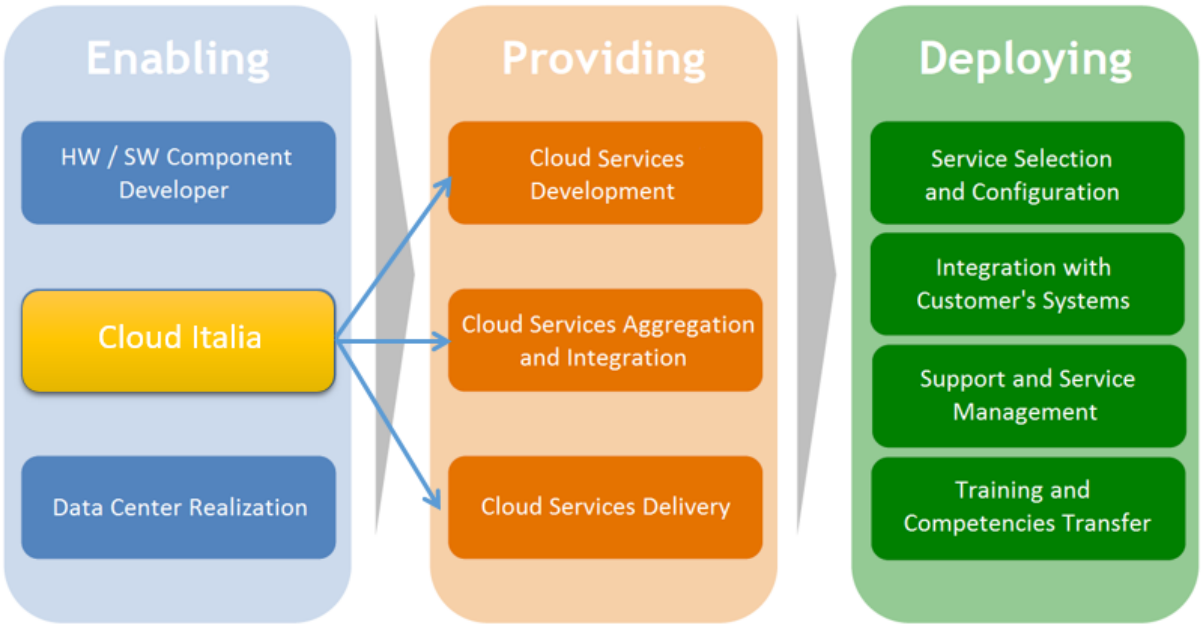


Image 47 – Mapping of CloudItalia on the Cloud Chain Value model proposed in this study

4.6.4 Deustche Telekom

Deustche Telekom is the biggest German and European telco company. DT and its subsidiary T-Systems have been offering end-to-end Cloud solutions for enterprises of all sizes since 2005 – from consulting, implementation, billing and customer service through to maintenance.

The company's declared goal is to grow by more than 20% each year in the Cloud sector, and to become the leading provider for businesses in Europe. Until 2016 a lot of the work that T-Systems has done has been around private Cloud services. Now, though, the company is admittedly challenging giants like Google and Amazon, offering services via the public Cloud, through a service called Open Telekom Cloud, delivered in partnership with Huawei, who will provide hardware and solutions, while T-Systems will provide network management and network.

The service will offer European enterprises on-demand, pay-as-you-go Cloud services via an OpenStack-based Infrastructure-as-a-Service solution operated by T-Systems, and the first

partner to join Open Telekom Cloud will be SAP. DT advertises this product pointing out that the servers where data will be stored are found in Germany: a German service provider from a German data center under German law, they say, grants the security customers want. Once again, the additional value that telcos can offer is the guarantee that data will be safely stored.The product is relatively cheap (a virtual machine with Windows server with two vCPUs and two GB RAM costs less than 17 Euro cents per hour) .

Telekom's managers have made no mystery about how they hope to steal shares from big U.S. companies who currently dominate the market, like AWS and Google. While the tendency for telcos is to enable existing and mature Cloud services for the customer, Deutsche feels they have the strength to create their own service and challenge the incumbent companies. Speaking of enabling existing Cloud services, in 2014, Deutsche Telekom had launched two complementary products, NetAnalyze and NetOptimize.

NetAnalyze monitors CDN and Cloud providers from all around the world; taking around 6 billion measurements every day directly from end-users. NetOptimize uses this data to redirect end-users in real time to the best provider possible, while taking into account business needs and requirements for any web or mobile video content editor. NetAnalyze/NetOptimize's goal is to cut down buffering, decrease rebuffering, ensures top performance, high availability and improved user experience.

To sum up, DT really wants to become a leader as a Service Provider. The consulting sector is also part of DT portfolio, but in a proportion not as relevant as the other two. *Image 48* maps DT's offer on the model proposed in this study.

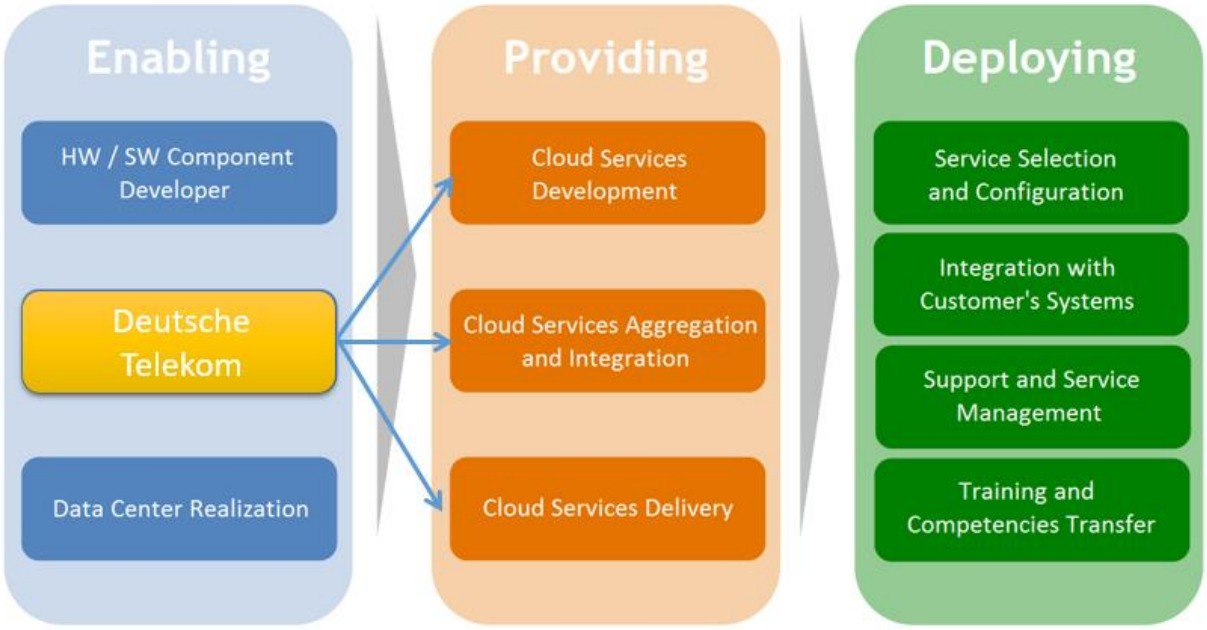


Image 48 – Mapping of Deutsche Telekom on the Cloud Chain Value model proposed in this study

4.6.5 Telstra Corporation Limited

Telstra Corporation Limited is Australia's largest telecommunications and media company which builds and operates telecommunications networks and markets voice, mobile, internet access, pay television and other entertainment products and services. Telstra has a long history in Australia, originating together with Australia Post as a government department, the Postmaster-General's Department, but now being fully privatized.

The society has been undergoing a change program to become more customer focused under its recent CEO, David Thodey. New CEO Andy Penn is expected to increase the focus on growth in international markets.

In 2011, Telstra announced a monster 800 million $ in developing its own Cloud, most of which would have been spent on the construction of new data center. Along the years, though, the

company realized that the investment was not as profitable as they wished, struggling to propose their own Cloud against the products offered by Amazon, Microsoft end the other market leaders. Even the responsible of Cloud projects Jim Fagan admitted “we realized we would not get the returns from investing in our own Cloud infrastructure”.

Far from spending the initial announced budget, in April 2016 Telstra launched what they called a “multi-Cloud” strategy, partnering with the same players that used to be competitors. This strategy includes a Cloud aggregation product, which allows Australian customers to directly connect to services provided by their partners (Microsoft’s Azure and Office 365, VMware’s vCloud Air, AWS, IBM Softlayer), only plugging in to the gateway once, and “Tesltra Cloud Management Platform” (in partnership with US company RightScale), which gives the customers visibility and management of their Cloud environment (analytics around cost, performance, storage, compute…) from one unified control panel.

According to Tesltra, this move has been prompted by companies’ growing use of combined private and public Cloud solutions. The new platform adds a critical layer across multiple Cloud platforms that gives businesses a view across all Cloud resources. This extra visibility increases choice and control, and also makes it easier for IT teams to buy and manage Cloud services right across their businesses.

Recapitulating, Telstra is a telco giant, leader the Australian market. When the Cloud hype started, Telstra hurried in trying to build its own Cloud Services, but soon realized incumbents could not be beaten and switched to a partnership model. Consulting services are not a significant part of Telstra’s offer. A graphic representation of such considerations is offered in *Image 49.*

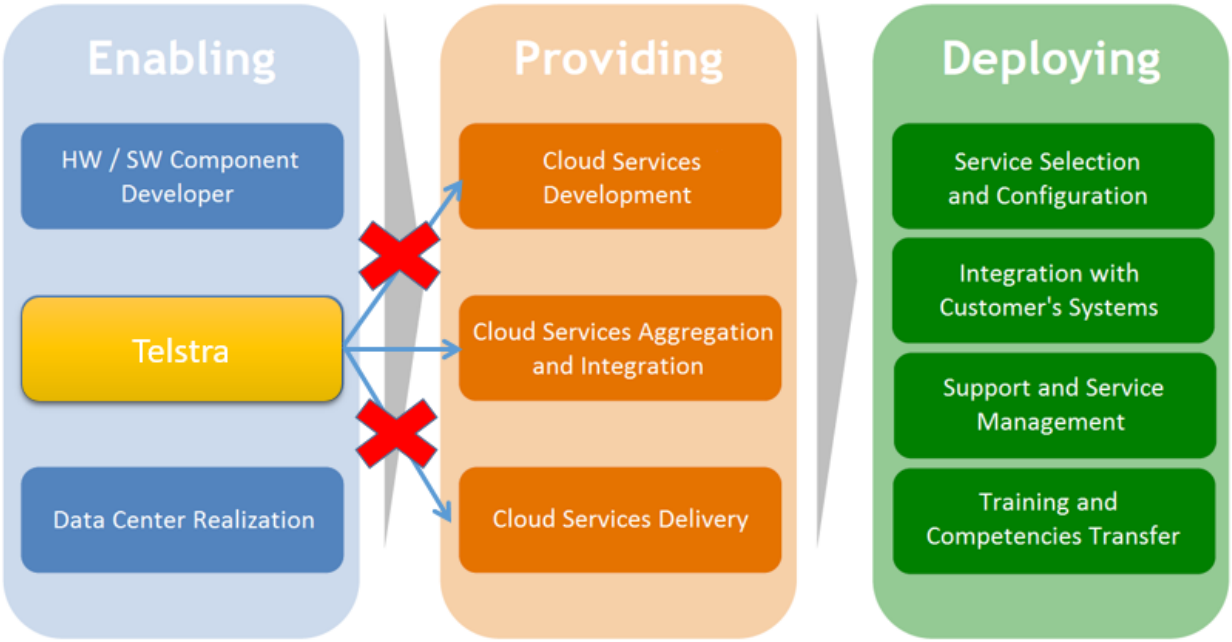


Image 49 – Mapping of Telstra on the Cloud Chain Value model proposed in this study

4.6.6 NTT Data

NTT Data is the IT and consulting unit of Nippon Telegraph & Telephone Corp., which is in turn commonly known as NTT, a Japanese telecommunications company headquartered in Tokyo, Japan. NTT is ranked 65th in Fortune Global 500 and is the third largest telecommunications company in the world in terms of revenue.

To rapidly move from being a classic phone provider to a modern digital Cloud focused company, NTT has chosen, through its subsidiary NTT data,, the M&A way and its history is, in fact, rich in acquisitions (634 million $ spent by NTT DATA buying companies from 2011 to 2016 according to Bloomberg). This allowed the Cloud-related revenue of the society to grow from 26% in 2008 to 46% in 2015 (NTT data).

Besides this, many Japanese companies, including NTT Data and its mastodon parent company, are sitting on big war chests and facing a shrinking home market, so NTT Data is also looking to

use M&A as a tool to establish itself as not only a major U.S. but also international player in IT consulting and support services.

The most important and expensive acquisition took place in 2016, when NTT Data bought Dell Services for about 3 billion $ and with it its USA, UK and Australia based data centers Global rivals of NTT Data, including Cognizant Technology Solutions Corp., Tata Consulting Services Ltd. and Atos SE had also previously participated in an auction for Dell Services that failed to generate a deal.

The M&A operation is expected to boost the company's experience in advisory services, but most of all in infrastructure presence. NTT Data also gains a new roster of federal customers, as Dell Services has currently a strong presence with a variety of US agencies.

In 2013, NTT had already more than doubled its data centers, acquiring U.S based Raging Services and acquired the American Virtela, aiming at the improvement of the response times of hosted applications and at the enlargement of its portfolio with Cloud-based security services as well as network virtualization expertise. NTT Data also inherited about 7700 square meters of server rooms from PT. Cyber CSF, bought in 2015.

Pure service providers have also been targets of NTT, like Arkadin, a Cloud-based collaboration Saas provider. "What we provide is what we call 'carrier Cloud' -- network and data center in a coordinated manner -- and we provide this with reliability and safety. That is where we can differentiate," along with providing economic and affordable connectivity, stated the CEO.

NTT, like many telcos, is working to provide a combination of public and private Cloud services to its customers and is about to launch a platform that will provide a single customer portal for all Cloud services, whether public or private, and all managed in the same way using SDN to allocate and manage resources.

Companies located in the right part of the chain proposed in this work have also been target, though. In fact, of the over 20 acquisitions of companies carried out in the last 5 years, a vast majority (75%) have a focus on 'soft' IT-services like IT consulting and/or various kinds of IT support. As an example, in October 2016, NTT acquired Nefos AG Salesforce consulting partners in Germany, Austria and Switzerland. The acquisition of Nefos reinforces NTT DATA's leadership position in Customer Management/Customer Experience (CRM/CX) solutions, key elements of both digital business and digital transformation solutions. Other M&A include Cirquent (2008), Keane (2010) and Intelligroup (2010).

Not as important as acquisitions, partnerships play a fundamental role in NTT's strategy, being the one with SAP the most relevant. In 2015, in fact, a premium partnership with SAP has been announced, to provide infrastructure services for SAP HANA Enterprise Cloud. Finally, NTT America subsidiary is famous, among experts, for providing secure connection to the Cloud, having dedicated enterprise-class firewalls for its Cloud services and requiring every customer in its Enterprise Cloud to use two-form authentication[43].

NTT Data is a giant in the Cloud Computing sector. Born as a telco company, the Australian firm grew rapidly, especially through acquisitions, occupying now all the subsets of the Providing and Deploying columns *(Image 50).*

[43] KPMG (2016)

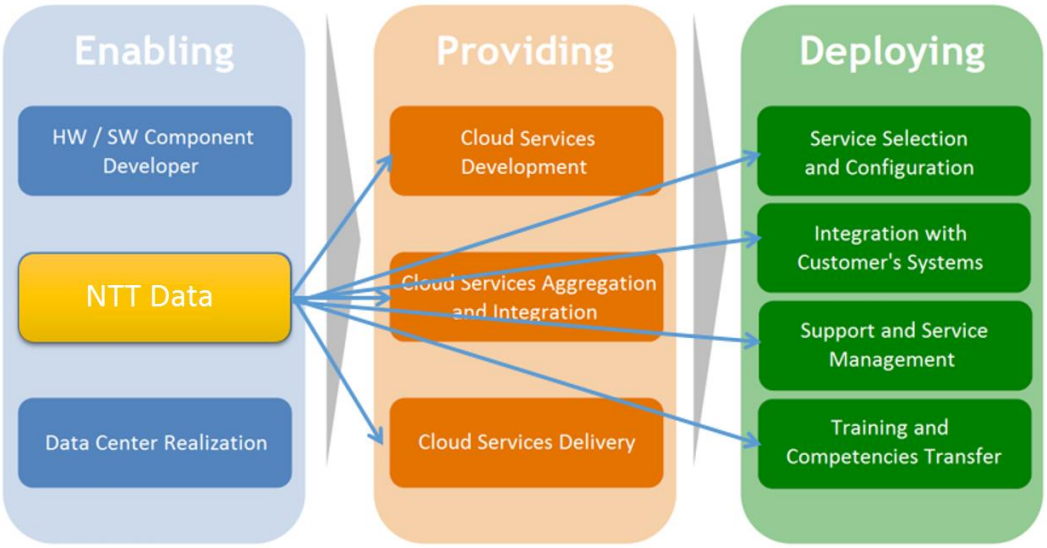


Image 50 – Mapping of NTT Data on the Cloud Chain Value model proposed in this study

4.6.7 AT&T Inc.

AT&T Inc. is an American multinational telecommunications conglomerate, headquartered at Whitacre Tower in downtown Dallas,Texas. AT&T is the second largest provider of mobile telephone services and the largest provider of fixed telephone services in the United States, and also provides broadband subscription television services.

AT&T Cloud game is quite strong: by the end of 2016, 80% of its application will be on the Cloud. By 2020, the company plans to virtualize 75% of its network, up from 5.7% at the end of 2015. Applications being moved are both big and small: for example, in 2015 AT&T moved to the Cloud a 42-year-old application that was doing inventory management.

When, about ten years ago, AT&T took its first steps towards the Cloud world, the idea was to take Amazon and Microsoft in a total Cloud battle. Along the years, the focus has shifted dramatically, with the company finding its sweet spot in leveraging its network to enable secure, high performance access to multiple Clouds, making them appear as if they were part of a single ecosystem. At the core of this strategy is NetBond, its on-demand VPN (virtual private network)

connection into a whole host of Cloud environments. According to vice-president of Cloud BU Andy Daudelin, “value isn’t so much in providing a proprietary Cloud service, as there are a lot of fantastic Cloud services out there, but our niche or our value is in the network and leveraging the network to integrate the Cloud, especially in a hybrid environment”. NetBond allows customers to manage the Clouds they use from a single interface, where security and performance are built into the network service. The additional value provided by Netbond is it enables services on AT&T VPN, and as features are added to that network, such as network-based firewalls, in-line filtering or traffic for malware and more, they are added to the NetBond capabilities as well.

As an example of partnership, in October 2016, AT&T announced that AWS entered their vast community of partners. NetBond will allow customers to access Amazon’s Web Service through AT&T high-speed network, while other benefits will include the capability to gather and send data from prefigured sensors and devices via the Internet-of-Things over the company’s network, besides combining threat data, analytics and know-how from both companies to boost security.

In short, AT&T admittedly switched to a partner model and stopped trying to compete with Cloud providers, rather enabling the use of their services through AT&T’s network.

In our graphic (*Image 51*), this means a slow-down in the integration towards the Service Development and Sevice Delivery model and a strong step towards the Service Aggregation and Integration section.

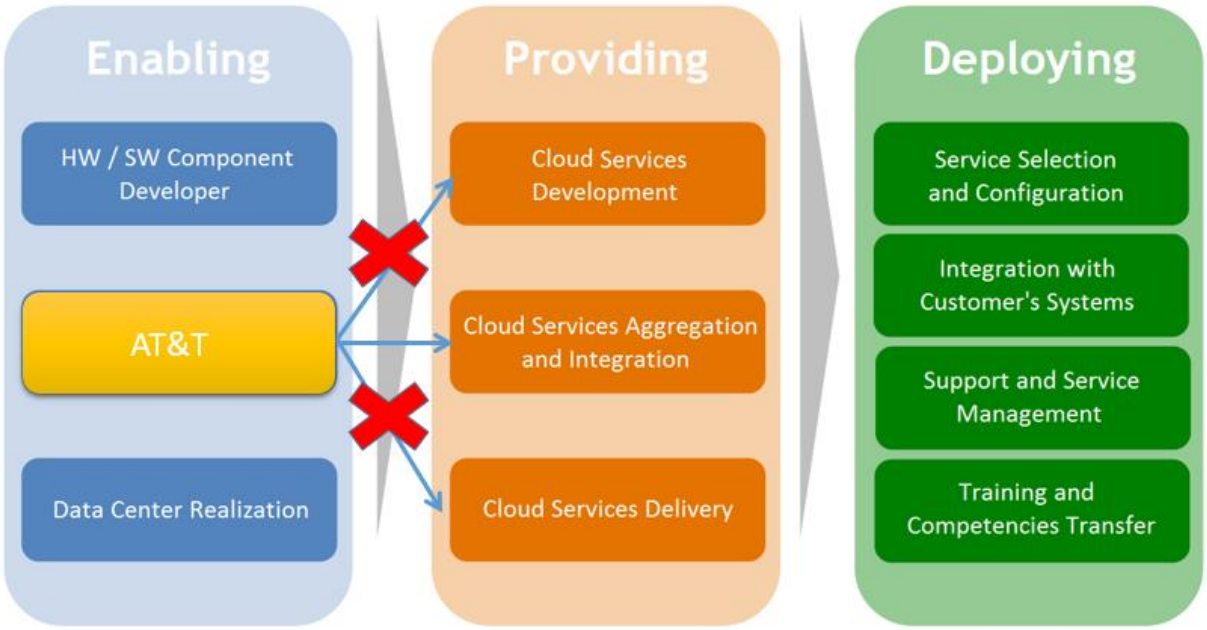


Image 51 – Mapping of AT&T on the Cloud Chain Value model proposed in this study

4.7 TLC Infrastructure: segment review

This quadrant of the chain plays a key role in the overall level of service that end users get, as they own the network that physically delivers the Cloud to the customer. The future of this market is not clear yet: for a long time they have been thought to be the next “dumb pipe”, facing the same risk that we saw for the previous subset, with services such as the Internet connection turning into commodities, and, with an hypothetic standardization of level of services, making price the main choice driver for customers.

Today, though, this forecast seems way too pessimistic: through differentiation and partnerships, they can provide or enable the access to Cloud service, while being the only players able to guarantee real SLAs to the customer.

Telco Cloud enablers / providers have a huge advantage of owning and operating the infrastructure networks, ensuring the quality of communications services. Also. If security is top of the customers' list, then Telco Cloud providers will probably be their choice. In the wake of recent high-profile data thefts and outages, in fact, the interest of most users towards the Cloud, understanding the possibility to lower costs, is mitigated by the risk of data being compromised. That's why many telco Cloud service providers have been adding appropriate security features to their services, to gain consumer confidence and ensure secure and uninterrupted services. NTT's enterprise-class firewalls are a good example of this. Moreover, many medium-sized and enterprise businesses already work with telcos, having established relationships for voice and other networking services. This is particularly true, for example, for Telecom Italia, which is a reference for many "PMI".

While telcos may offer more security, the service provider should also have the ability to segregate different clients' data and environments at an application and virtual infrastructure level, so that only authorized users can access that data. In this regard, pure Saas and Iaas vendors (Office 365, Salesforce, AWS, etc.) still have an advantage. That's why they need to rapidly get these competencies: some telco's are trying to partner with hardware providers (EMC, Cisco, Hp, etc.) and software and virtualization specialists, such as VMware and Citrix Systems.

Many others are expanding their global data center footprint through acquisitions, or building their own centers (NTT, mostly through massive acquisitions, Telecom Italia and Fastweb, raising their own server centers)

The tendency of telcos to move, through differentiation, acquisitions or partnerships towards the right part of the chain is real. The choice between offering proprietary Cloud services or enabling the access to the incumbent companies' own products is crucial. The case studies of AT&T and Telstra taught us how telcos, as big and powerful as they can be, may have serious problems selling their own Cloud products, and being credible to the customers' eyes. In fact these two companies reversed their strategies, which included monster investments aimed at creating their own Clouds, heading towards a multi-Cloud model and establishing as simple Cloud enablers,

rather than providers. A similar issue is being faced by Telecom, who is finding it hard to be really believable as an IT player, and mainly works through partnerships. In this regard, Deutsche Telekom goes against the trend and openly challenge incumbent service providers with its new product.

Other companies like Fastweb, besides partnering with big players, also try to promote an open innovation model (Call4innovation), looking for startups to collaborate with. We have also seen an example of a company (NTT) performing several acquisitions in the consulting sector. Other strategies include partnering with such companies, like the case of Telecom and Accenture.

Telco should also pay more attention to the potential of the data they collect: mining data for new consumer revenue streams has not yielded much success yet. This is partly due to increased regulatory pressure and public opinion concerns (fed by Apple's CEO Tim Cook accusations to Google and Facebook, who "trick people into giving up their data"). Telcos, for example, will bundle together location or movement data and sell them to governments who want to predict infrastructure demand, or provide for use mobile information, to allow managing motorway traffic and optimize public transport networks. The commercial opportunities for Telcos are great, and mostly unexploited.

4.8 Data Center Realization: strategies of the players in the segment

Data center services are services that help to either create, implement or maintain a data center, or to enhance what that data center does for an enterprise. This very broad term encompasses many different kinds of services that may assist planners in brainstorming around how to set up a data center. Other data center services may help to provide better results for what comes out of a data center.

4.8.1 HPE

We already talked about HP in the Component Developer section. HPE is a big player. The company has its own business unit, called HPE Datacenter Care Services, to provide comprehensive support solution tailored to meet customers' requirements. Over the last three years, HPE also started selling data centers in a new way, via a program called "facilities as a service", or FaaS. While companies normally either build their own data center or lease space, HP builds the center, complete with all the power and environmental systems, to customer specs, and will maintain ownership of the structure, unless the customer eventually decides to buy it. To date, though, this service has not had the success it initially hoped to gather.

In 2016, together with other tech giants such as Google and IBM, HPE launched a new standard called OpenCAPI. This standard, designed to speed up server performance, is aimed at helping businesses better handle increasingly data-intensive workloads. OpenCAPI can reduce complexity, eliminate inefficiencies in current architectures and bring compute power "closer to the data". Below is reported HPE's mapping on the Value Chain (*Image 52*)

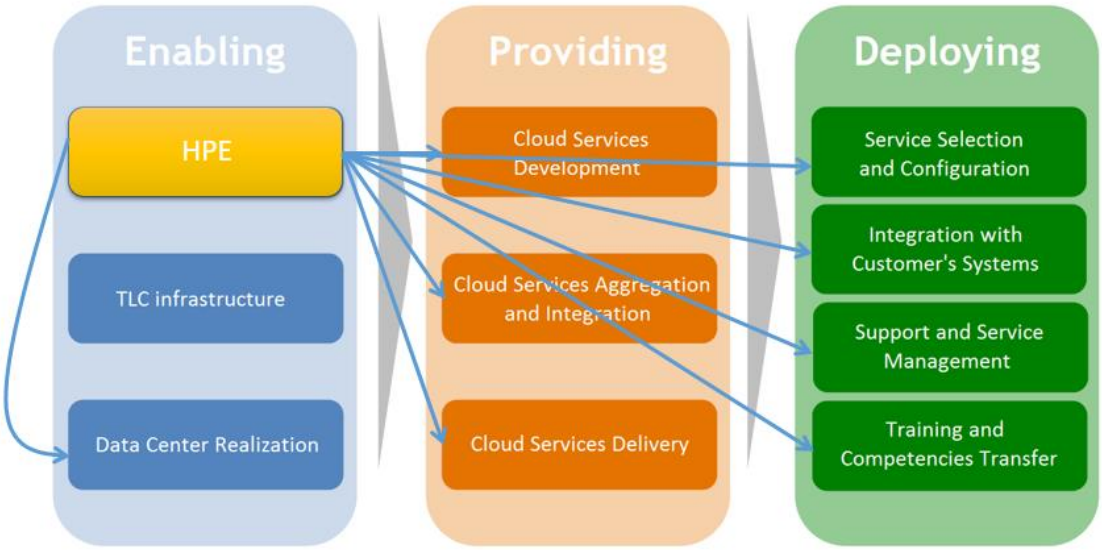


Image 52 – Mapping of HPE on the Cloud Chain Value model proposed in this study

4.8.2 IBM

IBM, already introduced in the Component Developer section, is one of the leaders in the Data Center Services market. IBM provides services such as data center design and realization, storage and server optimization, Middleware services and data migration between data centers. IBM is part of many consortia, one of which has been discussed above in HP's presentation.

The company has an extensive presence in our chain model (*Image 53*): this makes IBM very reliable to the eyes of the customer. While its suite of Cloud services includes IaaS, PaaS and SaaS, IBM, mainly a component and software developer, also masters consulting services, with a massive presence in the right part of our model, close to the end customer, but also being the market leader, along with HP, in Data Center Services.

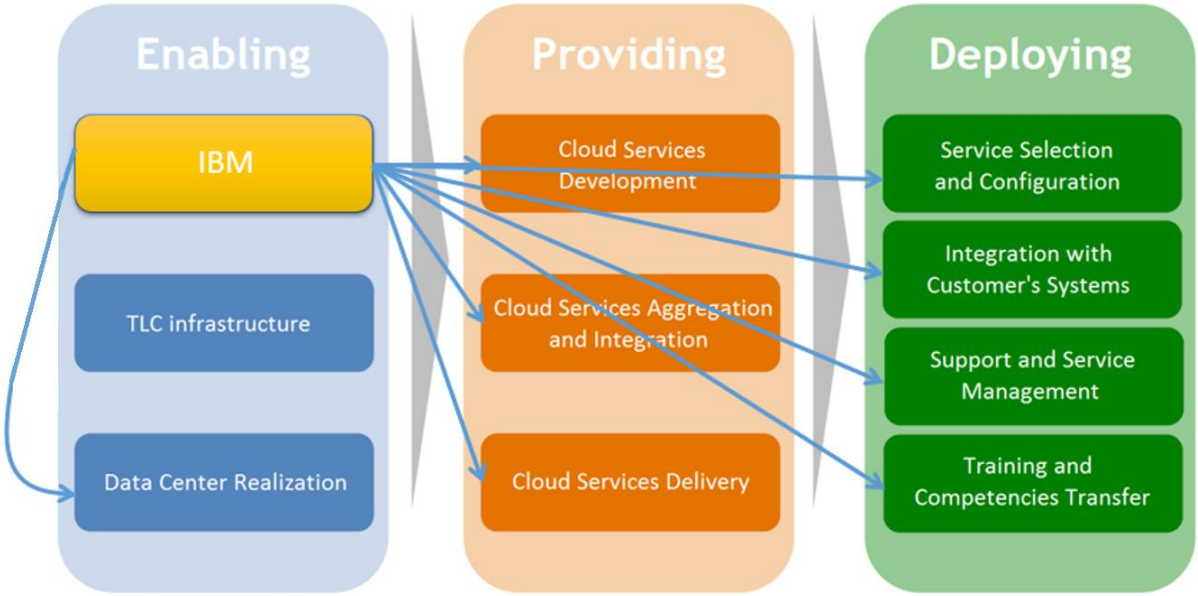


Image 53 – Mapping of IBM on the Cloud Chain Value model proposed in this study

4.9 Data Center Realization: segment review

Consulting for data center realization should include interviews, risk analysis, conception, steering of certification processes, in a design phase. Planners need to consider what kinds of data are valuable to the business and how many data will be needed. The building phase includes planning, project management and project cost control services, while energy-management and ROI evaluation are also part of the package.

The variables to be taken into consideration when designing a new data center are several: first, a sustainable model should be implemented. Criteria like modularity, flexibility, scalability and energy-efficiency should be primary drivers, in order to give to the customer the chance to adapt to requisite changes in the future. The maintainability of the system is also something to be really careful about, and this includes implementing affordable monitoring systems and providing solutions easy and fast to repair, in order to be able to deliver decent SLAs to the end customer. Fire protection and air-conditioning systems expertise are also requisites for the consulting company. Finally, security is an obvious requisite, extensively discussed in other sections of the study. The respect of criteria necessary to the obtainment of high-level certifications is a plus customers should not underestimate, as it allows them to have a competitive advantage.

Later on, months or years after the realization of the data center, administrators will often need to adjust or improve specific processes for better performance. Data center services can help to optimize data backup and data recovery, the flow of data to individual employees or customers, and the use of aggregated big data to feed analytics machines that can show businesses more about where they are going in the future. The relative importance of drivers guiding the realization of data centers are not static over time and while being all of them important, some have gained more attention over the last years. For example, floor space was considered as an important variable. Today, innovative concepts like infrastructure monitoring, sustainability and modularity are more important to the eyes of the market.

This sector is mainly populated by tech giants, whose core business we usually find in other sections of the chain: HP and IBM are Component Developers which integrated vertically and entered this market. This makes a lot of sense, as data center realization skills are mainly obtained through the components and data center realization itself.

A trend we can notice in this market is strong collaboration inside the section of the model. Like we have seen for the OpenCAPI Consortium, which will give life to the first products in 2017. OpenCAPI concepts will be both included in new data centers realized by the consortium participants and later rolled out to the customers who choose such companies as consultants. Another similar consortium with the same strategic goals is GenZ, which aims at addressing the need for higher performance data accesses, with an interconnect based on memory operations that addresses both server node and rack scale. Memory operations such as loads and stores allow processors to access both volatile (ie DRAM) and non-volatile storage in the same efficient manner. Emerging Storage Class Memory (SCM) and rack level disaggregated memory pools, are example use-cases that benefit from a memory operation interconnect.

Notably absent from the OpenCAPI Consortium and the Gen-Z Consortium is Intel, which is likely to explore its own ways to improve server performance for emerging workloads and keep its specifications under wraps rather than release them into the open source world. The rest of the market, though, is moving towards open standards.

4.10 Cloud Services Development: strategies of the players in the segment

Service Developers build (and most times deliver) Cloud services. This is the very central section of the chain proposed in this study. We are now going to review some of the major Developers and try to spot patterns and relationships related to other segments of the model.

4.10.1 Amazon Web Services

AWS, or Amazon Web Services, is a subsidiary of Amazon.com, which offers a suite of Cloud Computing services that make up an on-demand computing platform. Officially launched in 2006, AWS was originally designed as a way of meeting the company's own huge demand for resources as its retail empire grew, while later Amazon began making its online infrastructure available to outside developers.

In 2015, it was estimated that AWS customers were deploying 10x more infrastructure on AWS than the combined adoption of the next 14 providers[44]. In 2015, at AWS "re:Invent Keynote", Amazon disclosed that they had more than a million active customers every month in 190 countries, including nearly 2000 government agencies, 5000 education institutions and more than 17500 non-profits. Customers included NASA, Pinterest, Netflix and the CIA[45]. According to a survey conducted in Q2 2016 from Synergy Research Group, Amazon's share in the Cloud Infrastructure Services sector is about one third of the whole market, and that's including IaaS, PaaS and Hosted Private Cloud. Leader in the IaaS and PaaS markets, AWS offers access to an enormous number of applications provided through its AWS marketplace. In this regard, the company can make the most of its e-commerce knowhow and apply it to cloud software.

For its products, the company has been cutting prices for years, while adding instead great value with numerous new features. Amazon does not want to profit much upon single customers, rather expand its marketshare. Amazon is releasing so many products, while lowering prices, that even though its competitors are trying to chase, they are nowhere near the aggressive pace Amazon is keeping. A graphic which shows AWS's price strategy is reported in *Image 54.*

[44] Gartner (2015)
[45] Amazon's data

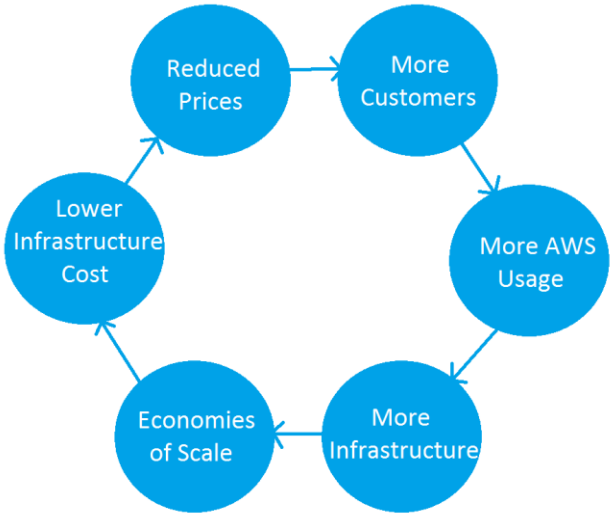


Image 54 – Graphic shown at AWS event, 2012, still valid today

In October, it was announced that Amazon and VMWare from Dell Technologies teamed-up to provide a new offering which consists in a software, sold and supported by VMWare, that leverages AWS. This partnership is aimed at helping customers which used both products, reducing the need for integration software and skills on the customers' side.

The absolute leader in the "Providing" column of our model, Amazon does not limit to that section. Let's focus, for example, on the hardware they use for their networking requisites. Amazon started out buying servers from the big makers, eventually becoming the top buyer from Rackable Systems. Over time, though, the company decided to engineer its own system to tune them precisely for its own workloads So, in 2009, AWS designed its own network and went to original design manufacturers to build the hardware, and put together a team to write the networking software stack on top of them. Designing its own hardware allowed Amazon to add only the feature they needed, saving lots of money to invest somewhere else. Surprisingly, besides cost reduction Amazon also got major network availability, because switches and routers designed by AWS only had the feature needed, as opposed to commercial network operating systems and hardware, which have to cover all of the possible usage scenarios and protocols, with tens of millions of lines to code, which are difficult to maintain.

Amazon is also reportedly considering offering home internet services in Europe. Making the most of European legislations, which guarantee wholesale access to existing networks, the company could buy services from existing providers and bundle them with its Prime services, creating a package similar to those offered by cable TV and Internet Providers So in this markets, Amazon may be able to buy 'white label' Internet access in bulk and then resell it under the Amazon labe. In the U.S., Amazon would have it harder though: the main reason for that is that the Federal Communications Commission (FCC), which regulates this industry, did away with network "unbundling" more than ten years ago and has no plans to reinstate those rules[46].

The workaround would consist in providing Internet wirelessly through mobile devices, which is open for wholesale access. Amazon is likely going to push ahead aggressively with this initiative in the UK and Germany[47]. By controlling even a small portion of internet connections in key markets like those, they can eventually start attracting even more people into the Amazon Prime service, which is one of their core objectives for their retail business after all.

Moving to the right part of our chain, important partnerships have been setup by the American giant, the most important of which the one with Accenture, which helps companies migrate and run their business in the AWS Cloud. The partnership gave life, in 2015, to Accenture AWS Business Group, which reunites professionals from both societies expert in Cloud architecture and marketing solutions, but also sales and business development, which offers consulting services and integrated technological solutions.[48]

To sum up Amazon's strategy (*Image 55*), they are the undisputed leader in the "Providing" column of our model. They develop and deliver IaaS and PaaS services, and grant access to thousands of SaaS applications through AWS Marketplace. Amazon developed partnership programs to gain a closer presence to the customer, even founding a spinoff joint venture with

[46] Ars Technica (2016)
[47] The Daily Mail (2016)
[48] Washington Technology (2016)

Accenture. AWS is also designing its hardware and software, to make it better compatible and optimized for its requisites.

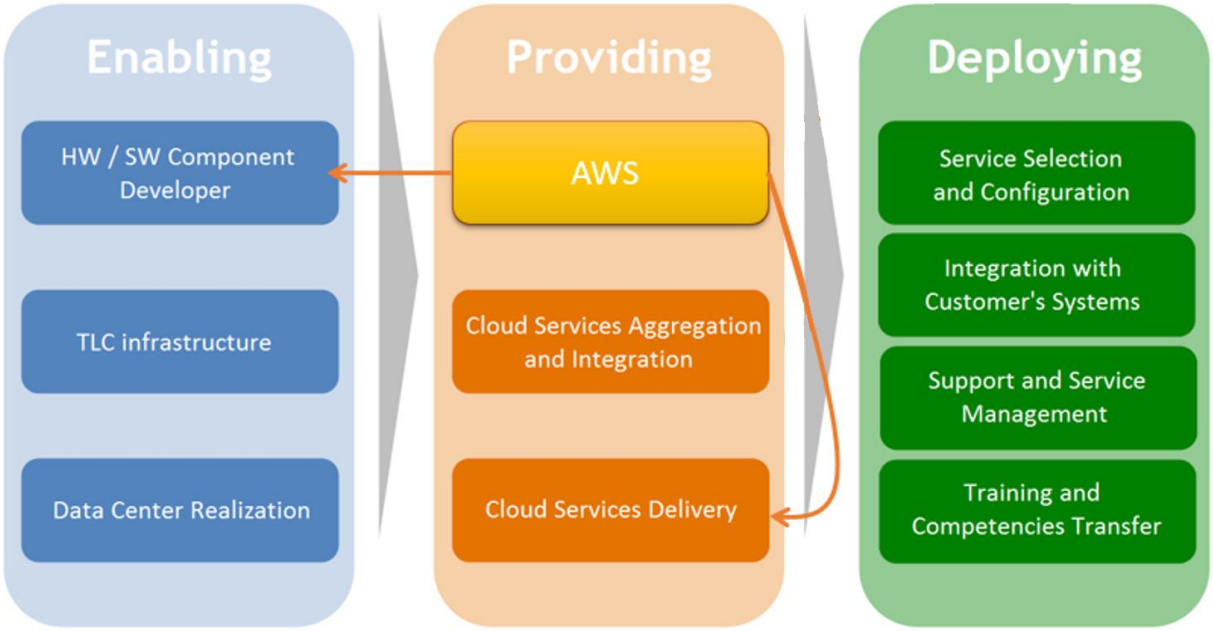


Image 55 – Mapping of AWS on the Cloud Chain Value model proposed in this study

4.10.2 Google

Google is an American tech company specialized in Internet related services and products, including online advertising technologies, search, Cloud Computing, software and hardware. In August 2015, Google announced plans to reorganize its interests as a holding company called Alphabet Inc., while Google became Alphabet's leading subsidiary. Google's services include, beyond Google's core search engine, services for productivity (like Google Docs), email (Gmail), social networking (Google+), language translation (Google Translate), turn by turn navigation (Google Maps), video-sharing (YouTube) and much more.

Google's Cloud Services span from Google Cloud Platform (which includes the IaaS Google Cloud Compute Engine, the PaaS App Engine and Cloud Storage) to the SaaS G Suite (before 2016 called Google Apps for Work), to the G Suite marketplace.

Google App Engine is a platform for development and hosting of web applications which is free until up to determined thresholds, opened in 2008 and released as a production environment in 2011.

Despite Google's size and power, when it comes to Internet services, its Cloud offer struggles against the competition (Microsoft Azure and AWS). It's not easy to define the reason why the leader AWS seems so far away, but some causes may include Google's "origins" and its difficulty to gain credibility within the enterprise. Starting from the first point, we may say Google's entry into the Public Cloud market was largely defensive and to support demand from their customer base to extend their service. About the second argument, even with the announcement of a strong partnership with VMware, Google still has some issues with credibility in the enterprise business. More partnerships may be a step towards the right direction, for example with large hybrid providers like Dell and HPE, while from a datacenter and infrastructure perspective, Google may need to run a major acquisition (VMware may be a target)[49].

Despite these factors, as written above, Google also has one very good point when It comes to the Cloud: Big Data Management and Analysis. This gets clearer if we take as an example Spotify's decision to move its core infrastructure to Google Cloud, announced in February 2016. Nicholas Harteau, Spotify's vice president of engineering and infrastructure, said that they chose Google "because of their leadership in data for quite some time." [50] In fact, Google is betting big towards this direction, and as they already have very good data management tools, the real challenge is make them easy for customers to use, than they will have a real advantage over the rest of the market[51].

In regard of hardware used to run its data centers, Google does not build individual computer chips (yet), but they piece together systems from existing parts and contract outside companies

[49] Forbes (2016)
[50] Forbes (2016)
[51] Gabriel Consulting Group (2016)

to assemble them. “Yet” because Google revealed, in May 2016, that they built a proprietary chip for machine learning and have been using it since 2015[52].

Google is also moving towards the telco segment of the market: its Google Fiber project, started in 2013, provides broadband Internet and cable television to an increasing number of locations in the US. In March 2016 Google also started offering landline phone services, which makes sense, since it was already providing Internet connections and TV packages. For its Nexus and Pixel phones, Google also made available “Project Fi”, a service started in 2015 which borrows the coverage of T-Mobile, Spring, US Cellular and Three to provide internet access for mobile users. Moreover, in summer 2018, the Pacific Light Cable Network (PLCN), a 12.800 km undersea infrastructure financed by Google and Facebook, is expected to be operative[53].

Google, although still far from AWS, is one of the world market leaders as a Cloud Service Provider. It also offers Aggregation and Integration services, with its App Engine and through its vast marketplace. Google designs many of the machines needed to run their services, and now even its own proprietary chip, drawing an arrow towards the “HW/SW Component Developer” segment. The telco sector is another one involved in Google plans (see Google Fiber, Project Fi and the PLCN). After a first period in which Google went in a direct way to the customer, in 2012 Google Cloud Platform Partners was kickstarted: Technology Partners integrate Google platform to extend functionalities, or offer one of Google Services (mostly AppEngine) as a basis for their products, while Service Partners offer consulting and implementation services. Google’s offer is represented in *Image 56.*

[52] Forbes (2016)
[53] Wired (2016)

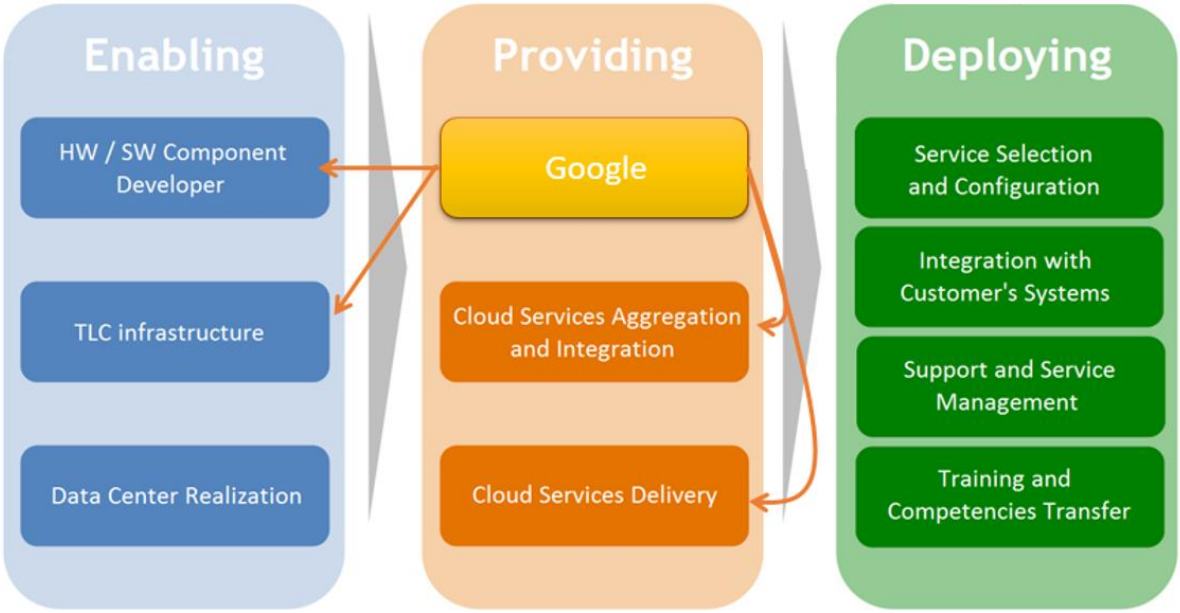


Image 56 – Mapping of Google on the Cloud Chain Value model proposed in this study

4.10.3 Microsoft

Microsoft Corporation is the biggest software producer of the world, in terms or revenue, and one of the biggest in terms of market capitalization. It was founded in 1975 by Paul Allen and Bill Gates and with its software and operating systems it gave a huge contribute to the idea of computers and technology we have today.

Until 2011, the Cloud has not produced big revenues for Microsoft, rather representing a threat to the big money the company made on software licenses. Over the years, though, Microsoft has been able to fill in the gap with all competitors but AWS and provide a complete offering in the Cloud department. Today everything in the Cloud that is not SaaS is a two-horse between AWS (bigger market share) and Microsoft (bigger profit per customer).[54]

[54] Tech Republic (2015)

Microsoft has the broadest set of cloud services available today, which includes some widely deployed SaaS applications such as Office365, Dynamics, Share Point, Exchange and Skype For Business. This combined with its IaaS and PaaS services (the most representative being Azure) gives Microsoft a bigger "cloud footprint" than any other provider.

As Artificial Intelligence and machine learning are trends expected to change the IT world as we know it and the Cloud, Microsoft gives developers the possibility to build such intelligence into applications through the Cortana Intelligence Suite. In addition to being Microsoft's voice interface, Cortana includes a suite of tools, one of them being a bot framework. Also, the combination of Microsoft Cloud and AI with Hololens creates some really interesting use case scenarios, for example businesses revolutionizing the shopping experience.

Moreover, in 2016 Microsoft deepened its hybrid cloud strategy with the release of Windows Server 2016 and System Center 2016. Windows Server 2016 is a cloud-ready operating system designed to enable hybrid cloud while System Center 2016 allows users to deploy, configure and manage hybrid cloud infrastructure.

Microsoft has built a lot of partnerships with consulting partners, to be able to approach the customer more directly. Moreover, some partners, like Accenture, can deliver Azure's services on their own. In fact, Accenture and Microsoft have an agreement that enables Accenture to provide clients with an end-to-end public cloud solution on the Windows Azure platform, marking the first time clients can contract for design, delivery and ongoing management services of applications hosted in the cloud on Windows Azure from a single global technology services provider[55].

Some examples of non-consulting related partners include HPE (alliance to provide a Hybrid Cloud solutions integrated with Azure), Adobe (in the marketing Cloud segment) and Renault-Nissan (smart car segment).

[55] Accenture (2016)

Moving to the telco side, Microsoft is rich in partnerships as well. A recent example is the one announced in September 2016 with Telstra (analyzed in the telco segment), to deliver Office 365 integrated with voice services. The deal will see Microsoft's productivity and collaboration services combined with Telstra's network to create a unified cloud collaboration and voice calling solution[56].

More importantly, Microsoft is taking part, along with Facebook, in the laying of an undersea cable in the Atlantic Ocean, similarly as we said about Google. The cable, 6600 km long, is part of a project called Marea. This is a big deal, as it highlights how Microsoft is interested in the telco market too. Time will tell how many other steps Microsoft will take in this direction. The first approach to the telco world had been made in 2011, when Microsoft acquired Skype.

Finally, as seen for other providers like Google, Microsoft is also designing its own data centers, approaching the "HW/SW Development" segment of our model. What is also interesting, Microsoft joined in 2014 the Open Compute project, an open source hardware movement. The contributes of Microsoft can be very important, because even its own servers have to be designed in order to perform well in different conditions. This is because Microsoft has a variety of facilities, from a building with a capacity for 300,000 servers outside Chicago and a purpose-built cloud center in Quincy, Wash., to much smaller facilities in other parts of the world, including some co-location facilities.

To sum up, Windows is a leader in the Cloud market, providing all kinds of services, from IaaS and Paas to SaaS, and it also serves as an aggregator (see as an example Azure marketplace). Many strategic alliances have been established both towards the consulting industry, even granting to some companies permission to deliver some products themselves, and in towards the telco sector. In this last regard, Microsoft is showing some interest towards this market, approaching

[56] www.crn.com (2016)

it years ago with the acquisition of Skype[57] and now laying fiber cables undersea in a joint venture with Facebook[58]. Microsoft's offer is represented in *Image 57.*

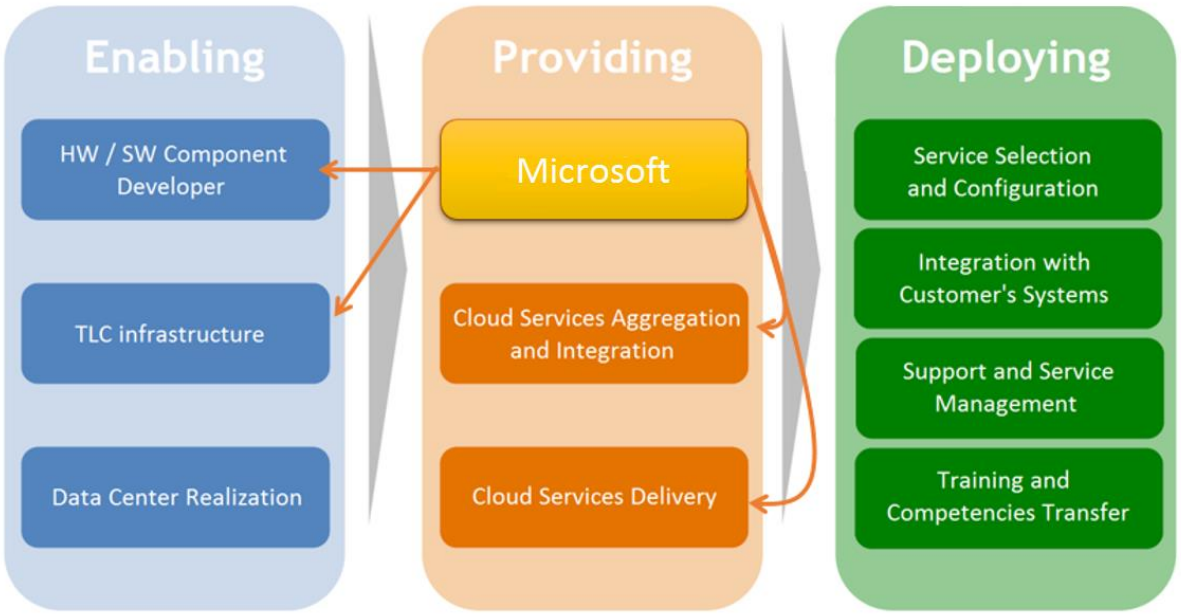


Image 57 – Mapping of Microsoft on the Cloud Chain Value model proposed in this study

4.10.4 Salesforce

Salesforce is an Cloud focused company headquartered in San Francisco. The society was founded in 1999 offering SaaS services. Today the offer includes PaaS and IaaS services and is one of the greatest actors in the industry. *Image 58* reports Gartner's Magic Quadrant for PaaS (2016), where Salesforce is mapped in a very favorable position.

[57] Business Insider (2011)
[58] Wall Street Journal (2016)

Image 58 – Magic Quadrant for PaaS, Gartner (2016), Salesforce is in the Leaders section

Proof of the gradual enlargement of Salesforce's offer, from a SaaS to a PaaS & SaaS provider, is the ecosystem created around its offer. In fact, Salesforce's marketplace, called AppExchange, gives developers the chance to publish their own application based on Salesforce platform.

To have an idea of the cash flow generated by such applications, Apttus, a so-called quote-to-cash company that helps businesses draw up price quotes and contracts, and ultimately get customers to sign on the dotted line, is on track to generate revenue of $150 million this year, and more than $250 million in revenue next year[59]

[59] CNBC (2016)

Another application, FinancialForce, will approach a $100 million revenue run rate by the end of the year. The company sells enterprise resource planning (ERP) apps that help customers with supply chain, human resources and product management.

The risk faced by such companies, obviously, is being totally dependent on Salesforce. Their services normally fill niches still unexplored by Salesforce standard apps, but if the giant from San Francisco later decides to build its own proposal, this will be better integrated with the system and more advertised. This recently happened to ServiceMax, leader in the field service management with its app available on AppExchange, which is facing some serious risks due to Salesforce proposing their own field service tool in 2016.

Recent strategic moves from Salesforce include:

- a partnership with Cisco announced in 2016, which will result in native integration of Cisco Spark and WebEx into Salesforce's Sales Cloud and Service Cloud via the Salesforce Lightning Framework (according to the two companies, the integration will allow joint customers to communicate in real-time using chat, video, and voice without leaving Salesforce or having to install a plug-in, eliminating the hassle of toggling between apps);

- the introduction of a new e-commerce service based on its $2.8 billion acquisition of Demandware Inc. in July. The Salesforce Commerce Cloud is intended to help customers set up online storefronts and in-store tablets and kiosks, adding commerce functions to the company's portfolio of software delivered as a service over the internet[60];

- the launch, announce in October 2016, of a new Artificial Intelligence (AI) tool called Einstein, which should spot patterns, make predictions and more in general "help humans".

[60] Wall Street Journal (2016)

When it comes to consulting services, Salesforce has an incredible network of partnerships, one of the strongest being with Accenture. Besides that, Salesforce traditionally serves as a consultant itself when it comes to big, strategic customers.

Every four months, Salesforce releases important upgrades, most of which include the possibility to configure some process that before could only be implemented through coding. This is actually reducing the need for consulting support. In fact, after an initial go-live project, customers may have acquired themselves competencies for the maintenance of the system.

Summing up, Salesforce position in our model, it serves as a Service Provider, with PaaS and SaaS offerings. Its marketplace aggregates products from other companies based on their platform, making Salesforce score a presence also in the Cloud Services Aggregation and Integration of our model. Salesforce has a vast network of partners, but, especially for big go-live projects, it also delivers consulting services. Its user-friendly configuration tools reduce skills needed on the customer's side, enlarging the Providing column and pushing the consulting one (*Image 59*).

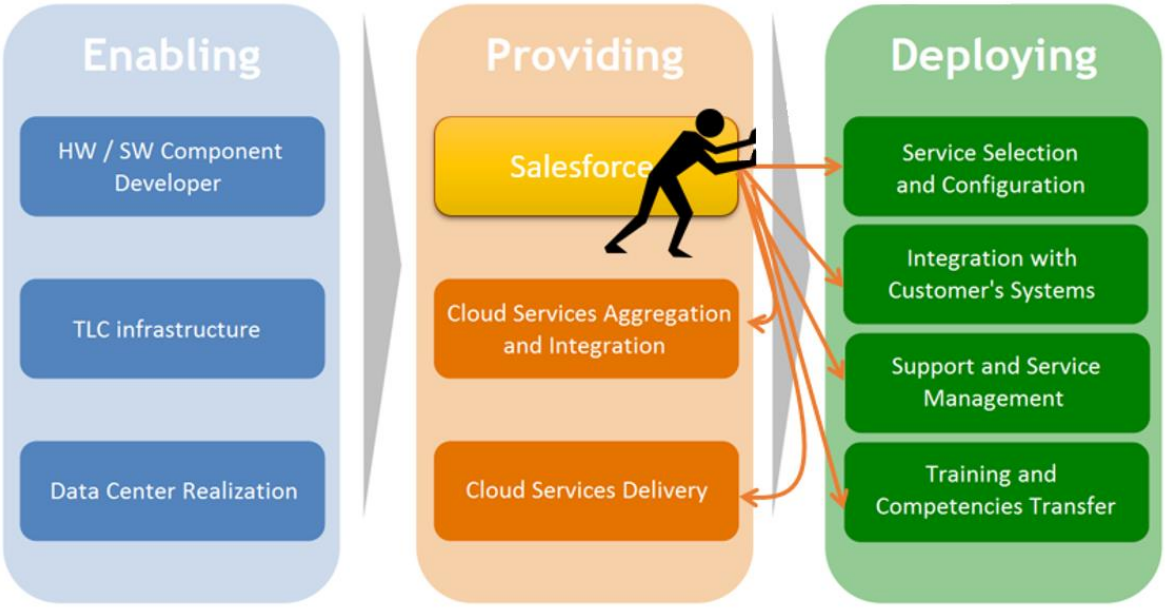


Image 59 – Mapping of SFDC on the Cloud Chain Value model proposed in this study

4.10.5 Dropbox

Dropbox is a file hosting service operated by Dropbox Inc., headquartered in San Francisco. Founded in 2007 by MIT students Drew Houston and Arash Ferdowsi as a startup company from the American seed accelerator Y Combinator. Dropbox uses a freemium business model, where users are offered a free account with a set storage size and paid subscriptions for accounts with more capacity. The functionality of the service can be integrated into an application via API.

The reason why Dropbox is included in this study is mainly for its decision to switch their data from AWS to its own data centers. For eight years, in fact, Dropbox stored billions of files on Amazon's Cloud. Between 2014 and 2016, though, Dropbox built its own data centers and moved there about 90% of its files. Paradoxically Dropbox, a Cloud focused company, moved its data away from the cloud. This actually makes sense, as some companies get so bug it gets convenient for them to build a proprietary structure. Dan Williams, Dropox Infrastructure manager, stated "if you're big enough, you can save tremendous amounts of money by cutting out the cloud all the other fat"[61]. Just like Google, Facebook, AWS and Microsoft have done for years, Dropbox started designing its machines, called Diskotech, each Diskotech box holding as much as one petabyte of data. The migration process took two years: once built the initial code, the team tested it on a network of pretty standard hardware, a kind of shadow version of the services with about 20% of data that was housed on Amazon and tested it for eight months. This epic task is not for everybody, and many big companies choose to go the opposite direction (see Evernote).

In our model (*Image 60*), Dropbox occupies the Cloud Services Development segment, the Cloud Services Delivery one and, after designing and building its own data centers, the HW/SW Component Developer role.

[61] Wired.com (2016)

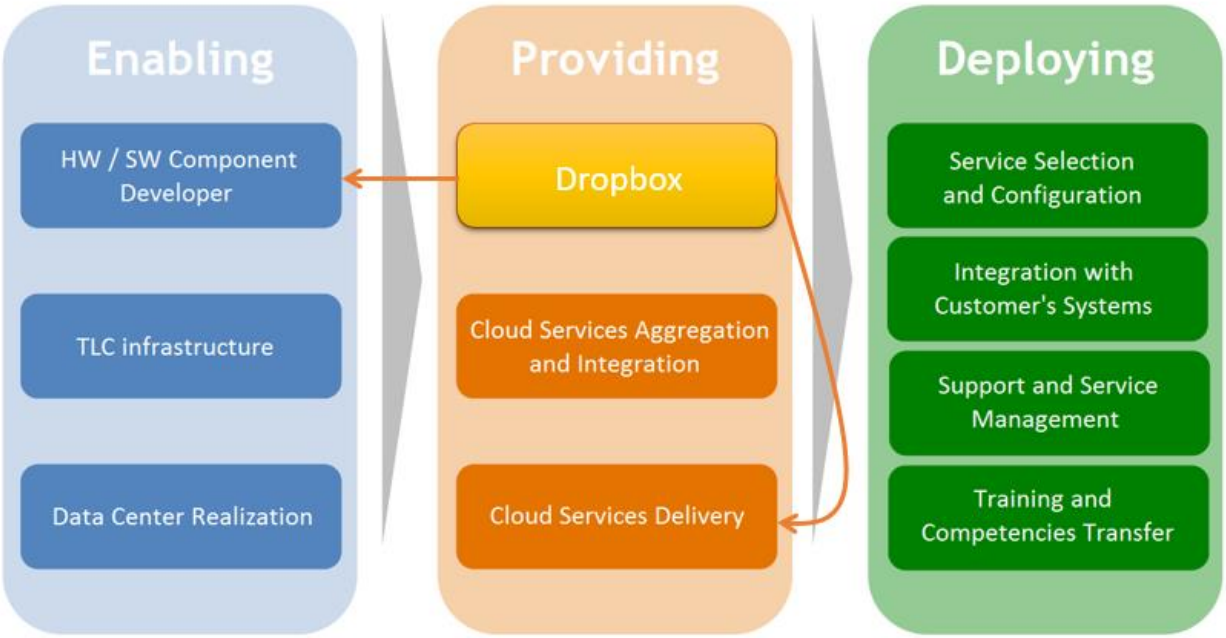


Image 60 – Mapping of Dropbox on the Cloud Chain Value model proposed in this study

4.10.6 Evernote

Evernote is a cross-platform, freemium app designed for note taking, organizing and archiving. Developed by Evernote Corporation, it supports a number of operating system platforms and also offer online synchronization and backup services.

In September 2016, Evernote announced they would shut down their data centers at the beginning of 2017. The transition concerns approximately three petabytes of user data from Evernote's two current data centers into the Google Cloud Platform. Evernote is doing the exact opposite of Dropbox, as seen in the previous paragraph. The industry trend is by, by the way, by Evernote's side, with more businesses moving applications and data into shared Public Cloud infrastructures. One of the drivers that made Evernote opt for Google's offer is AI, which means

Evernote hopes its partnerships with Google, besides cutting costs, will improve end users' experience, making the most of big G's "self-learning" machines[62].

The representation of Evernote's strategy in our model (*Image 61*) will be the exact opposite of Dropbox's, with the company ditching data centers and direct Cloud Services Delivery to cut costs, exploit Google's AI tools and refocus on the Cloud Services Development segment.

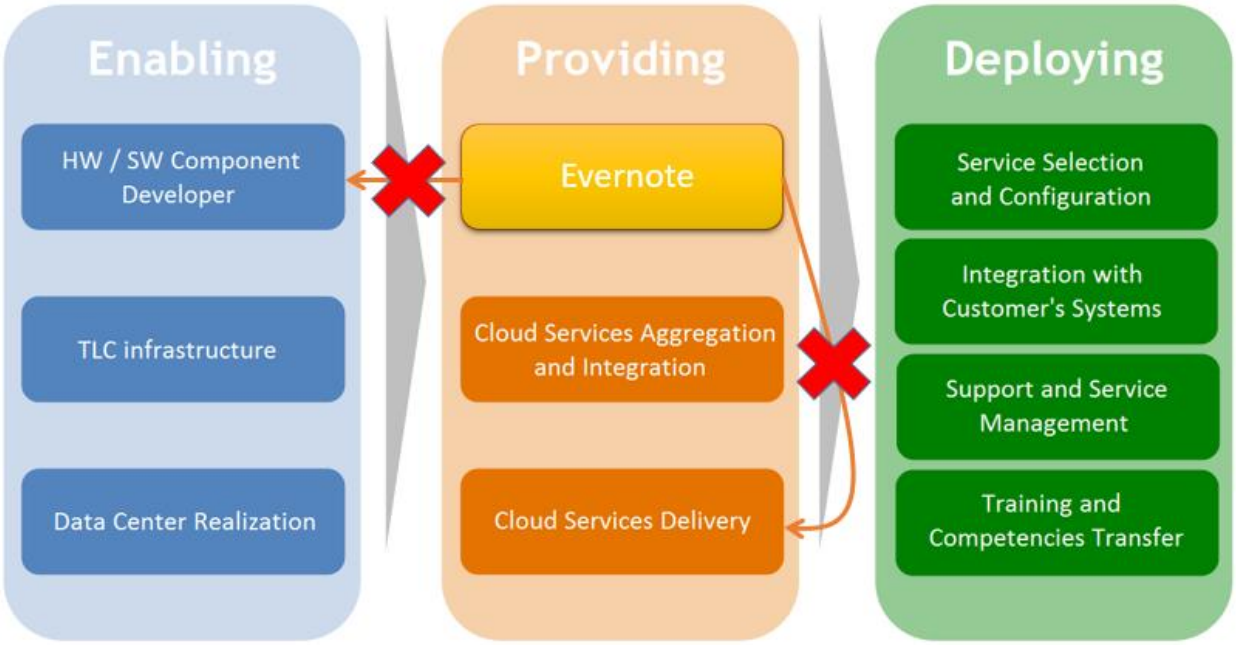


Image 61 – Mapping of Evernote on the Cloud Chain Value model proposed in this study

4.11 Cloud Services Development: segment review

Service Developers usually develop standardized solutions, able to satisfy the needing of as many customers as possible. It is thus difficult to differentiate, especially as for the IaaS model. At a SaaS level, the offer mostly includes horizontal solutions, suitable for most enterprises, applications for individual productivity or Sales Force Automation systems. Some companies, to

[62] Fortune (2016)

allow customers to develop vertical solutions, provide dedicated platforms (aPaaS), through which it is possible to create applications that will be delivered as a Service.

As a reference to our model, a subset of worldwide leader among Cloud Services Developers is trying to integrate towards the HW / SW Component Development segment, with companies like Google, Amazon or Microsoft designing more and more components they use to provide their services, or building their own data centers (Dropbox). On the other hand, we have also seen an example of the opposite process (Evernote ditching their data centers and moving their data to Google's Cloud), so that we cannot say that either of the two strategies is absolutely right in today's market. By the way, the direction that the industry seems to be going towards is the same as Evernote's.

The biggest Cloud developers/providers also seem to be "tired" to stay OTT (over the top) and to have to depend on the infrastructure: they can buy it"[63]. We have seen examples of this concept in the previous paragraphs, with Google and Microsoft building telco infrastructure. Another case is represented by Facebook, who, writes the Washington Post in 2016, is studying to become a real Internet provider: the society has been in talks with the U.S. government and wireless carrier to provide low-income and rural Americans with free connection. The program would not directly pay for users' mobile data, rather allowing them to stretch their data plans by offering free Internet access to resources such as online news, health information and job leads. By the way, if cost-saving is the main driver that leads the other players analyzed in regards of the "invasion" of the telco section, Facebook has different goals, the main being gaining a good image.

The rectangle of "Cloud Services Delivery" is also strongly related to the one we are analyzing, as most companies which develop a service also deliver it. One example where this does not happen is for applications based on services like GAE (Google App Engine). GAE provides services that can be encapsulated inside applications designed by third parties. Google than also hosts and delivers the service to end users, while the third party developer, in this case, only occupies the Cloud

[63] Il Sole 24 Ore (2016)

Services Development section. The Aggregation and Integration one is territory of expansion for Cloud Services Developers as well, with dedicated applications or, as seen for examples like AWS, Microsoft, Google and Salesforce, through virtual Marketplaces, where the company itself and third party developers can open-innovate and publish their own solutions, which extend the functionalities of the service.

Finally, it is fundamental for Cloud Providers to build an advanced network of partners, which besides being a part of the chain, representing the Deploying column, in this case play the role of vendors, actively proposing the partner Cloud solution to the end customer. Cloud providers can, sometimes, even be in competition with their partners, taking charge of most important projects themselves. A different and much more indirect form of competition takes place when, simplifying the functionality of the system and making it much more configurable (also by non-developers and unskilled users), providers are pushing their column to the right, making the Deploying one narrower and giving more and more customers the possibility to use the system without the help of a consulting company (like commented in Salesforce's paragraph).

4.12 Cloud Services Aggregation and Integration

This zone of the value chain is very heterogeneous, as it includes different types of services. As anticipated and defined in the introduction of the model, here we can find iPaaS (integration Platform as a Service, which are Cloud tools to connect different applications and services), CSB (a Cloud Service broker provides value added services on top of existing Cloud platforms[64]) applications built on top of specific micro services provided in a PaaS (like GAE) and Marketplaces.

[64] Gartner (2016), IT Glossary

4.12.1 Informatica (iPaaS)

Informatica is a US based company focused on data integration. Thanks to its cloud portfolio, Gartner placed it in the leader section of its magic quadrant (2016). In 2010 the Informatica Marketplace was launched, offering a data integration eco-system for Parners and Developers, to share and leverage data integration solutions.

Informatica holds 22%[65], as of 2015, of iPaaS market share ($91 million out of $414 total). Its product includes unique security and metadata capabilities that maintain data and enables fast time to value with native connectivity. Informatica's offer is shown in *Image 62.*

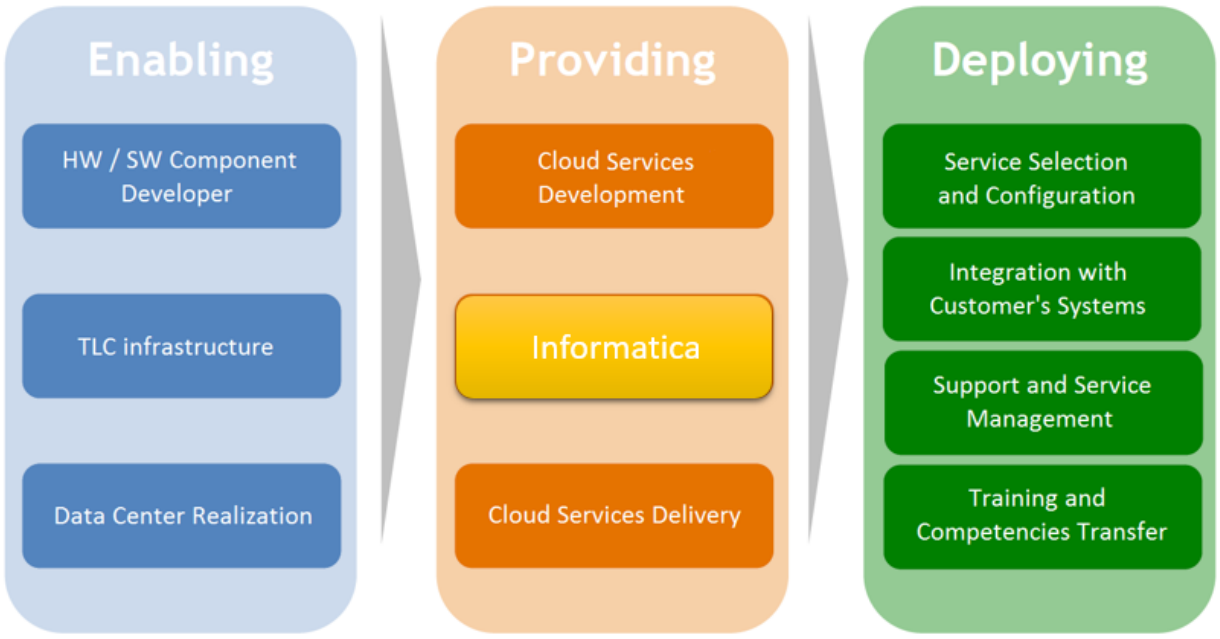


Image 62 – Mapping of Informatica on the Cloud Chain Value model proposed in this study

[65] Garner (2015)

4.12.2 Dell Boomi (iPaaS)

We extensively talked about Dell Technologies before. Dell Boomi is a service from Dell Technologies, which allows to connect applications in the Cloud. As business apps are often disconnected information silos, that result in manual processes and inconsistent data, Boom manages information repositories, both cloud-based and on premise. Boomi's platform as a service provides a single environment with a unified suite of offerings, accelerating end users' integration of all its businesses. *Image 63* represents Dell's offer.

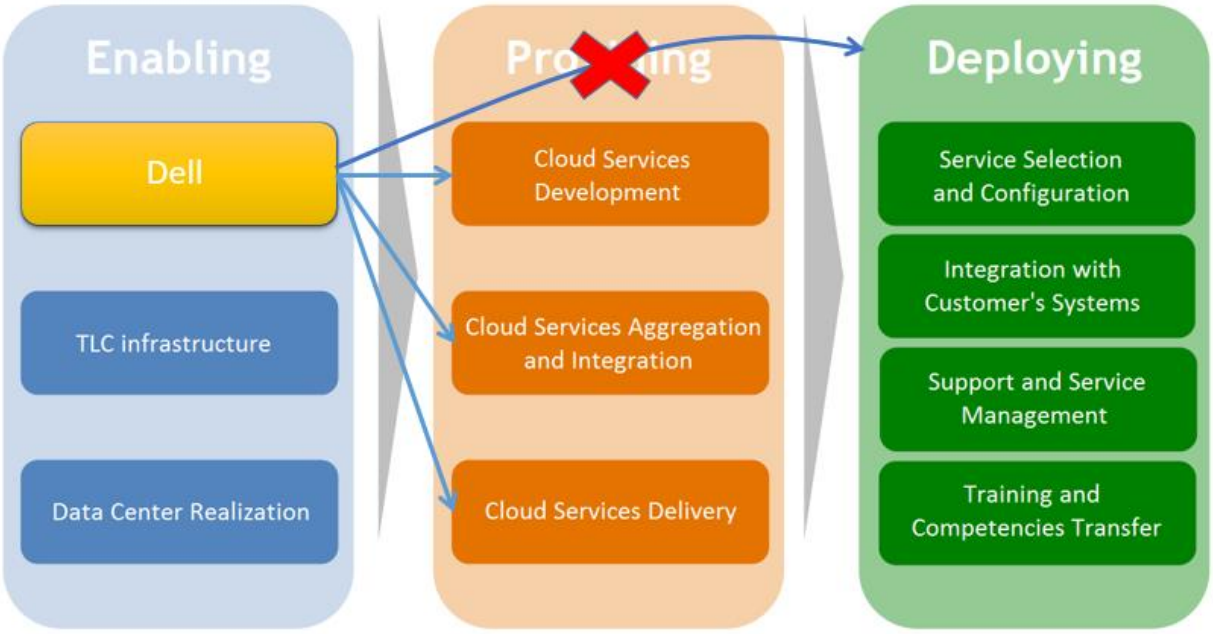


Image 63 – Mapping of Dell on the Cloud Chain Value model proposed in this study

4.12.3 Applications based on GAE

GAE (Google App Engine) is a PaaS which allows users to develop and host applications, run in Google Data Centers. GAE offers automatic scalability and is free up to a number of consumed resources. Published as a beta version in 2008, it became official in 2011. Example of applications

built on GAE include Panoramio (a Google owned geolocation oriented photo sharing service) and Udacitiy (third party educational website focused on offering university-style courses).

4.12.4 Cloudmore (CSB)

Cloudmore is a Cloud aggregator offered by its homonym Swedish company with subsidiaries in Estonia, the UK and US founded in 2007. The service brings many cloud-based IT products in one package, together into one single unified experience. The company also provides management tools that ensure to have centralized control.The platform enables customizable IT automation and distributed control, delivering to the user a single tool to provision and manage subscriptions or bundles. Cloudmore focuses on letting the user know what apps and services are being used and at what cost, through report-based BI, data export and dashboards. *Image 64* shows CloudMore's offer mapped on the Value Chain model.

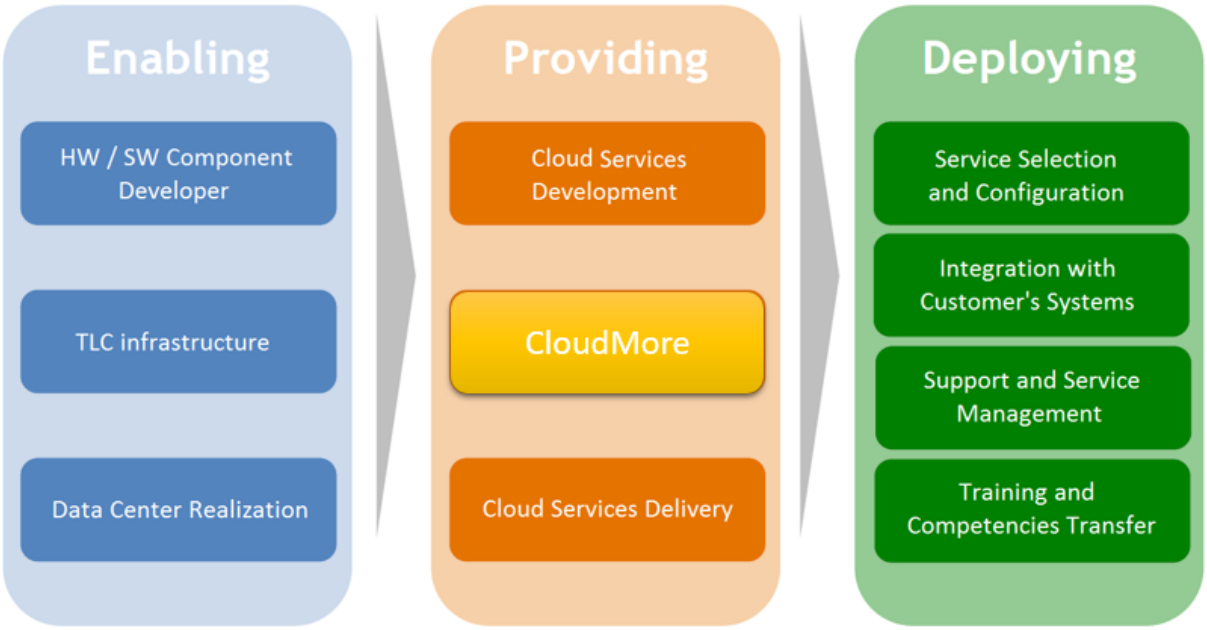


Image 64 – Mapping of CloudMore on the Cloud Chain Value model proposed in this study

4.12.5 DirectCloud (CSB)

DirectCloud is a division of DirectDial.com. DirectCloud is focused on Cloud Service Brokerage for business. The company intermediates and aggregates Cloud services for other businesses. These services can come from different vendors, but can be ordered and billed together. DirectCloud's target is composed mostly of small businesses as, while enterprises usually have dedicated IT departments and staff to handle the procurement, configuration, and maintenance of network infrastructure, hardware systems, and software that is used by the enterprise, small businesses are different. Typically, they have a few IT people that can perform several functions, but they are commonly focused just on maintenance and operations. Small business will typically turn to a value added reseller (VAR) or managed service provider (MSP) to handle common IT tasks[66]. *Image 65* shows DirectCloud's offer mapped on the Value Chain Model.

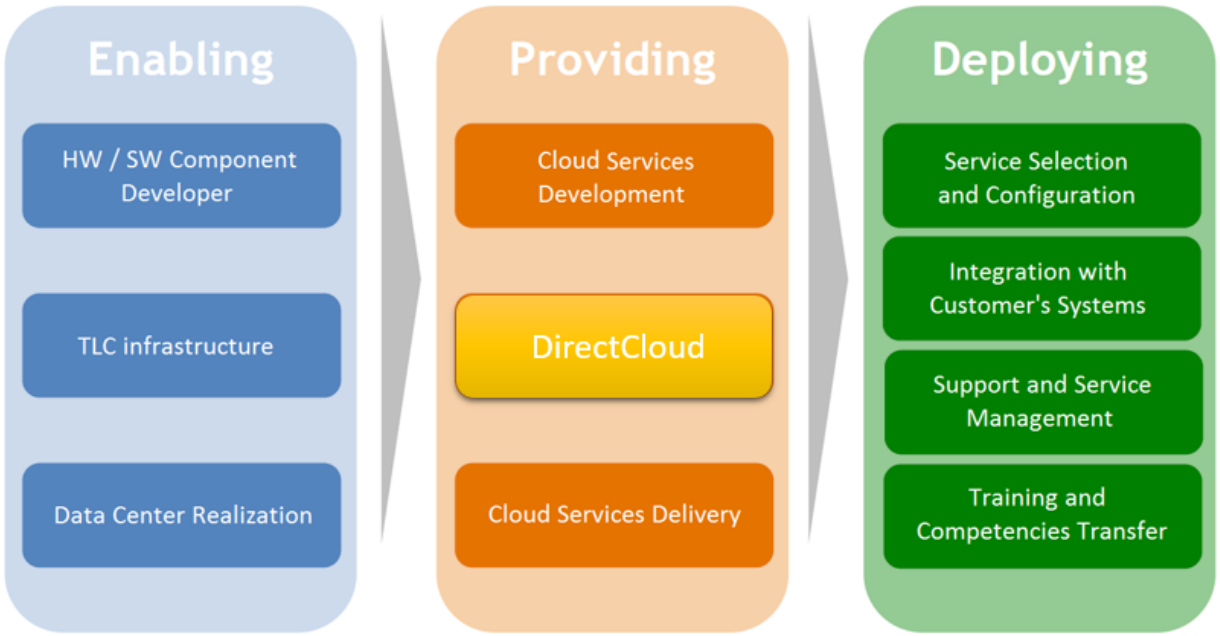


Image 65 – Mapping of DirectCloud on the Cloud Chain Value model proposed in this study

[66] DirectCloud.com

4.13 Cloud Services Aggregation and Integration: segment review

This heterogeneous sector of our model includes several type of services. Even though this section might seem to have analyzed a relatively small number of businesses, it must be noticed how this segment of the chain is “colonized” by the majority of companies reviewed in the previous paragraphs. In particular, the marketplace concept has been discussed and studied (see Amazon, Google, Salesforce, Microsoft, Telecom Italia and Fastweb). Everything that is not a marketplace, as very noticeable from the graphics of the model, tend to stay isolated in its segment of the chain.

Cloud Service Brokers select, configure, aggregate and distribute Cloud services, making their complexity transparent to the end customer. CSBs represent the channel to Service Providers for small and medium sized businesses. Many skills are involved in the creation and maintenance of a CSB offer, which include both technological and management capabilities. For example, they have to master the aggregation of services (research, pricing and procurement), the integrated management of the service (SLA and policies, billing), the technical integration (system integration at a SW level), personalization and extension of functionalities, marketing and support. CSB should focus on one or more of the following principles.

- Integration: making it easier, safer and more productive to integrate, consume and extend Cloud Services. Packages offered by such Service Brokers permit to exploit the Cloud advantages, combining Public Cloud from different levels and integrating them inside one unique solution, characterized by high performance levels. The offer typically enriches IaaS and PaaS services.
- Transformation: the main focus is on the development of SaaS personalized solutions, that companies can address to in case they should not be able to find more suitable solutions on the market. *Ad hoc* solutions are developed starting from the analysis of the customer’s requisites, and are usually optimized to be easily integrated with the customer’s systems.

- Distribution: business model typical of Hardware and Software resellers, intermediating between Service Providers and the customer.

In general, the CSB role is thought to be accelerating the adoption of Cloud services, especially amongst less experienced companies. In case of big sized organizations, instead, a mature IT unit should be able to serve as a CSB itself.

iPaas products, instead, enable the customer to develop, execute and govern integration flows. Customers can drive the development and deployment of integrations without installing or managing any hardware or middleware. This solution allows small businesses to achieve integration without a big investment in skills or licensed middleware software. The real value of iPaaS lays in its functionality: users can move data from one database to another, whether they're cloud-based or on premise; with an iPaaS, they can download purchase orders from Salesforce and have them automatically uploaded into an SAP ERP system for record keeping[67]. Because iPaaS is a cloud offering, it can connect to any number of data platforms, and because it is hosted by the vendor, end customers don't have to dedicate infrastructure staff on premises to run it. Gartners in 2016 estimated that revenue across all vendors would reach $1 billion within three years. However, for customers that need low-latency throughout of data between apps, traditional integration solutions may still be preferable, whereas iPaaS excel in ease of management, offering pre-built integration algorithms, GUI-based drag and drop templates or command line interface manipulation.

4.14 Cloud Services Delivery

The delivery of Cloud Services represents the last step before the end customer. Players offering this service directly provide the customer with the Cloud options required. It's with such subjects

[67] Network World (2016)

that customers interface, sign contracts, require an adequate level of service, make complaints etc., except for the presence of intermediaries.

4.14.1 VAR Group

VAR Group is an Italian ICT player, founded in 1996. As of 2016, its revenues are € 225 million a year, and the society can count on 550 different certifications and a series of partnerships with the most important actors in the market[68].

Their offer includes, besides the Cloud Services Delivery, consulting services. Their traditional core business switched over the years from infrastructure services provider to Cloud Provider. As seen in the dedicate sections, hardware / software developers segment of the market is packed with IT giants, so the company decided to differentiate towards the Cloud market.

The target of VAR Group, once limited to small and medium sized businesses, today includes big enterprises. They can reach the first group through direct market, offering about 75 different applications aimed at resolving all specific requirements on the market through a Software as a Service approach. The offer is presented in marketplaces created and handled by the Group, with the applications thought to be more suitable for their target customers. The creation of such Marketplaces has been carried out with the partner KPMG, structuring offer models as consistent as possible.

To reach big enterprises, the direct market model is not a valid solution. VAR Group aims at these customers with the help of the partner KPMG, providing the composition of a model and configuration service. VAR's offer mapped on the Cloud Value Chain model is shown in *Image 66.*

[68] VAR group (2016)

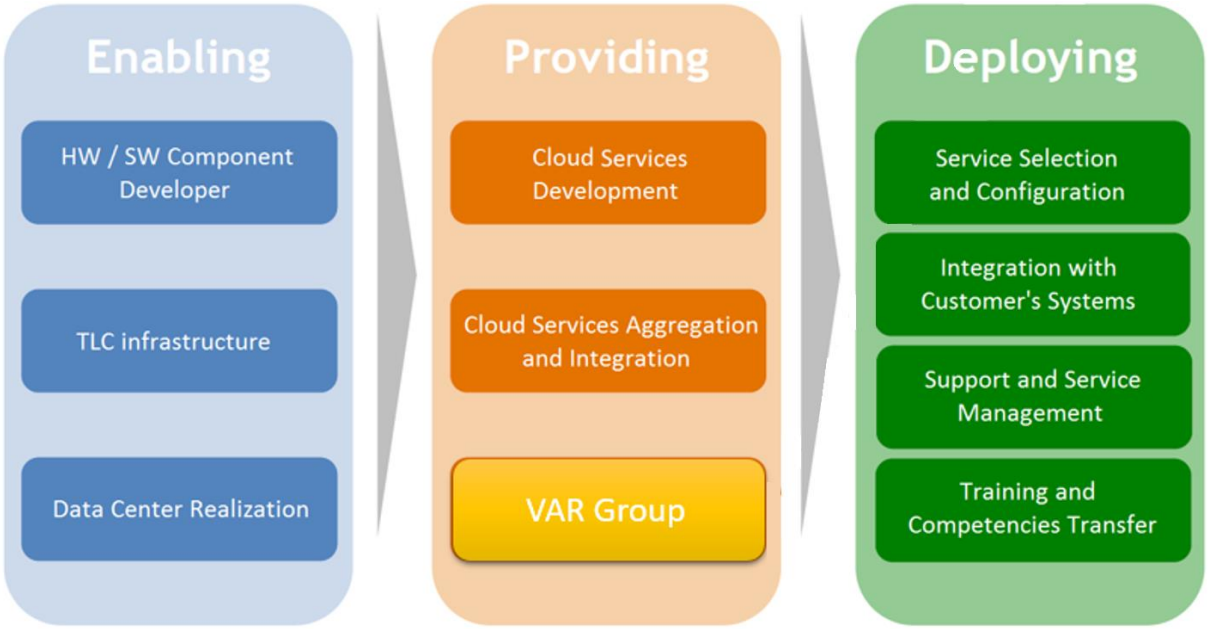


Image 66 – Mapping of VAR Group on the Cloud Chain Value model proposed in this study

4.15 Cloud Services Delivery: segment review

This paragraph is much shorter than the other, because a large portion of it is actually overlapping with the Cloud Services Development one.

The reason behind that is that the normal behavior, especially for big companies, is to build and deliver the Service. Most companies developing the application / infrastructure / platform directly, or through intermediaries, take care of the supply of such services to the end customer.

An example of a case where this does not happen (developer and deliverer do not coincide) has been analyzed in the analysis of the previous segment of the market: applications built over tools like Google App Engine are actually developed by a third party society, while Google act both as a Service Aggregator and a Provider.

The specific example reviewed in the previous paragraph concerns an Italian societies.

VAR Group come from an infrastructure services provider experience. The need for differentiation, to avoid being crushed by tech giants, pushed VAR towards the right part of our model, offering both delivery and consulting services. This situation is not infrequent, as many companies with the same background follow this trend.

What results clear from our analysis is that the Cloud Services Delivery segment of the Value Chain is a space occupied by companies which mainly take up other portions of the chain.

Most Cloud Services Developers than deliver the offer themselves, at the point that each company analyzed in that chapter might have been included in this one, also.

Independently of the background of the companies we found here, massive initial investments may have to be carried out to buy the physical resources necessary to the delivery of the service. Alternatively, they could be hired, decreasing the level of complexity taken in charge, but losing control over fundamental parameters like SLAs.

Even though the ICT as-a-Service model does not normally require a commercial network for the physical distribution of the products, like for the traditional IT market, in most cases the intermediation of a specialized company is requested.

4.16 Deploying: strategies of the players in the segment

In the last column of our model, players will be grouped at a higher level. So we will not review each of the four segments, but there will be a general overview of the strategies of some companies which are found in the “Deploying” column. The reason behind this choice is that such companies very rarely take care of just one of the segments in the column. As an example, most consulting firms will follow both “building” and maintenance projects, which refer to the “Service Selection and Configuration” and to the “Support and Service Management” rectangles. A big

percentage of them will also, if necessary (and if they have the competencies) perform as a System Integrator, making the new system work along with the ones that the customer already has.

A System Integrator is an enterprise that specializes in implementing, planning, coordinating, scheduling, testing, improving and sometimes maintaining a computing operations[69].

System Integrators need a broad range of skills, including software, systems and enterprise architecture, software and hardware engineering, interface protocols and general problem solving skills.

Finally, the last section of the model represents the real difference between this enhanced Cloud Value Chain and the one proposed by the "Osservatorio Cloud Computing e ICT-as-a-Service" of the School of Management, Politecnico di Milano in 2015. While the "Training and Competencies Transfer" portion of the model is often occupied by subjects whose core competencies are placed elsewhere in the Chain (reviewed later), we can also notice the presence of third party subjects, often in partnership with Service Providers, which make a living out of Training Services in regards of Cloud products.

4.16.1 Reply

Reply S.p.A. is an Italian consulting company, specialized on the design and implementation of Cloud and Internet based solutions. In 2015, the company obtained € 705 million in revenues and counted on 5000 employees[70]. Founded in 1996 in Turin, the firm makes use of a network model, formed by companies operating in different sectors such as big data, cloud computing, digital media and IoT.

[69] Gartner (2016), IT Glossary
[70] Reply (2015)

Reply has a history of acquisitions, which led the company to have assets all over Europe, many of which aimed at the enhancement of its Cloud competencies. Some examples include the acquisition of the German Skyskoplan in 2005[71], company expert in CRM solutions, the one of Communication Valley in 2008, another firm strongly oriented towards Internet integration and security tools. In the recent years, Reply tried to increase its communication and social media presence as well: see the acquisition in 2013 of the German Triplense GmbH and the one in 2016 of Xister.

The Company Profile published on Reply's own website[72] provides us with precious information about the company's growth and strategy over the years. In fact, unlike other players, Reply has not come out with any significant proprietary Cloud product, neither a classic platform nor an aggregator / integrator. Partnerships have been the only way chosen by the Italian firm to keep up the pace with the Cloud. Such partnerships can be either fruit of the society's own effort or come from acquired companies. Still from the company profile, in 2012 Reply bought Arlanis Software AG, which came with an important partnership with Salesforce, and in 2013 made its presence stronger in England with the acquisition of Solidsoft Ltd, specialized in consultancy and development of architectures and solutions based on Microsoft's Cloud. In 2014, Storm Reply (a branch of firm) was nominated an Amazon Premier Consulting Partner, getting to be among the 22 best Amazon's partners all over the world, while in 2016 won the "Cloud Partner of the Year" title from Oracle.

Finally, we can say Reply has not upset its strategy (*Image 67*) nor presented new Cloud Products, but limited itself to building (or "acquiring") precious partnerships, fundamental to maintain its position of world class consulting company and System Integrator.

[71] Milanofinanza.it (2005)

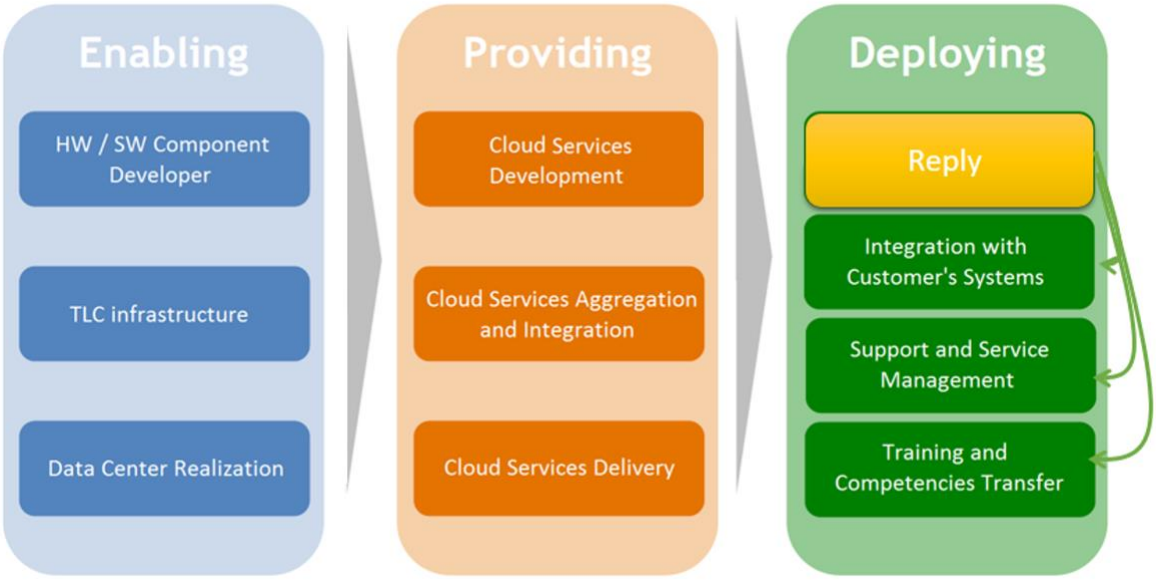


Image 67 – Mapping of Reply on the Cloud Chain Value model proposed in this study

4.16.2 AlmavivA

AlmavivA is an Italian group, operating in the ICT with a global presence. It has direct subsidiaries in Brazil, US, China, Colombia, Tunisia, South Africa and Belgium, in Bruxelles, being the real center of the European operations.

AlmavivA "classic" Cloud consulting Services are articulated along two segments:

- Advisory BU, providing consulting Services to introduce customers to the Cloud and transform their infrastructure and governance model;
- A technical Bu, which takes care of the transformation and execution of the project.

Almaviva provides a set of Cloud Services called AlmavivA Cloud Mix. This is composed of three products:

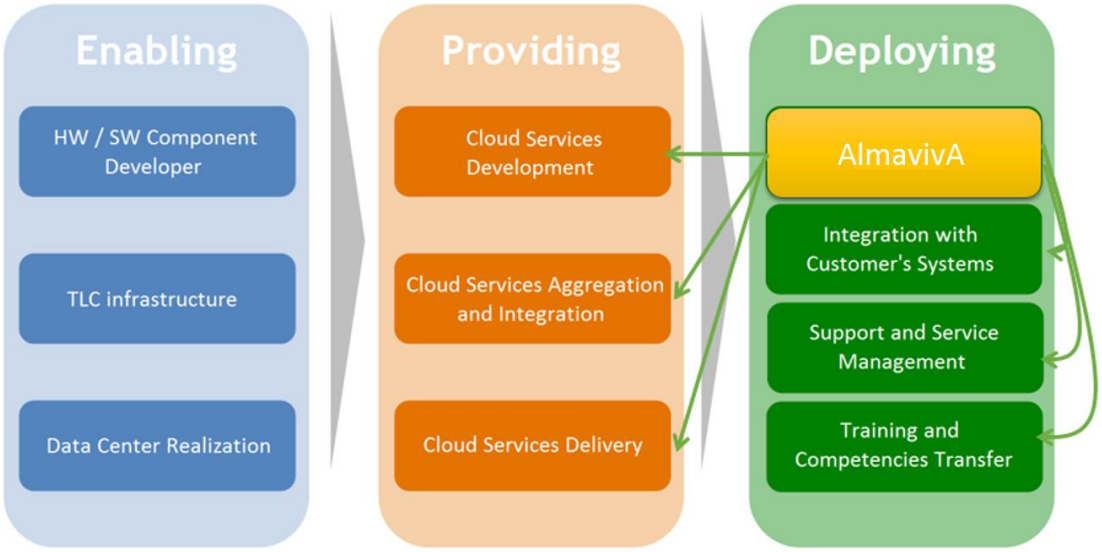
- HyperCED, a Private Cloud infrastructure with a low level of automation and high customization possibilities instead;

- NUBA, a Private Cloud infrastructure with a low level of customization but high automation possibilities;
- Public Cloud Offering: through dedicated partnerships, AlmavivA is able to provide with a Service Assurance, using third parties' infrastructures. In this way, some workloads will end up being in the Public Cloud in a static or dynamic way.

Relevant strategic partners include Google, IBM, Microsoft and VMWare. Separate mentions for the one with Cisco (Cisco certifies AlmavivA's IaaS with the "Cloud and Managed Services Advanced" title) and EMC (partnership born in 2016 aimed at providing the market with Cloud Oriented services, like the already available Fast Disaster Recovery as-a-Service)[73].

All these tools are orchestrated through a unique interface.

Overall, referring to our model AlmavivA completely covers the Deploying column, but it also invades the Providing one, both developing / delivering Cloud Services and offering some kind of brokerage service, moving workloads to Public Clouds under determined conditions (*Image 68*).



[73] Corriere delle Comunicazioni (2016)

Image 68 – Mapping of AlmavivA on the Cloud Chain Value model proposed in this study

4.16.3 Accenture

Accenture is a global professional services company which provides consulting services. It appears in Fortune Global 500 companies. As of 2016, the company reported net revenue of $32,9 billion, with more than 384.000 employees in 120 countries[74].

Accenture began as the business and technology consulting division of accounting firm Arthur Andersen. In 1989, Arthur Andersen and Andersen Consulting became separate units of Andersen Worldwide Société Coopérative (AWSC). In August 2000, as a result of a long time dispute, Andersen Consulting broke all contractual ties with AWSC and Arthur Andersen and was required to change its name. The name chosen was Accenture, supposedly derived from "Accent on the future".Over the years, Accenture developed strong System Integration skills, both organically and thanks to its vast number of acquisitions. Just as a very recent example, in January 2016 Accenture acquired Formicary, a financial trading systems specialized integrator[75].

In 2013 Accenture performed a massive $ 400 million investments in cloud capabilities in order to develop a new service called Accenture Cloud Platform. This product is meant to enable the integration and management of hybrid Cloud environments that span across multiple vendor platforms and are critical to providing flexibility and supporting emerging technologies. Overall, this is a move towards the Cloud Services Aggregation / Integration segment of our model, as it is not a standalone product with its own functionalities, but it is a integration tool to manage multiple Cloud platforms. In September 2016, this platform was enhanced with important upgrades. The premise for the development of such services are, obviously, strong alliances with Service Providers, whose Clouds will have to be integrated in the final product. In this regard, Accenture invested in high fidelity features across seven different Cloud Provider, with continued emphasis on the hyper three leaders (AWS, Microsoft Azure and Google Cloud Platform). ACP

[74] Accenture (https://newsroom.accenture.com/fact-sheet/)
[75] Hedge Week (2016)

includes, as an example, support for 19 Azure PaaS solution types and high-fidelity feature support for VMs based on Azure Resource Manager (ARM) templates[76].

One of Accenture's main strategy guideline is represented by partnerships with leading solution providers: that's why the company is Salesforce's main consulting partner. Beyond an organic growth that allowed such achievement, Accenture also pursued this goal through external acquisitions of specialized companies like when, in September 2016, Accenture acquired the Italian firm New Energy Group[77].

Born as a simple consulting division, Accenture grew to become one of the absolute world leaders in consulting services and system integration. As a reference to our model, it fully occupies the "Deploying" column of the model, while minor acquisitions and strong partnerships (like the one with Salesforce) also allow us to draw an arrow straight towards the "Providing" column. Finally, with ACP, a service provided by Accenture and meant to help customers manage multiple Cloud solutions, the company also gain its presence in the Cloud Service Aggregation and Integration segment (*Image 69*).

[76] Business Wire (2016)
[77] Corriere della Sera (2016)

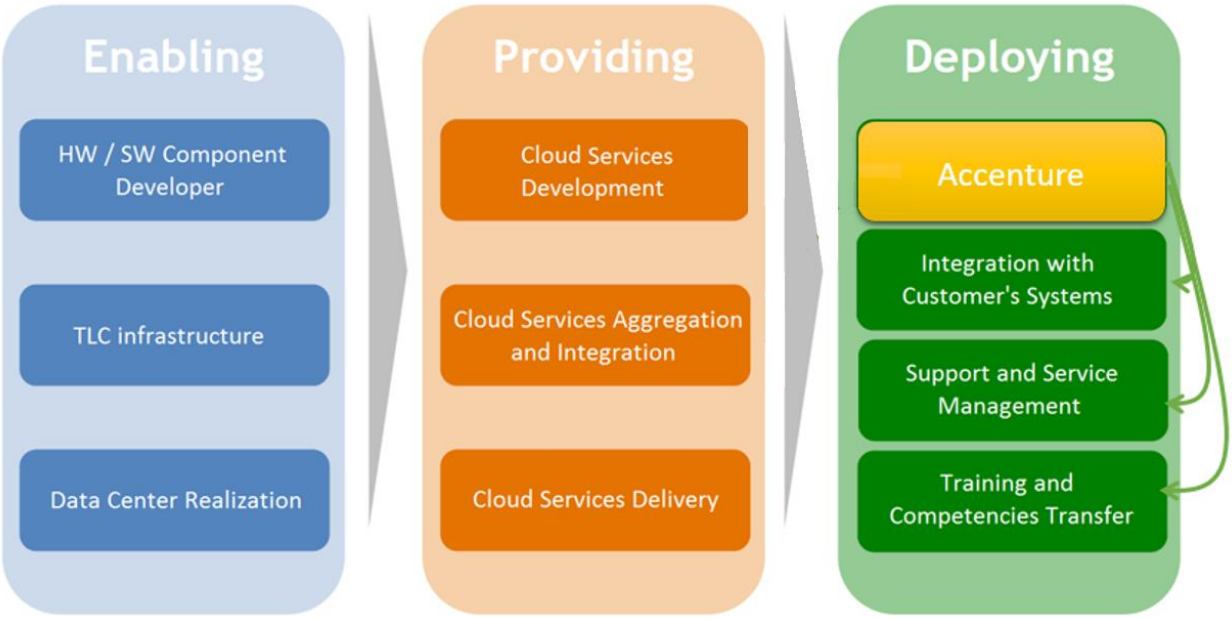


Image 69 – Mapping of Accenture on the Cloud Chain Value model proposed in this study

4.16.4 Capgemini

Capgemini is a French multinational management consulting corporation with headquarter in Paris. It provides IT services and is one of the world's largest consulting, outsourcing and professional services companies with almost 183.000 employees in over 40 countries[78].

Founded by Serge Kampf in 1967 as an enterprise management and data processing company, along the years, both through organic growth and external acquisitions, the company got to become one of the world leaders in consulting ICT services and system integration. In particular, one of the main acquisitions in Capgemini's history is represented by IGATE. This was a massive $ 4 billion deal performed in 2015, with the target being an application network and business process outsourcing specialist.

In the previous paragraph, the importance of the strategic alliance between Salesforce and Accenture has been pointed out. In Capgemini's case, a very important partnership has been

[78] Capgemini (2016)

signed with Microsoft. In fact, in 2015 the program "Capgemini Cloud Choice with Microsoft" was born. It consists of a set of integrated services and offers to habilitate the transformation of cloud-based activities and the implementation of technological solutions, making use of Microsoft's Cloud technologies. Capgemini's offer, mapped on the Cloud Value Chain model, is show in *Image 70.*

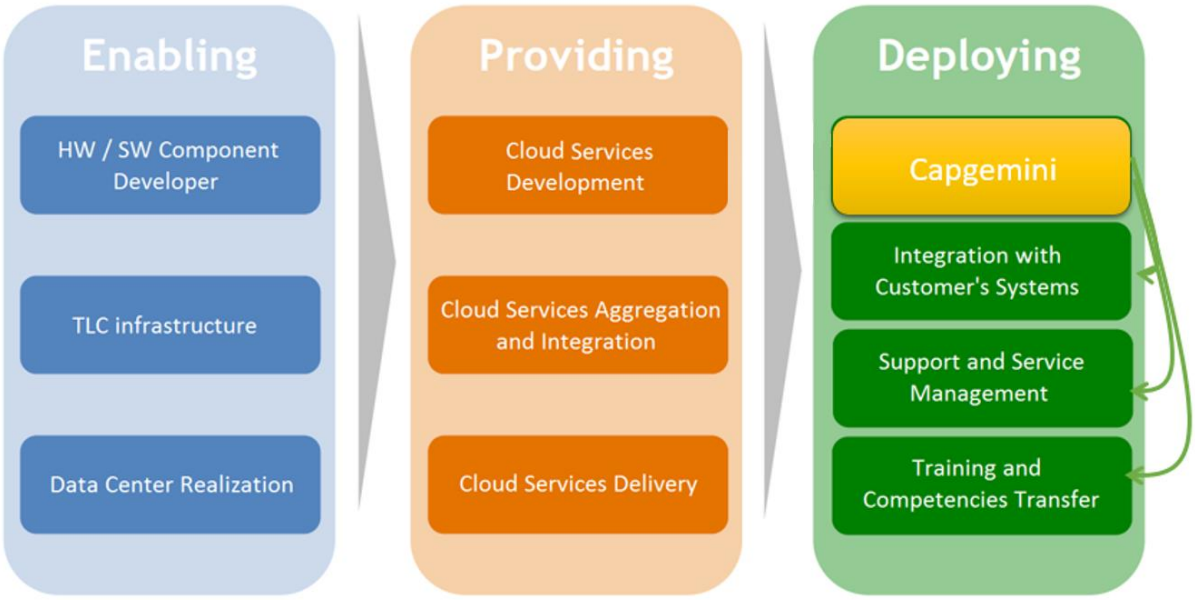


Image 70 – Mapping of Capgemini on the Cloud Chain Value model proposed in this study

4.16.5 Engineering Ingegneria Informatica

Engineering Ingegneria Informatica, commonly known as Engineering, is an Italian ICT company founded in 1980, especially oriented towards the bank, finance, utilities and health-care sectors. Born in 1980 as Cerved Engineering, a management buyout operation in 1984 results in a property change, with the parent Cerved leaving the company.

The company takes care of design, development, outsourcing IT services, consulting and system integration. With more than 7000 employees in Italy, Europe and South America, Engineering has four business units and five competence centers. The latest years have been relatively rich in

acquisitions for the Italian firm, starting from the purchase of T-Systems Italia SpA from Deutsche Telekom in 2013.

In 2014 Engineering completed the acquisition of MHT S.r.l.. MHT is a leader company in the implementation of Microsoft Dynamics services. The strong partnership between MHT and Microsoft, beyond its resources and competencies, has been the key driver of the purchase. Once again, strategic partnerships are highly-valued at the point that, if the company is "late" and does not have strength necessary to build its own partner network, it must be completed purchasing external companies.

A similar situation occurred one year later, when Engineering acquired WebResults S.r.l., a small player which directly develops and delivers SaaS solutions. Besides that, WebResults is certified partner for Marketo, Microsoft and Platinum Consulting Partner for Salesforce. Before this acquisition, Engineering was not a Salesforce certified partner.

To conclude, the strategy performed by Engineering Ingegneria Informatica in the latest years included the research of new Cloud Services to offer directly to the end customer, but above all took into consideration acquisitions aimed at gaining strategical partnerships that were missing from its portfolio (*Image 71*).

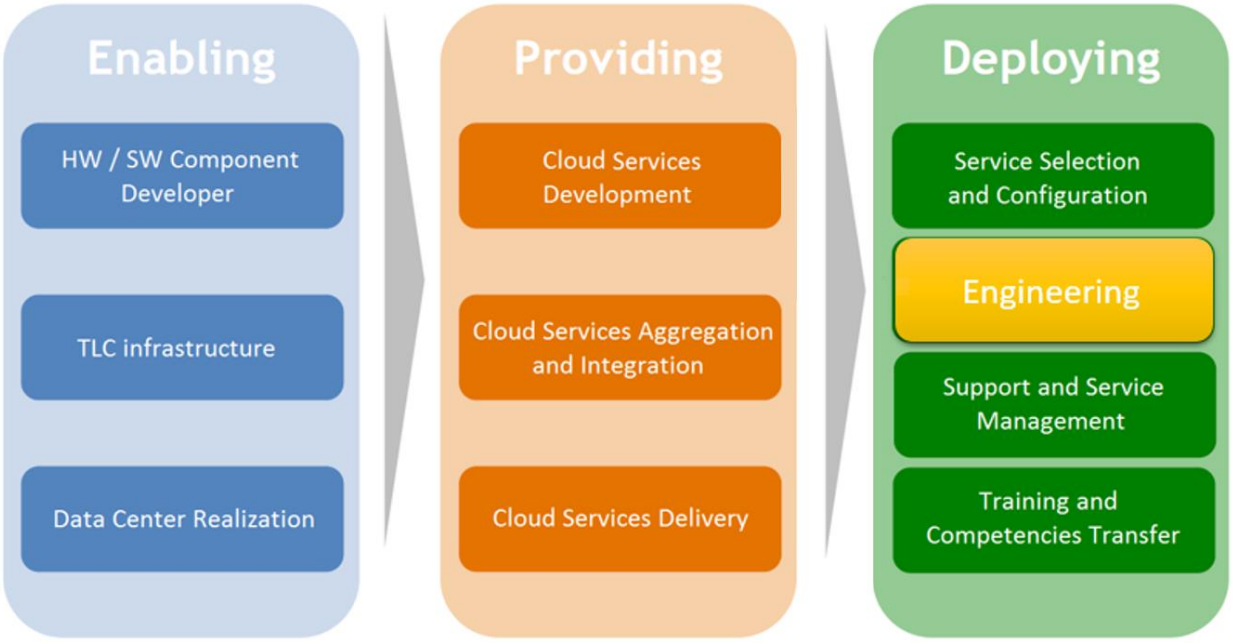


Image 71 – Mapping of Engineering on the Cloud Chain Value model proposed in this study

4.16.6 Bluewolf

Bluewolf is an IBM society specialized on Salesforce Services. Bluewolf is one of Salesforce's top partners with 12 global offices and more than 500 emplpoyees in the US, Europe and Australia. In "The IDC MarketScape: Worldwide Salesforce.com Implementation Ecosystem 2015 Vendor Assessment" Bluewolf has been recognized by market analysts as the leader in Salesforce services implementation[79].

Since 2002, Bluewolf strategy turned around one fundamental point: be good at implementing Salesforce's Services and maintaining a good relationship with the vendor.

This time, though, such strategic position has been appreciated elsewhere in the Cloud Value Chain and Bluewolf has been acquired by IBM for about $ 200 billion[80].

[79] BlueWolf (2016)
[80] Wall Street Journal (2016)

This move brings together Bluewolf's knowledge of the Salesforce world, including Cloud Services and consulting, with IBM's own Cloud Services experience and strategic consulting chops, along with its capabilities in experience design, enterprise mobility, analytics and cognitive solutions.

IBM is located all over our Chain Value model, but in this case we can consider Big Blue's consulting unit as the core to draw the company on the model. This would sum up in a huge consulting company acquiring a huge – smaller- consulting / system integrator to exploit its strong partnership with a Service Provider (*Image 72*).

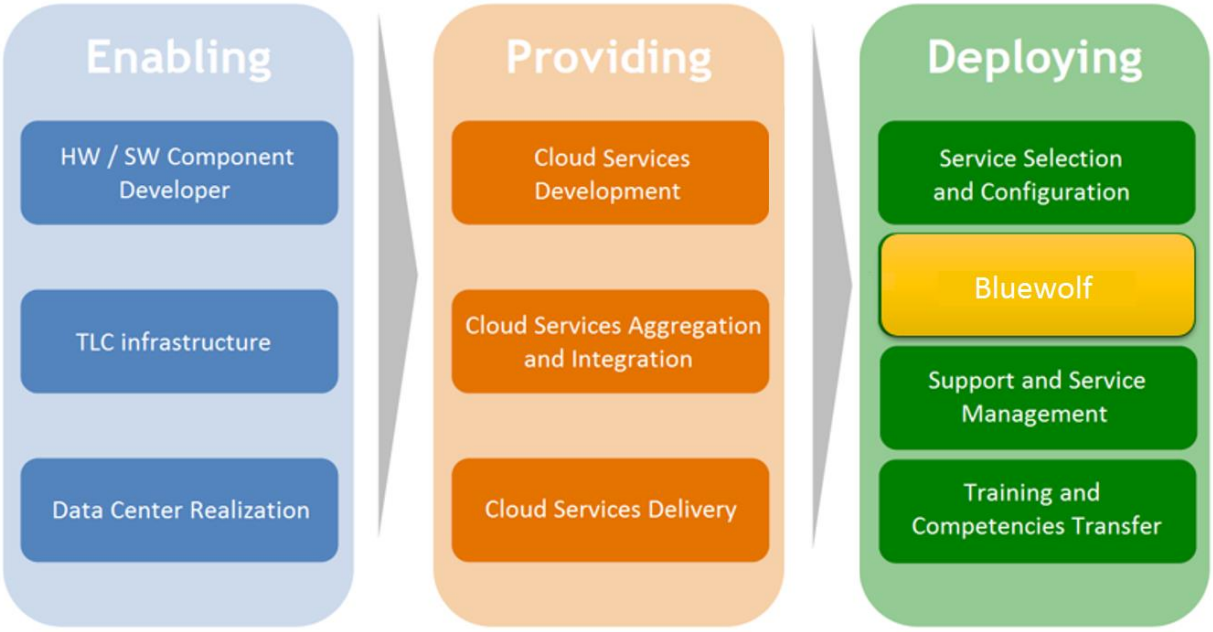


Image 72 – Mapping of Bluewolf on the Cloud Chain Value model proposed in this study

4.16.7 Eduteam

Eduteam is an Italian group based in Bari. The group has three main business unit, which are called Devteam, Samteam and Crmteam. This last group is focused on Cloud CRM Services, providing certification-oriented training on Microsoft's products.

The revenues of the Crmteam business unit is guaranteed by the fact that Eduteam is a Microsoft Gold Certified partner. This brings a big competitive advantage for Eduteam, which receives leads and potential customers from the Provider and is also advertised on Microsoft's website.

Besides training delivery, which represent the core business, Eduteam provides consulting services, which include requisite analysis, functional analysis, design, integration, testing and documentation, for the platforms it has competencies on, including Microsoft CRM Dynamics (*Image 73*).

If we wish to draw Eduteam's position on our model, the core would surely be placed on the "Training and Competencies Transfer" section, while the company also delivers consulting services, while the partnership with the Service Provider is a big competitive advantage.

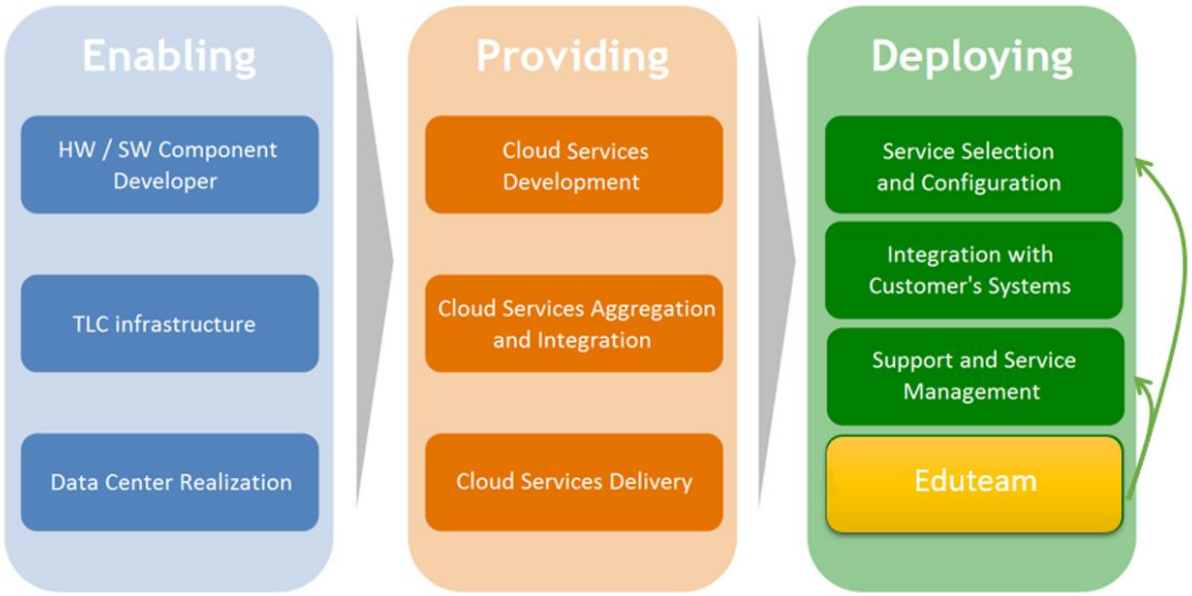


Image 73 – Mapping of Eduteam on the Cloud Chain Value model proposed in this study

4.16.8 PRES Formazione

PRES Formazione is an Italian company specialized in ICT Enterprise training. Founded in 1998, PRES offers certification-oriented classes. Pres's offer include live classes, classes held at the customer's virtual classes, e-learning available on the website and workshops. Besides that, the company offers the possibility to take certification sessions in Pres's structure.

PRES Formazione has a wide gamma of partnerships and among the most important are players like Cisco, Oracle, IBM, EMC2 and VMware. Being a certified trainer, PRES can offer to the end customer a guarantee of the good level of service; moreover, the websites of these companies advertise PRES Formazione amongst their certified trainers. Finally, when the Service Provider does not offer training services it can pass the potential customer to PRES.

PRES Formazione, PRES's parent company, is also focused on consulting services, with the same precious partnerships seen for PRES Formazione.

To sum up, in PRES we both have the System Integrator – Service Provider (for the parent company) and Trainer – Service Provider partnership as a basis for the business model (*Image 74*).

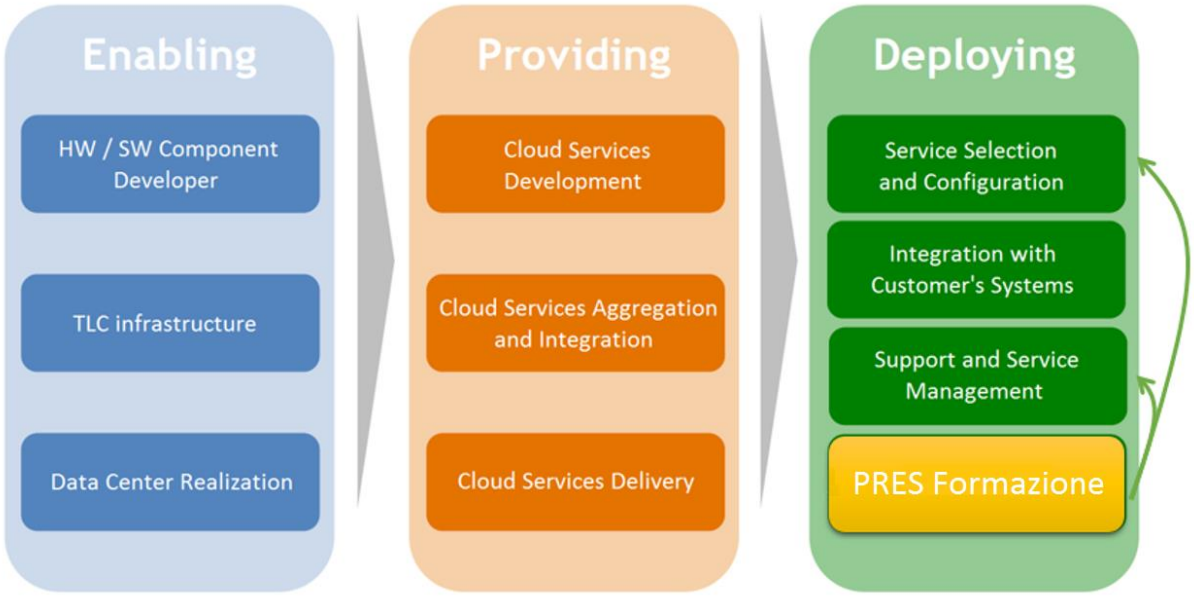


Image 74 – Mapping of PRES Formazione on the Cloud Chain Value model proposed in this study

4.16.9 Fast Lane – GKI

Fast Lane – GKI is an international company specialized on enterprise training services. Fast Lane provides know-how concerning virtualization and Data Center, voice, video and unified communications, security and VPN, storage networking, wireless networking. It has capillary presence in more than 60 countries all over the world.

With a strong focus on training, Fast Lane also provides consulting services in regards of strategic consulting, technological consulting (Cloud and network related) and project management.

Fast Lane's world presence has been built thanks to the partnerships of the company with the main Service Providers. Referring to Cloud technologies, Fast Lane presents partnerships with subjects such Amazon, Cisco, Citrix and Microsoft. These relationships are fundamental for the success of the company, as the Provider can pass leads and potential customers to the trainer and even advertise it on the website. Fast Lane's offer is shown in *Image 75.*

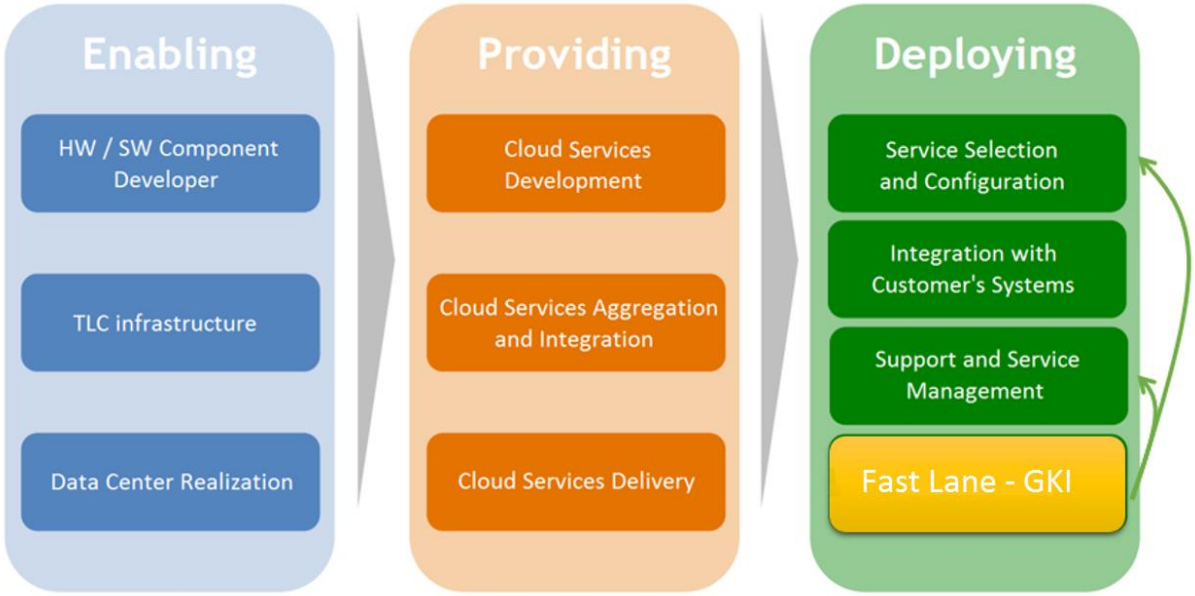


Image 75 – Mapping of Fast Lane – GKI on the Cloud Chain Value model proposed in this study

4.16.10 Global Knowledge

Global knowledge is a UK-based company which provides IT and business skills learning to both Public and Private sector companies and organizations across the United Kingdom. Its learning programs include classrooms, learning on-demand, virtual delivery, mentored and blended learning at training centers, on-site and online. The company was founded in 1995 and employees about 1300 people worldwide[81].

Global Knowledge provides Training Services about Cloud Computing, from general knowledge to specific IaaS / PaaS / SaaS Services. Specifically, the company refers to be "AWS Authorized Training Partner", "Cisco Learning Specialized Partner", "Citrix Authorized Learning Center", "Microsoft Gold Learning Partner" and "VMware Premier Authorized Training Center".

These Partnerships provide the end customer with the security of a reliable Training Center, give the company the possibility to access official training material and guidelines and to run

1. [81] Global Knowledge (2016)

examination sessions for the Providers' certifications in its structure and allow Global Knowledge to appear on the websites of the partners, besides possibly receiving leads and potential customers.

Once again, the partnership of the Training Center with multiple Service Provides turns out to be strategic and fundamental for the success of the company and must be therefore represented in our model. Global Knowledge does not provide Consulting Services, limiting itself to the "Training and Competencies Transfer" portion of the Chain (*Image 76*).

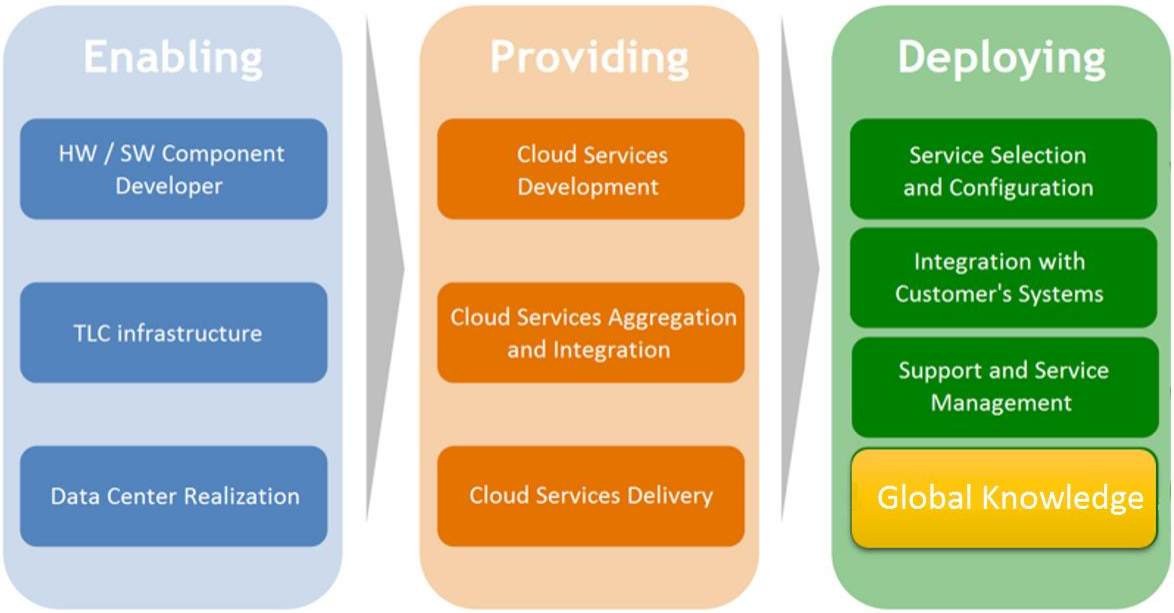


Image 76 – Mapping of Global Knowledge on the Cloud Chain Value model proposed in this study

4.17 Deploying: segment review

Following is a review of the sub-segments composing the "Deploying" column

4.17.1 Service Selection and Configuration, Support and Service Management: segment review

The “Service Selection and Configuration” and “Support and Service Management” sections refer to activities which are among the core competencies of consulting firms.

Consultants support end customers and help them orientate in the new Cloud ecosystem, transversally and at all levels. The Cloud is potentially a deep transformation both at an IT level and as far as the business management goes and consultants can support customers in their path towards the strategic plan, besides in the phases of operative implementation, providing technical and process skills.

Consultants specialize in supporting customer in all phases of the project, such as during the requisite analysis, the choice of the reference architecture, the vendor selection and the product selection, the implementation of the projects and the system management. Consultants provide their customers with skills and tools they do not have internally, mixing them with experience in the sector and knowledge of the market and of best practices. They are often specialized on specific aspect of the System, such as the architectural part, the integration platforms or the informatic support to business processes, in order to offer to the customer specific competencies and solid experience.

As seen in the course of Chapter 4, the role of Consultant is often covered by companies whose core businesses are often placed in other segments of the model. This is because the Consultant role is the closest to the customer, and the whole Chains tends to follow the customer and the biggest profits.

Many consultants are born as System Integrators as well, while others later acquire such skills to offer a wider gamma of services. Clearly, consultants in most situations can offer training services as well, but whether the company has a dedicated business unit / can offer a good service depends on its size and focus.

As for where these players try to expand, we can consider Accenture's and AlmavivA's examples. Accenture's ACP represents a step towards the very central Cloud Services Aggregation and Integration segment. This section, being in the middle of the Chain, gathers new entries from all over the model. AlmavivA's Cloud mix, by the way, shows how the tendency is not just towards the central segment of the Providing column, but also towards the other two rectangles. In this regard, consultants can exploit their business knowledge and develop personalized Services (for example on leading PaaS platforms) for end customers. Verticalization and personalization are thus key factors in allowing the channel to bring to end customers the value related to experience in the business.

Then, these Cloud Services can be directly delivered from the consulting company's servers. Other times, the company might even decide to deliver from its servers Cloud Services developed by other Service Providers. Moreover, the partnership with the Service Provider that companies provide Consulting Services about is an important part of their strategic plan.

To sum up, from the "Service Selection and Configuration" and "Support and Service Management", the segments of our model typically covered by Consultants, companies tend to expand obviously towards "Training and Competencies Transfer" (a typical example is represented by training held by Consultants soon before the go-live of a new system), towards the System Integration, as seen in the previous examples, and sometimes towards the whole column of Providing, both with products aimed at the management of a multi-cloud environment (Cloud Services Aggregation and Integration) and towards the realization of proprietary Cloud Services (Cloud Services Development / Cloud Services Delivery) , or simply the providing of Service developed by another Service Provider. Finally, the partnership with the Service Provider is a *leitmotiv* in the strategy of consulting companies. Advantages obtained through partnerships come at the cost of long procedures and time spent on the project and require an open mindset.

4.17.2 Integration with Customer's Systems: segment review

Moving on to the "Integration with Customer's Systems", we may say that a System Integrator also acts as a Consultant if it has the skills required and vice versa. Overall, the analysis of some of the market leaders showed how for System Integrators partnerships with the Service Providers have a great value. This is natural, considering that a Provider which does not normally deliver consulting services or does not have available consultants will pass its leads and customers to the Consultants and System Integrators.

It's not a surprise, then, Engineering's urge to acquire companies which had already gained precious partnership positions with some of the leading Service Providers. The same considerations have probably been carried out by IBM's management when the American tech giant decided to buy out Bluewolf.

Bluewolf had been founded in 2000, and its alliance with Salesforce dated back to 2002. Bluewolf's strategy to rely mostly on one single Provider is risky, but highly repaying: SFDC fed for years Bluewolf with leads and customers, making it the giant which would be acquired by IBM. By the way, its fate remains heavily related to SFDC's one, and a possible decline is Salesforce's success would translate into the same for Bluewolf.

Finally, it has been observed how, besides the usual Provider – Integrator relationship, biggest System Integrators might also urge to extend their alliances to other parts of the Value Chain. It's the case of TCS with VMware.

4.17.3 Training and Competencies Transfer

In Chapter 3 we introduced three categories of players occupying this segment. All of them will be discussed below.

4.17.4 Training and Competencies Transfer: Service Providers

Leading Service Providers like Salesforce, Google, Microsoft etc. normally present a lot of training material on their websites, to make their product as known and as wide-spread as possible.

They generally build certification paths, which serve the purpose of standardizing the skills and knowledge of users. Let's better analyze these paths and the tools provided by these companies by analyzing a real case.

"Salesforce University" is a collective name for all learning tools and certifications offered by the SaaS Provider. A quick look at the official website[82] will provide us with the following kind of information:

- Salesforce organizes real classes all over the world. These classes are really expensive, making it a further revenue source for the Provider;
- Salesforce provides classes with a virtual coach. Some of them are free to access, while others require some level of partnership which can be granted by the company;
- The same goes for standard online classes;
- Salesforce organizes private workshops, a further revenue source for the Provider;
- Salesforce built different learning paths, which consist of training material / classes and related certifications (further form of revenue): Admin, User, developer, Solution Designer and Technical Architect.

This is really the way it goes for most Service Providers. The Training and Competencies Transfer for them is both an opportunity to spread their product and a big chance to differentiate their revenues.

[82] http://www.salesforce.com/it/services-training/training_certification/

4.17.5 Training and Competencies Transfer: IT Consulting Companies

The second type of companies introduced are Consulting companies: most times, they obviously include in their offer training material and classes. These Services are normally also delivered in order to attract new customers towards the core Services

4.17.6 Training and Competencies Transfer: Education Centers

Education Centers often have close relationships with the Service Provider: the Provider can in fact advertise the training center on its website and redirect leads and potential customers. This is a huge advantage, considering that for a small training center appearing, for example, on Microsoft's website may represent a big plus.

Centers which partner with Service Providers often advertise themselves as "Certified" Partners or Centers, showing to the customer a proof of their reliability, usually deliver courses oriented towards the obtainment of certifications of the partner Provider and often give the chance to take the exams for such certifications in their structures.

Chapter 5

Case study: Milan Consulting

To better understand how to use the enhanced model presented in Chapter 3 for the mapping of Cloud Value Chain Players, a Milan-based consulting company has been analyzed. The company name has been anonymized in Milan Consulting. Its strategy will be reviewed, with the help of a questionnaire submitted to the management and face-to-face interviews. The analysis of the information provided will be used to map the company on the Cloud Value Chain.

5.1 Company profile

Milan Consulting is the pseudonym for an Italian, Milan-based consulting company specialized on ERP, CRM and BI Services. Founded in the late 90s, the company employees more than 100 people and has active customers all over Europe and in the USA. Milan Consulting is not listed.

The information reported in this chapter is based on the analysis of public documentation about the society, interviews with the management, a questionnaire submitted to the employees and data directly provided by the company.

A first part which analyzes the overall company profile will be followed by a focus on the CRM division. The CRM division offers the implementation of a Cloud product and its mapping in the Cloud Value Chain model will be used for its validation.

5.1.1 Organization

Milan Consulting offers ICT consulting services. These services can be divided into three main categories[83]:

- ERP consulting services;
- CRM consulting services;
- Business Intelligence consulting services.

For each of the three categories, Milan Consulting presents a dedicated line business unit. Organizational chart is reported in *Image 77.* Besides the three line business units, it presents staff units taking care of Accounting & Finance, HR, Marketing and Sales.

[83] Milan Consulting' website

Image 77 – Milan Consulting's organizational chart

The company is specialized on just one main product for each of the consulting services provided.

In particular, the ERP business unit, which counts on about 40 employees, is specialized on a ERP suite, oriented to the needing of medium-sized businesses, used by over 500 customers in Italy. The ERP product is an on premise ERP platform which is integrated, modular and scalable. In this study the product will be referred to as "ERP Systems", while the Service Provider will be called "ERP United". While ERP United is a huge tech company, ERP Systems is not a leading product in its market.

The CRM business unit, which can count on about 40 consultants as well. Is specialized on a Cloud CRM product. This product, which will be here called "CRM Systems", offers SaaS and PaaS capabilities and is one of the leaders worldwide. The Service Provider will be referred to as "CRM United".

Finally, the BI (Business Intelligence) business unit is composed of about 10 consultants only. This business unit has been suffering the global crisis of the economy, but is now the fastest growing

of the three. The turnaround was possible thanks to a switch in the product offered, which, unlike before, is now a Cloud solution and this was greatly appreciated by the market.

5.1.2 Sector and Competitors

Milan Consulting offers three very different kind of services, so that a dedicated analysis should be dedicated to each of them.

Starting from the ERP business unit, it must be pointed out that Milan Consulting offers and is only specialized on ERP Systems which, by the way, is not amongst the leader products of the market. Consequently, customers willing to adopt another solution, like the market leader SAP, are out of Milan Consulting's capabilities. The choice to focus on just one product represents a big advantage when it comes to relationship management of the partnership with ERP United which, being the only ERP partner, is very keen on passing leads and potential customers to the consulting firm. On the other hand, as already highlighted, customers who desire to implement another solution cannot be engaged. That's why Milan Consulting's success is also related to ERP System's..

Competitors are represented by big, medium and small-sized consulting firms and system integrators. Competitors specialized on multiple ERP solutions have the advantage of a wider range of potential customers, while facing the risk of minor specialization and skills related to the single products. ERP United is also a possible competitor, as it offers consulting services related to ERP Systems as well. By the way, considering that Milan Consulting is a "Gold Consulting Partner" and that ERP United usually takes charge of much bigger projects, it would inappropriate to list ERP United as a real competitor.

Moving on to the CRM division, the considerations related to the advantages and risks of providing customers with only one ERP product are valid in this section as well. This time around, though, CRM Systems is one of the worldwide leaders in its market segment, so that the audience of customers is wider. Like for the ERP BU, it would be inappropriate to consider CRM United as

a competitor, even though it does provide consulting services. Moreover, CRM United has recently made use of some of Milan Consulting's consultants for a big Italian project it is following, so that it even became a customer.

Finally, all considerations reported for ERP and CRM can be applied to BI.

5.1.3 Partnerships

Milan Consulting has strong relationships with the Service Providers whose products the company is specialized on. The company advertises on its website what are officially called "Platinum Partner", "Gold Partner" and "Partner" certificates related to CRM Systems, ERP Systems and BI Systems[84].

In particular, the partnership with CRM United is more than 10 years old, with more than 100 societies running CRM Systems environments designed by Milan Consulting, being small and medium sized manufacturing firms the most numerous category of customer serviced.

The partnership with ERP United is almost 20 years old, with more than 200 projects carried out in 33 countries.

Finally, BI United is a very recent partner, as the switch from the old BI software to the new Cloud application was performed in 2014.

5.1.4 Customers

Milan Consulting's customers are small, medium and big sized enterprises companies based in the European Union and North-America and operating all over the world. These customers come from different backgrounds, being their core businesses in sectors such as manufacturing,

[84] Milan Consulting's website

services, health, science, engineering, consumer goods, fashion, financial services, foundations and education and chemical.

5.2 The CRM business unit

The following section will provide a focus on Milan Consulting's CRM business unit. This division offers the implementation of the Cloud product CRM Systems and has been the one whose strategy was reviewed in detail, thanks to the questionnaire presented in the continuation of the study, interviews with the management and analysis of different type of data, including real contracts and offers (anonymized and deprived of financial data), useful for the definition of "contract templates" and to classify the services offered by Milan Consulting.

5.2.1 Services offered by the CRM division

Milan Consulting offers two kind of CRM services to its customers: configuration / development of the application and maintenance services[85].

Configuration / development projects are typically represented by the erection of a new environment from scratch. The typical situation is represented by a customer who wants to change its CRM for CRM Systems. It is not rare, though, especially among small and medium sized Italian companies, that the customer does not have a CRM at all (it is very unlikely that it does not have an ERP). According to data provided by Milan Consulting, about 60% of CRM customers require an integration with other systems already in use. The other 40% is mainly composed of customers who do not need integration, do not have the economic resources to integrate their systems or (rarely) do not have other systems beyond the one erected by Milan Consulting.

[85] Interview with the CRM director

Configuration / development projects also include all kind of activities which require some level of configuration or coding. Examples of typologies of configuration / development CRM projects carried out by Milan Consulting during 2016 include the extension of an existing systems to a new category of users (requiring new functionalities), the adoption of a new module of CRM Systems by the customer, the realization of custom Cloud pages to grant access to the system to external users (like distributors or suppliers), the merge of two environments, the rollout over subsidiaries of the system initially implemented for the headquarter, the rollout of applications from CRM Systems Cloud Marketplace over subsidiaries, after a pilot with the headquarter, etc.

Maintenance services include everything that does not require new configuration / coding. Obviously, this definition cannot be interpreted strictly, as maintenance services may include the implementation of minor, incremental upgrades.

5.2.2 Customer research and contract management for the CRM division

Milan Consulting has a Marketing business unit which is dedicated to the organization of events and workshops and to the building of a network of customers interested in such initiatives. The BU dedicated to the real concrete engagement of the customer and to the closure of contracts is the Sales division. The closure usually happens after significant presales activities, which often include the realization of a sample environment of CRM Systems for the customer, simulating its business and data and some demos to show use cases and everyday fruition of the product. The rapid configuration offered by CRM Systems allowed to move this part of the process to a very early stage, as the preparation of a simple complete demo, according to the director of the CRM division, can take as little as one day of work for a single consultant. Moreover, the Cloud today allows such demonstrations to be carried out remotely.

When it comes to the preparation of an offer or contract, some common templates have been identified in this study, through the analysis of real anonymized documents provided by the management of the CRM division[86].

Configuration / development contracts for the CRM division of Milan Consulting can belong to one of the following categories:

- Time and Materials (T&M) contracts are characterized by an estimate of the overall effort of the project, according to predefined goals. This effort is then translated into business days of work for each professional figure and the total estimate is given by the sum of such estimates multiplied by the daily fee of such consultants. However this is just the estimate, because the final amount will be given by the same formula, but using the actual days of work instead of the estimated ones. The client has the freedom to change the specifications of the project or to add new requests (knowing that this means a change in the total estimate). A premature exhaustion of the total budget can cause friction between Milan Consulting and the customer.
- Fixed cost contracts follow the same logic, but the actual total amount is decided before the kickoff of the project. The definition of goals gains much more importance and Milan Consulting and the customer have to specify in detail in the contract the modules and functionalities to activate.

As emerged during an interview held with the director of the CRM business unit, Milan Consulting tends to prefer T&M contracts when the uncertainty in the project is high: an undisciplined customer, a long and ambitious project, the activation of some modules or functionalities that Milan Consulting has never implemented or the presence of multiple subjects (like other consulting companies) to interface with are all elements that increase this variable.

[86] Review of anonymized contracts provided by Milan Consulting

The reason behind this strategy is that in a fixed cost contract Milan Consulting totally bears the risk of a failure (but is also better rewarded in case of great efficiency), while in a T&M contract such risk is shared with the customer.

Moreover, configuration / development offers prepared by Milan Consulting always include a training to be carried out before the go-live of the new system or new modules / upgrades. Even though the contracts reviewed had been deprived of financial data, interviews with the CRM direction highlighted how the daily fee for training services is usually higher, at least pre-negotiation, than the one for development and configuration. Moreover, the professional figures involved are often different, as a "functional" employee, with none to little coding and configuration skills, is able to perform a good training, provided he or she knows the system deeply from a use case point of view. The CRM director explained how such services are too often underrated by the customer, at least initially, as the abundance of training material publicly made available by the Service Provider and the competencies gained by the key users involved in the implementation phase often grant the customer with the illusion of being able to perform training sessions on its own. The CRM director provided a recent example of a customer which, after an initial refusal of the training days included in the offer, had to take a step back and purchase a training session for the end users. The honest motivation provided by the customer was that the training material available online, despite being very well prepared, did not obviously include the custom configurations implemented by Milan Consulting.

Milan Consulting usually offers two options in regards of training services:

- Training to all end users: this is the most expensive approach for the end customer, as it takes time and more sessions to prepare all the end users, which usually start from a knowledge of the system equal to zero;
- Train the trainer: following this model, usually, Milan Consulting's consultants train the key users who took part in the design of the system. This implies a dialogue with an audience already familiar with the final solution and numerically reduced. This is the most

cost effective solution for the end customer, but it requires the presence of prepared and smart key users.

Maintenance contracts usually see the customer paying a monthly fee, which gives access to:

- “Corrective Maintenance”, meaning the customer receives a dedicated assistance on problems or requests related to developments in course or concluded, not covered by any level of guarantee;
- “Evolutive Maintenance”, which enables the realization of minor incremental upgrades;
- “Application Support”, which means that business users are granted assistance over the processes active in its organization.

Such requests can be directed to Milan Consulting’s customers’ portal or sent directly to an email address, which through email-to-case turns them into CRM Systems cases in Milan Consulting’s environment.

The payment of the monthly fee guarantees the response from Milan Consulting within predetermined SLAs and covers quick maintenance and support activities. Long lasting activities decrease a monthly, cumulable budget of business days available to the customer behind the payment of a discounted fee. The fee can be flat (the hours spent by different professional figures are all rewarded the same fee) or differentiated (each professional figure has a different fee).

This second type of contracts somehow includes training services as well, considering that the “Application Support” point can be considered as a continuous education service in regards of real-life cases and issues. Real training sessions are not proposed in offers regarding such contracts, unless the customer specifically demands it.

5.2.3 Focus: from CRM Premises to CRM Systems.

Milan Consulting was founded 20 years ago, but it was not until 2005 that the company started to work on CRM Systems[87]. Before that year, "CRM Premises" was the product implemented by the CRM division. CRM Premises is an on premise CRM software, which is today also available in a Cloud version. However, its capabilities and diffusion are far from CRM Systems, due to the improper delay with which the Service Provider jumped on the Cloud train.

When Milan Consulting decided to start the switch to CRM Systems, it was a risky choice, because CRM United was still a much smaller company than its rivals and the Cloud was still a big bet.

However, this premature decision allowed Milan Consulting to get a noticeable advantage over the competitors in terms of competencies and reputation. The early partnership allowed, in fact, Milan Consulting to make a name as a specialist in the implementation of customer service CRM Systems modules for small and medium sized manufacturing enterprises.

This might seem like a small niche, but the small niche of a vast and fast growing market, for a medium sized consulting firm, can mean a lot.

By the way, the switch to CRM Systems came with its own risks. CRM Premises, in fact, tried to stop the initiative by blocking the passage of leads and potential customers to Milan Consulting.

This is one of the main risks of a "single source" approach: the success of the consultant is tied to the success of the provider, and when it is time to leave it for an uprising one, the jump can be dangerous.

[87] Interview with CRM management

5.2.4 Focus. the partnership with CRM United

Milan Consulting's partnership with CRM United dates back to 2005. More than 100 societies working in different sectors today run CRM Systems modules implemented by Milan Consulting[88].

The maintenance of a high level of partnership with the Service Provider is the result of an effort coming from many sides of Milan Consulting's organization. In fact, a determined punctuation has to be reached, which is the results of various components, such as number of converted leads or number of certified consultants.

The partnership with CRM United guarantees advantages such as free training programs for consultants, workshops, participation to events and dedicated training material. However, the biggest one is given by the advertising on CRM United's website and the passage of leads and potential customers to the consulting firm.

These advantages come with the risk and downsides seen before, which are represented by the risk of hooking up to one single provider. A possible future jump towards a new product would involve the risks represented by the change happened in 2005 (explained in the previous section), while, in the meantime, the bargaining power is unbalanced on the Provider's side.

Milan Consulting's success is strongly tied not only to CRM United's side, but also to CRM United's strategy. As an example, it may be useful to report an argument expressed by the CRM director during its interviewing time. The reasoning was gathered in consideration of CRM United's announcement, in 2016, to raise the prices of the licenses.

The CRM director proposed to take as an example a medium sized company with a limited budget for the next two years[89].

[88] Milan Consulting's website
[89] Interview with the CRM director

Such budget, supposedly € 80.000, has to cover the implementation and maintenance of a new system, besides paying the monthly license fees for the Cloud Service. If we suppose that the company has to provide 50 users with the system, and that the average annual license fee is € 1000, than the total license cost would sum up to € 50.000. The customer would thus have a budget of € 30.000 to spend on the project and maintenance of the system for two years. But if we consider a bump in price of 20%, then the customer would be left with € 20.000 as a budget for consulting services. As negotiable as CRM United's prices can be, they will never be as much as Milan Consulting's fees.

This is just an example of how a simple, non-revolutionary strategy decision of the Provider can cause huge impacts on the consulting company.

5.2.5 Focus: Milan Consulting's Marketplace Application for CRM Systems

The following information has been gathered through interviews with Milan Consulting management of the CRM business unit[90].

CRM Systems provides its users with a Marketplace where applications can be published. Such applications are built on CRM Systems' platform. They complete and extend the functionalities of the system and some of them produce a big stream of revenues for developers.

Milan Consulting's revenues had, until 2015, only come from consulting services, so that differentiation was an option. In regards of applications aimed at rapidly spotting potential customers on a map, the market leader was represented by a product that will be here called "Fast Map". Fast Map provided users with a functionality that did not exist in CRM Systems, was the absolute leader but asked for really expensive monthly licenses. No company had yet come out with a cheap version of the product, and Fast Map, with its high quality product, was not going to lower prices soon.

[90] Interview with the CRM director

That's why in 2015 Milan Consulting decided, after a detailed market analysis, to implement a cheap and simple version of Fast Map, called "Fast Selling", to cover the lower segment of the market. The project employed, part-time, a team of about five consultants for several months and the result was a well-designed, simple application ready to be placed on the market.

Even before publishing the app on the Marketplace, Milan Consulting succeeded in selling it to one of its customer and installed it in its CRM Systems environment. The customer, as of November 2016, is using the solution with high level of satisfaction, behind the payment of a monthly fee.

During one of the meeting scheduled with the Provider to review the solution and obtain the authorizations to publish it on the Marketplace, though, bad news emerged for Milan Consulting: CRM United was about to release its own product for spotting potential customers on a map.

Not only was the fee for the solution included in one of the regular CRM Systems' licenses, but the product was not released as an application of the Marketplace, rather as a standard functionality of the system, meaning that integration was total, even transparent to end users.

All of this would have been bad news for Milan Consulting alone, but the worst part was the decision from CRM United to block Milan Consulting's publication on the Marketplace. All the advantages which were to come with the publication (guarantee for the customer, control over the package, international visibility) were cancelled by the Provider's decision.

As of today, the first customer who adopted Fast Selling is still alone, which means that a huge investment resulted in a very small monthly revenue.

This was another example of the bargaining power of the Provider in the partnership with small Consultants. Milan Consulting's was, in fact, an articulated project, with the ambition of publishing on CRM System's marketplace a cheap version of the market leading "Fast Map", potentially reaching dozens of customers worldwide. According to data provided by the CRM

division, the overall total effort which has been provided for the development of the custom solution can sum up to about 500 days of work totally, split among different professional figures, from simple developers, to certified architects and project managers. Milan Consulting did not have precise data about this, but a rough estimate of the number of medium-sized customers to reach to reach the breakeven point, in order to consider the project as profitable, had been set to about ten, to be reached within one year from the publication of the app and to use the application for two years, with an average of 30 to 50 licenses per month. The conflict with CRM United's product, which blocked the publication of the app, resulted, as of November 2016, into the engagement of only one customer, which represent a failure for the project.

5.3 Questionnaire submitted to Milan Consulting's management

The questionnaire is composed of three sections. The first one aims at mapping Milan Consulting's strategy *as is* and *to be* as for the "Providing column" of the Chain Value model. In particular, managers were asked whether they think their company is taking care of an activity and whether it is likely to be done in the future. Nineteen managers completed the questionnaire.

According to 100% of them Milan Consulting is taking care of activities related to the development of Cloud Services and will keep doing it in the future. No manager believes that Milan Consulting is taking care of Cloud Services Aggregation / Integration (seventeen answered No and two did not know), while only three think this segment of the market will be addressed in the future. Eighteen managers out of nineteen do not position Milan Consulting in the Cloud Services Delivery. Fifteen managers, by the way, think it is possible that this market will be explored in the future.

The second section of the questionnaire concerns the "Deploying" column of the model. Eighteen out of nineteen managers think Milan Consulting takes care of Service selection and configuration for the end customer. For all of the managers this segment will follow to be

occupied in the future. 100% of managers also think that Milan Consulting takes care of system integration, with only one manager not sure whether the future strategy of the company will include it and eighteen sure it will. All managers think Milan Consulting takes care of Support and Service Management (today and in the future), while Training Services are provided by the company in the opinion of four managers, with fourteen saying that such Services will be delivered in the future.

Finally, managers were asked to indicate the players with which they think Milan Consulting has strategic partnerships. 100% of them selected Service Provider/Developers and two selected System Integrators. As for the future strategy, 100% still selected Service Providers, eight of them System Integrators, two selected companies who take care of Service Aggregation/Integration, five Training Centers and four other IT consulting companies.

The questionnaire and its results are provided in the attachment section of the study.

5.4 Analysis of the questionnaire and mapping of the player on the Cloud Value Chain

The managers' answers concerning Service Selection and Configuration, System Integration and Support and Service Management in the *as is* situation are all positive, with the exception of one interviewed marking "No" in the question related to the Service Selection and Configuration. As for the future situation, we still only have one exception, with one manager who does not know whether Milan Consulting will provide System Integration Services in the future and all other answers positive. That is why we can consider these segments as occupied by Milan Consulting today and, likely, in the future.

The Training and Competencies transfer section of the model is not represented in the *as is* mapping (only four managers out of nineteen would position Milan Consulting there). This is because Training Services offered by Milan Consulting cannot be intended as a standalone offer, rather as the final phase of a project. According to thirteen managers, by the way, Milan

Consulting will offer Training Services in the future. Previous interviews had revealed how Milan Consulting is evaluating to offer, in the future, Training Services unbundled from other kind of projects.

Moving on to the "Providing" column of the model, all managers think that Milan Consulting provides and will provide Cloud Development Services. The results are motivated by the development of Cloud applications based on the Service Provider's SaaS / PaaS, such as the one presented in Section 5.2.5. This is why this portion of the model can be considered under the competence of Milan Consulting, in today's and tomorrow's strategy. As for the Service Aggregation and Integration, no manager thinks Milan Consulting is today providing any kind of such services and we can therefore exclude it from our mapping. Three managers (15,8%) think Milan Consulting is likely to take care of such services in the future. In particular, aggregation or integration Services might be developed around the CRM Systems platform. By the way, these answers represent a minority. Therefore, our "future" mapping excludes this segment too.

As for the Cloud Services Delivery, while it is clear that Milan Consulting is not there in this moment, almost 80% of the managers think the company will get there. In regards of this point, it must be pointed out that Milan Consulting already provides some customers with a "Cloud-like" Service, having installed on its servers an instance of ERP Systems and delivering it via the Internet to the final customer. When revising NIST's essential characteristics of the Cloud together with the IT employee in charge of the providing of the service, he specified that not all of them are respected (two out of five, in fact, are not). For this reason, the Service cannot be considered Cloud and this was specified to the managers in the questionnaires.

Considering the positive answer as for the *to be* strategy, managers may think that Milan Consulting is likely to occupy this segment of the model with new products, or they may believe that the service already offered will finally get to a point where all five essential characteristics of a Cloud service will be covered. The mapping of the future strategy includes this point.

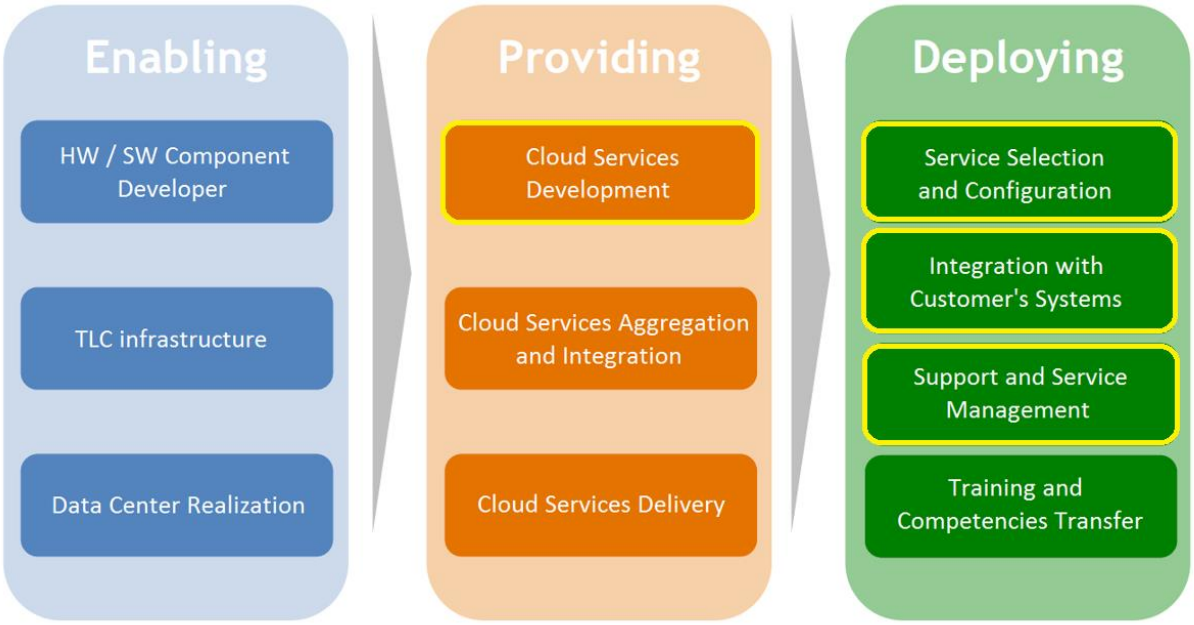


Image 78 – Milan Consulting's mapping on the model, highlighted in yellow

Image 78 shows the mapping of the situation of Milan Consulting *as is*, highlighting in yellow the segments of the model occupied by the consulting company. Milan Consulting's core competencies are related to the classic consulting company's role (Service Selection and Configuration, Support and Service Management) and that is why we can compare Milan Consulting's strategy with the considerations in Section 4.18.1 of this study.

There, it has been concluded, analyzing the strategies of some consulting firms, that they have a tendency to expand from their core business to the System Integration and Training Services segments, fully occupying the "Deploying" column of the model and we also have this situation in Milan Consulting. In fact, the interviews with the managers and the analysis of recurrent offer templates of the CRM division allow us to confirm what also emerged from the questionnaire, which is the presence of the company in three sectors of the column, while unbundled Training Services will likely be offered in the future.

In 4.18.1 it has also been observed that some consulting companies tend to expand towards the "Providing" column as well, at all levels. This observation is also validated by Milan Consulting's mapping on the model: the current situation shows a presence in the Cloud Services Development segment, while most managers think the company is likely to occupy also the Cloud Services Delivery portion in the next future.

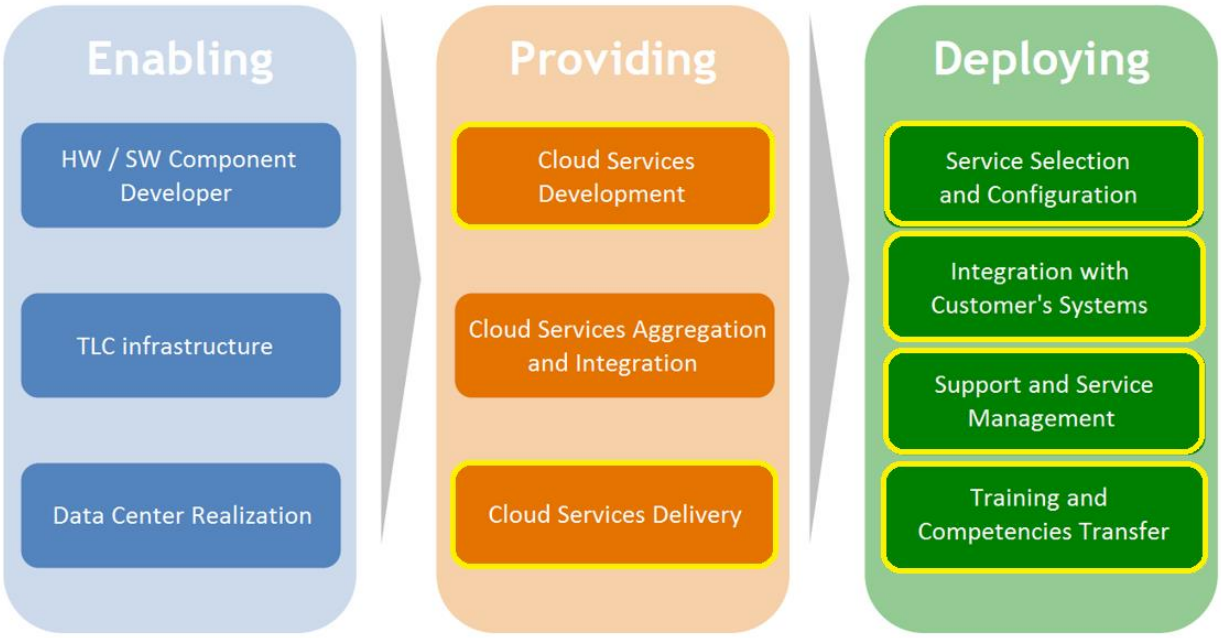


Image 79 – Milan Consulting's mapping on the model to be, highlighted in yellow

Image 79 shows the *to be* mapping of Milan Consulting on the model. While in Chapter 4 it has been observed that almost all consulting firms finally get to a full presence in the right section of the model, it has also been written that not all companies move to the central one and those who do not necessarily move to all of them.

This is why the (according to managers interviewed) absence of Milan Consulting in the Cloud Service Aggregation and Integration does not contradict the model. Moreover, it is possible that the company will also occupy the segment, independently of what managers think now.

Finally, *as is* relevant partnerships, according to interviewed managers, only include the Service Provider. This confirms what observed in Section 4.18.1 (in regards of Consulting Firms) and in Section 4.18.2 of this study (in regards of System Integrators), which is the absolute relevance of a strong relationship with the Service Provider, granting exclusive advantages to the Consulting Firm, such as strategic informative and study material, workshops and classes and, above all, the passage of leads and potential customers. All managers are sure that the partnership with the Service Provider will go on in the future, while eight out of nineteen managers think Milan Consulting may implement partnerships with System Integrators in the next future. This may be due to the fact that, while Milan Consulting only specializes on three main Services, the products that they need to be integrated with are a lot. It is likely that, if a new product with technical aspects not included in the company's skills become popular and recurring in many projects, then a partnership with a System Integrator might be necessary, at least until such competencies are gained. However, managers who think this kind of partnership is likely are still a minority (42%).

Only two managers foresee future strategic partnerships with companies which provide Services Aggregation and Integration. Finally, Training Centers and other IT Consulting Companies respectively scored a five and a four in the question regarding possible future partnerships. Even though such Services are also delivered by Milan Consulting (Training Classes not as a standalone service, but bundled with configuration and integration developments), the necessity to provide the end customer with real complete and end to end Services activates "coopetition" [91] mechanisms.

[91] Coopetition is a portmanteau of cooperation and competition. This happens when companies interact with partial congruence of interests, cooperating with each other to reach a higher value creation if compared to the value created without interaction and struggle to achieve competitive advantage.

Conclusions

The aim of this study was to analyze in detail the ongoing dynamics inside the Cloud Value Chain.

Cloud Computing technologies are having an important impact on the enterprise IT market, revolutionizing relationships, balances of power, creating new category of players and reducing the importance of others. The huge impact that the Cloud Computing takes to the IT industry, together with its growing diffusion, make the phenomenon central in the IT world.

In Chapter 1 of this study, the concept of Cloud Computing was introduced. Definitions and classifications were followed by an analysis of the situation of the international and Italian market, allowing the comprehension of the relevance and size of the trend.

In Chapter 2 we defined the methodologies used in this study: in particular, the review of the companies performed to understand patterns and dynamics inside the Value Chain has taken into consideration thirty-two firms, of which twelve producing technology which enables the paradigm of Cloud Computing, ten whose core business is composed of the development, aggregation, integration or delivery of Cloud Services and ten specialized on Services like as System Integration, Consulting and Training Classes. Finally a questionnaire, which followed some interviews, has been submitted in a consulting company: this was useful for a practical analysis.

Later, in Chapter 3, it was explained that the traditional ICT Value Chain is not adequate to map the Cloud industry, and the necessity of a Cloud Value Chain model was introduced. A review of those already existing in the literature followed. Amongst the models analyzed, the one designed by the “Osservatorio Cloud Computing e ICT as-a-Service” of the School of Management of Politecnico di Milano resulted to be the most accurate synthesis between completion and simplicity. Starting from this as a basis, an enhanced model to be used in this study has been introduced: in particular, the section concerning Consulting Companies and System Integrators was enriched with a new set of players, who take care of Training Services, providing their customers with classes and courses, often aimed at the obtainment of the certifications made available by Service Providers.

In Chapter 4, then, a significant set of players involved in the Cloud industry was analyzed, with the aim of mapping the ongoing dynamics inside the Value Chain. For each player, tendencies of vertical integration or differentiation and general strategic dynamics were reviewed, making use of public material such as papers, analyst's reviews, specialized articles and news.

Starting from the sector of the actors which develop hardware and software enabling the Cloud paradigm, it is not very crowded, with relatively few, big players. The tendency to became a commoditized market is strong, also because the biggest leading Service Providers have been building servers and data centers for years. Some companies just adapt their offers to the Cloud paradigms, while others take bigger risks and expand into the Cloud provider market, in order to avoid commoditization. Commoditization was also what telco companies had long been thought to be destined to, but today they are playing an important role in the Chain, being the only players able to guarantee real SLAs to the customer. Many of these companies are expanding their global data center footprint through acquisitions, or building their own centers, while others through differentiation, acquisitions or partnerships tend towards the right part of the chain, because that is where the customer and the highest margins are. The sector of Consulting Services for the realization of Data Centers is mainly populated by tech giants, whose core business we usually find in other sections of the chain. A trend we can notice in this market is strong collaboration amongst the players aimed at standardization and cost reduction. The overall vertical integration trend observable in the previously mentioned categories of players is aimed at avoiding commoditization and reducing risk.

Moving on to Cloud Services Developers, the main dynamic observable in the Chain is the partnership with System Integrators and Consulting Companies, which may play the role of vendors, actively proposing the partner Cloud solution to the end customer. In this regards, the main driver, especially for small and medium sized enterprises, should be represented by middle period business advantages rather than cost reduction. Coopetition mechanisms may develop, as Cloud Providers often also provide consulting Services. Coopetition dynamics are actually common in the Chain: for example telco companies offer Cloud Services, but they partner with Cloud Providers as well and so do consulting companies. While it is clear that coopetition mechanisms favor information exchange and are aimed at common growth, further investigation

concerning how such mechanisms may develop along the chain could be necessary. The section of “Cloud Services Delivery” is also strongly related to Cloud Services Developers, as most companies which develop a Service also deliver it. Cloud Services Aggregation and Integration is, most times, a segment of the Chain invaded by players positioned elsewhere, such as telco companies and Cloud Services Developers. This may be related to the fact that telco companies are not believable yet, to the eyes of customers, as Service Providers, so they also tackle the Cloud market through partnerships and the creation of virtual Marketplaces, gathering other developers’ offers.

Consultants, besides offering the classic product selection and configuration, support and management of the service, often provide Training Services and sometimes move towards the column of Providing, in order to deliver end-to-end services and complete packages to the customers. In this regard, consulting companies can exploit their business knowledge and develop personalized Services (for example on leading PaaS platforms) for end customers. Verticalization and personalization are thus key factors in allowing the channel to bring to end customers the value related to experience in the business. Especially observing the ongoing standardization trend in the Service Providers’ offers, personalization for the end customer can be considered as a competitive advantage and consulting firms have to make the most of this weapon, being the concentration in the segment high: the role is also covered by companies whose core businesses are placed elsewhere in the Chain. This happens because the closer to the customer the higher the profits, making consulting services high value activities towards which most players of the chain with the required competencies try to move. Finally, the partnership with the Service Provider is a big competitive advantage in the strategy of consulting companies, as they receive leads and potential customers. Advantages obtained through partnerships come at the cost of long procedures and time spent on the project and require an open mindset. Consultants also acts as System Integrators if they have the skills required and vice versa, and the partnership observation can be enlarged to this category of players. Leading Service Providers often expand towards the Training Services segment (it is a competitive advantage and a source of revenue for them) and so do Consulting Companies, which sometimes deliver them in order

to attract new customers. Services Education Centers often have close relationships with the Service Provider, being “certificated” in order to be more believable to end customers.

In Chapter 5, the review of the strategy of a consulting company, whose name has been anonymized, has been provided: information has been obtained through face-to-face interviews and the help of a questionnaire. This allowed better comprehension over the utilization of the model, using the information provided to map the company on the Cloud Value Chain. Milan Consulting’s mapping confirmed the dynamics highlighted in this study, where it had been observed that consulting companies, starting from their core business (Service Selection and Configuration and Support and Service Management) are trying to occupy the whole “Deploying” column of the model. This is true for Milan Consulting, which also provides System Integration Services and Training Classes. Even though, at the moment, they come bundled with implementation projects, in the future the company is likely to start providing standalone Training Services.

The dynamics observed in also showed how some consulting firms invade the “Providing” column. In regards of this annotation, Milan Consulting confirms the trend, occupying the Cloud Services Development section with its application built on top of the CRM PaaS Platform and providing a “Cloud-like” Service which in the future, according to the managers’ answers to the questionnaire, will whether satisfy all five NIST’s essential characteristics for Cloud Services or be followed by other real Cloud offers delivered by the company, occupying the Cloud Services Delivery box.

Finally, the tendency of the Consulting Company – Service Provider partnership has been confirmed in Milan Consulting as well, with 100% of managers believing that the partnership with the CRM Provider will be durable in time.

Overall, this study provides an enhanced version of the model designed by the “Osservatorio Cloud Computing e ICT as-a-Service” of the School of Management of the Politecnico di Milano in 2015, including a set of players which used to remain outside of the mapping, despite being involved in the Cloud industry. The validation of the model came from the literature, from the

presence of such players in the industry and from Milan Consulting's case study, which confirmed the dynamics and trends highlighted in Chapter 4.

This study may be deepened in the future. Periodical revision is, of course, necessary: in a fast-changing Cloud world, most considerations here provided might be inaccurate in some years. Other open points which provide sparks for follow-up can also be pointed out, like carrying on the in-depth analysis of the IT consulting role in the chain (for example exploring the importance of strategic consulting in the chain) or monitoring the evolution of coopetition mechanisms over time.

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Attachments

Questionnaire presented to Milan Consulting's managers

Section 1

Ritieni che ad oggi la tua società si occupi dello sviluppo di Servizi Cloud? Per esempio la creazione di applicazioni, anche basate su piattaforme o servizi di altri Provider.

- Sì – 19 (100%)
- No – 0 (0%)
- Non so – 0 (0%)

Ritieni che sarà presente nella sua strategia futura?

- Sì – 19 (100%)
- No – 0 (0%)
- Non so – 0 (0%)

Ritieni che ad oggi la tua società si occupi dello sviluppo di Servizi IaaS, di Marketplace, di Cloud Brokerage o, in generale, di servizi che aggregano o integrano altri servizi Cloud già esistenti?

- Sì – 0 (0%)
- No – 17 (89,5%)
- Non so – 2 (10,5%)

Ritieni che sarà presente nella sua strategia futura?

- Sì – 3 (15,8%)
- No – 15 (78,9%)
- Non so – 1 (5,3%)

Ritieni che ad oggi la tua società eroghi servizi Cloud, anche sviluppati da soggetti terzi?

- Sì – 1 (5,3%)
- No – 18 (94,7%)
- Non so – 0 (0%)

Ritieni che sarà presente nella sua strategia futura?

- Sì – 15 (78,9%)
- No – 2 (10,5%)
- Non so – 2 (10,5%)

Section 2

Ritieni che la tua società si occupi di selezione e configurazione di Servizi per clienti finali?

- Sì – 18 (94,7%)
- No – 1 (5,3%)
- Non so – 0 (0%)

Ritieni che sarà presente nella sua strategia futura?

- Sì – 19 (100%)
- No – 0 (0%)
- Non so – 0 (0%)

Ritieni che la tua società si occupi di integrazione di servizi Cloud?

- Sì – 19 (100%)
- No – 0 (0%)
- Non so – 0 (0%)

Ritieni che sarà presente nella sua strategia futura?

- Sì – 18 (94,7%)
- No – 0 (0%)

- Non so –1 (5,3%)

Ritieni che la tua società fornisca supporto e gestione del servizio Cloud per il cliente finale?

- Sì – 19 (100%)
- No – 0 (0%)
- Non so – 0 (0%)

Ritieni che sarà presente nella sua strategia futura?

- Sì – 19 (100%)
- No – 0 (0%)
- Non so – 0 (0%)

Ritieni che la tua società si occupi di servizi di training su prodotti Cloud per clienti finali?

- Sì – 4 (21,1%)
- No – 15 (78,9%)
- Non so – 0 (0%)

Ritieni che sarà presente nella sua strategia futura?

- Sì – 14 (73,6%)
- No – 5 (26,4%)
- Non so – 0 (0%)

Indica con quali dei seguenti player ritieni che la tua società abbia in corso delle partnership di valore

- Fornitori/Sviluppatori di Servizi Cloud – 19 (100%)
- Soggetti che integrano ed aggregano tra loro Servizi Cloud – 0 (0%)
- Altre Società di Consulenza IT – 0 (0%)
- System Integrator – 2 (10,5%)
- Centri specializzati nell'erogazione di Training – 0 (0%)

Indica con quali dei seguenti player ritieni che la strategia futura della tua società preveda di stringere partnership strategiche di valore

- Fornitori/Sviluppatori di Servizi Cloud – 19 (100%)
- Soggetti che integrano ed aggregano tra loro Servizi Cloud – 2 (10,5%)
- Altre Società di Consulenza IT – 4 (21,1%)
- System Integrator – 2 (10,5%)
- Centri specializzati nell'erogazione di Training – 5 (26,4%)