

# Amazon Web Services: a Case Study

## Contents

<b>1</b>	<b>Introduction</b>	<b>2</b>
<b>2</b>	<b>History of AWS</b>	<b>2</b>
<b>3</b>	<b>Business Analysis</b>	<b>3</b>
3.1	Creation of AWS: Sell what we already have . . . . .	4
3.2	Growth factors and issues . . . . .	4
3.2.1	Economies of scale leads to cheaper service provision . . . . .	4
3.2.2	Simultaneous competition and coopetition . . . . .	5
3.2.3	Raising the entry barrier for competitors . . . . .	5
3.2.4	Lowering the entry barrier for starting a new business: consumerization of businesses . . . . .	6
3.3	Healthy side effects: how Amazon's core business is benefited in return for invest- ing in AWS . . . . .	7
<b>4</b>	<b>Recommendations and Future Growth Trajectory</b>	<b>8</b>
<b>5</b>	<b>Conclusion</b>	<b>8</b>

## 1 Introduction

The Amazon Web Services (AWS) is a set (more than 25) of proprietary web-based services owned by Amazon.com. All these services ranging from simple storage to sophisticated database services constitute the cloud platform offered by Amazon. An extensive list of customers for AWS include Dropbox, UniLever, Airbnb, Nasdaq, Netflix. As of 2007, there are more than 300K developers actively using AWS [1]. It is one of the pioneers which brought the cloud computing closer to masses helping number of start ups bootstrap their businesses. AWS is a true testimony of how a just-Internet-enabled business grew into a complete-technology-company competing with dedicated technology companies- the likes of Google, Microsoft, and Apple.

In the following case study, we analyze the various aspects of AWS and the business and economic principles that drove their creation and design.

## 2 History of AWS

The Amazon web services was launched in 2002 and the portfolio of services expanded over time. The Amazon Elastic Cloud EC2 was built in 2004, which is central to the whole AWS infrastructure. Amazon itself is one of the clients for the EC2 platform. Amazon Virtual Private Cloud (Amazon VPC) is the latest (2011 August) addition to the list [2].

In spite of strong guarantees on the availability of the infrastructure to the clients, AWS experienced major outage recently, thus strengthening the critics of cloud computing initiatives.

Today, AWS has a wide set of products including the following most popular ones.

1. Amazon Elastic Compute Cloud (EC2)
2. Amazon Elastic MapReduce
3. Amazon Mechanical Turk (Mturk)
4. Amazon Relational Database Service (RDS)
5. Amazon Simple Storage Service (S3)
6. Amazon Simple DB
7. Amazon Dynamo DB

The less known ones include

1. Amazon AWS Authentication
  2. Amazon CloudFront
  3. Amazon CloudWatch
-

4. Amazon Elastic Beanstalk
5. Amazon Elastic Block Store (EBS)
6. Amazon ElastiCache
7. Amazon Flexible Payments Service (FPS)
8. Amazon Fulfillment Web Service
9. Amazon Historical Pricing
10. Amazon Product Advertising API
11. Amazon Route 53
12. Amazon Simple Email Service (SES)
13. Amazon Simple Queue Service (SQS)
14. Amazon Simple Notification Service (SNS)
15. Amazon Simple Workflow (SWF)
16. Amazon Virtual Private Cloud (VPC)
17. AWS CloudFormation
18. AWS Import/Export
19. AWS Management Console (AWS Console)
20. AWS Storage Gateway

### **3 Business Analysis**

In the following, we analyze the various forces that lead to the creation of AWS and that drive its explosive growth in adaptation of the services. Namely, we discuss

1. the motivation and strategy behind creation of AWS
  2. the forces that are driving its growth
  3. how the AWS growth in turn acted as a strong catalyst to the success of Amazon's original core business and associated products
-

### 3.1 Creation of AWS: Sell what we already have

Amazon core business of selling goods (ranging from books to fresh food and electronics to fashion cloths) through its e-commerce portal (Amazon.com) has seen exponential growth in the past decade. A total of 650 million users, per year (as of 2008), visit Amazon.com portal generating a revenue of more than 15 billion USD for Amazon [3]. There are 76 million active customers and 1.3 million sellers depend on the portal. Thanks to the sheer number of the visitors and volume of the transactions they initiate, the scale of the infrastructure needed by Amazon to run its core business is unprecedented.

Hence, after building such a massive storage and computing infrastructure that is always available, resistant to failures, its intuitive to open up the infrastructure and sell it as a commodity. This helps Amazon not only to expand the infrastructure further thus benefiting its own core business (as described later in Section 3.3) but also to attract more customers to this new product. Thus, Amazon launched Amazon Web Services in 2002 and slowly adding more and more services to the AWS portfolio, making Amazon as the market leader in cloud computing world.

### 3.2 Growth factors and issues

#### 3.2.1 Economies of scale leads to cheaper service provision

The scale of the AWS infrastructure is unmatched. The EC2 platform has more than 17K cores which positions AWS at 42 in top 500- super computers list [4]. Such a scale has huge cost efficiencies through a combination of high-volume, low cost procurement thanks to bargaining power of buyer Amazon. In addition, constant technological innovations in design, operations and management of the data centers and AWS help Amazon to reduce the prices further. Amazon has lowered prices 19 times since the start of AWS in 2007 [5]. Amazon CEO's vision of *providing premium services at non-premium prices* extends to AWS as well. GigaOm once commented- "When Amazon Web Services isn't adding new services, it's cutting prices on those it already offers. The speed with which Amazon rolls out new services, and commoditizes them with its pricing, is its chief advantage." [6].

Because of cheaper service provision, there is a flood of new customers for AWS. However, with the advent of new competitors like Google Cloud Engine, there is an ever increasing stress on Amazon in pricing. However, presence of more than 25 services in its portfolio, AWS is more lucrative for a customer to deploy his business on AWS than a cheaper service provider who offers lesser number of services. For example, consider the case of AWS which provides both computing (EC2) and storage services (S3) and another provider who provides only a storage service but at a cheaper price. Given that any typical large business needs both scalable computing and storage, AWS is most preferred choice which offers a complete basket of services. Especially AWS providing services of Database (RelationalDatabase service, Simple DB, etc.) along with simple storage and computing makes the choice of AWS very attractive for any customer. In addition, Amazon has a better/cheaper pricing if several of services from AWS are used by a single client, for example, AWS allows free unlimited data transfers among different services,

---

thus making it cost effective. This diversified service offering is something AWS is benefited from Amazon's core business which expanded itself from selling only books to almost any consumer good through its portal.

### **3.2.2 Simultaneous competition and coopetition**

AWS positions Amazon in an interesting situation of simultaneous competition and coopetition with some of very big players in technological markets. Most of the AWS services can be seen as repackaging some of competitor's products and re branding them through their AWS portfolio. For example, Amazon Relations Database Service (RDS), which is part of AWS, heavily uses Microsoft's SQL Server [12] and Oracle. Customers of RDS can choose one of these SQL flavors as part of their contract for RDS. Because of the very large client base for the RDS service, Amazon ends up as a big customer for Oracle and Microsoft for their database products. Amazon is in a coopetition with these players to offer a value-added service to the end users. End users, instead of purchasing Oracle or Microsoft's database products, they buy Amazon's RDS service. Thus, Amazon can be understood to be a middle man in the supply chain between end user and the original service providers. Interestingly, Oracle and Microsoft has AWS alternatives namely, Oracle Cloud [11] and Windows Azure [13]. Thus, Amazon has to compete with these players while engaging in a coopetition simultaneously.

### **3.2.3 Raising the entry barrier for competitors**

Being one of the early players in cloud computing market, Amazon has a huge lead time in AWS marketing. Since designing and building huge cloud infrastructures require vast amount of resources: time, man power in terms of software engineering, competitors need precious time to catch up. In addition, the diverse basket of services offered in AWS give Amazon a huge competitive advantage to attract new clients. AWS acts as one-stop-shop-for-all-computing needs to start a new tech business.

One more very important aspect of AWS is- Amazon itself is a very big customer for AWS for its core business. Hence, strengthening AWS is a natural choice for Amazon which is in its own business interests. For other players in the market, for example, RackSpace [7], a huge uncertainty exists in planning new initiatives in introducing new services on its cloud products. AWS is a product evolved from its existing cloud infrastructure unlike some competitors alternatives which had to be built from scratch, thus giving a huge lead time to Amazon in bringing AWS to market.

Huge costs involved prohibit existing clients for AWS to switch to a new, yet cheaper, alternative, thus running AWS continues to be profitable for Amazon.

---

### 3.2.4 Lowering the entry barrier for starting a new business: consumerization of businesses

One of the major impacts of AWS on business world is consumerization of businesses. Especially the following characteristics of AWS (or in general, any cloud computing infrastructure) made this possible:

- *On-demand service provisioning:* Entrepreneurs can set up their IT- based businesses whenever they wish and close it down when they decide to cease the business. The AWS gives unprecedented agility to entrepreneurs to test ideas/businesses without a lot invested in IT equipment, resource first and later struggling to get rid of. This opened up even research institutions and universities to be customers of AWS to run some short-lived experiments using massive infrastructure offered by AWS at a fraction of cost that incur in traditional environments [8].
- *Elasticity:* Some businesses may have very few customers to begin with, which may grow exponentially as the service offered become more interesting like in the case of Instagram [9]. AWS provides an amazing way of elasticity which scales up and down the amount of resources the current work load of a service demands, as shown in Figure 1.
- *Inexpensive:* In addition to the above, the services provided by AWS come at a fraction of cost involved in self-hosting of the services. Total cost of ownership of certain products (for example, Oracle Server) may be prohibitively expensive. More over, using AWS services free the entrepreneurs from the initial huge capital costs involved in bootstrapping a new business. Augmenting self-hosting services with state-of-the-art security will incur in huge costs too. As shown in Figure 1, AWS helps to reduce the wastage of deployed resources and same time costs incurred match very closely to that of optimally needed resources at that instant.
- *Zero or negligible IT labor costs:* Resorting to AWS frees the businesses from setting up elaborate dedicated IT teams taking care of machine repairs, set up and monitoring the energy resources. Airbnb found significant reduction in IT labor costs and it will increase further as the business grows [10]. Dropbox and Airbnb are some of the most popular It businesses that run on AWS.

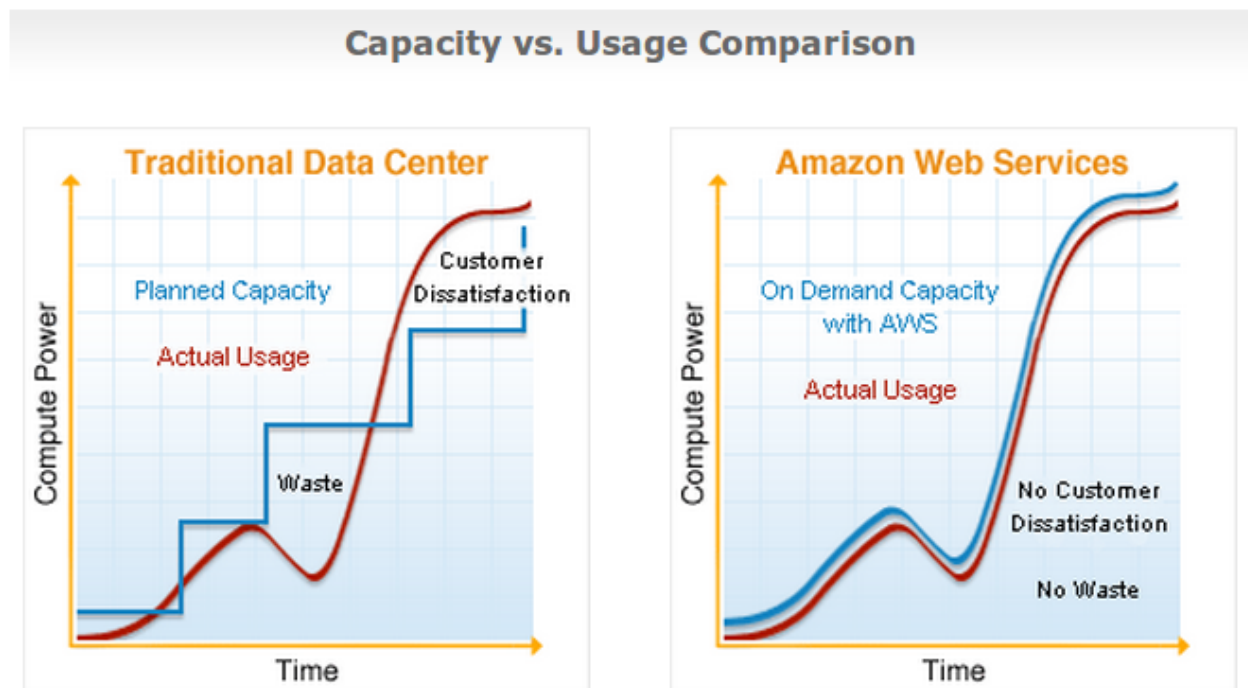


Figure 1: Cost savings with AWS for businesses [Source: [5]]

In a recent test, the Defense Information Systems Agency compared the cost of developing a simple application called the Tech Early Bird on \$30,000 worth of in-house servers and software with the costs of developing the same application using the Amazon Elastic Compute Cloud from Amazon.com's Web Services. Amazon charged 10 cents an hour for the service, and DISA paid a total of \$5 to develop an application that matched the performance of the in-house application. [5].

### 3.3 Healthy side effects: how Amazon's core business is benefited in return for investing in AWS

The huge investments and focus made by Amazon on AWS not only improved revenues from dedicated AWS customers but also helped to improve its core business by introducing value-added services running on AWS. In 2007, Amazon introduced cloud-based music service to sell MP3 songs and a web-music player. It positioned Amazon in a direct competition with Apple's iTunes. Even though other competitors like Google announced similar service, the music content available on Amazon are significantly cheaper, thanks to the scale of economy principle. Amazon Cloud Drive introduced almost simultaneously, runs on AWS (S3) service. The Kindle device sold by Amazon has a huge competitive advantage over Nook in the market thanks to up to 5GB of cloud-based free storage for storing books and personal documents. It also allowed to reduce the manufacturing cost of the device by getting rid of microSD card slot on the device. Amazon AppStore, that runs on AWS, built to sell Android apps is a popular value added service to

the recently introduced Kindle Fire device. Often, the prices of the apps on AppStore found to be cheaper than that of even Google's Android Market. Amazon's Instant Video is another massively popular service which helped Amazon to build a huge eco system of content- music, books, apps, video that is vital for the success of a tablet device in the current ever- changing market extremely crowded with numerous devices from number of manufacturers like Samsung, LG, Asus, Acer.

## 4 Recommendations and Future Growth Trajectory

Based on the current growth trajectory of AWS, Amazon continues to generate more and more revenue on the AWS. Despite proliferation of numerous cloud- based products in the market, Amazon will continue to benefit from diversified set of services AWS offers, its huge reliance on AWS for its own core business and the cost efficiency due to scale of economy.

One possible new service that can be added to AWS is groups or individuals selling their computing and storage capacity on their computers, with certain service guarantees on availability, through Amazon's portal, much similar to the way a typical seller sells commodities like used books, electronics, other utility products through its portal. It is like crowd- sourcing the cloud storage. Universities, individual research labs across the world can be typical sellers making use of such service to improve the usage of unused capacity on their already- deployed IT infrastructure, thus generating additional revenue. It enables another coopetition model for Amazon which is already hugely benefited by opening up its Amazon.com portal to number 3rd party vendors, who grew exponentially to more than 1.3 million. However, such a direction needs a much detailed marketing study and business analysis.

## 5 Conclusion

In this paper, we discussed briefly the motivation behind introduction of Amazon Web Services (AWS) platform by Amazon. We analyzed various growth factors that still drive AWS's exponential growth. We conclude by showing how Amazon's core business itself benefited hugely from the ever-expanding AWS. We presented possible expansions that can be made to AWS's basket of services.

## References

- [1] [http://en.wikipedia.org/wiki/Amazon\\_Web\\_Services](http://en.wikipedia.org/wiki/Amazon_Web_Services).
  - [2] <http://phx.corporate-ir.net/phoenix.zhtml?c=176060&p=irol-corporateTimeline>.
  - [3] <http://www.slideshare.net/davinken/amazon-web-services-history-overview-presentation>.
-



- 
- [4] <http://arstechnica.com/business/2011/11/amazons-cloud-is-the-worlds-42nd-fastest-supercomputer/>.
  - [5] <http://aws.amazon.com/economics/>.
  - [6] <http://gigaom.com/cloud/amazon-cuts-prices-again-on-key-web-services/>.
  - [7] <http://www.rackspace.com/>.
  - [8] <http://aws.amazon.com/solutions/case-studies/harvard/>.
  - [9] <http://instagram.com/>.
  - [10] <http://aws.amazon.com/solutions/case-studies/airbnb/>.
  - [11] Oracle cloud. <http://www.oracle.com/us/solutions/cloud/overview/index.html>.
  - [12] Sql server. <http://www.microsoft.com/sqlserver/en/us/default.aspx>.
  - [13] Windows azure. <http://www.windowsazure.com/en-us/>.
-