IM 701 Case Study: The Creation and Current Environment of Amazon Web Services

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Table of Contents

Introduction

In 1995 Amazon officially launched as an online bookseller. From the beginning the plan was to become an "everything store." As the company grew several innovative projects were thought up and implemented. By 2002 it became apparent that technology was not keeping up with the company's innovative pace. According to Andy Jassy, CEO of Amazon Web Services (AWS), project timelines were set back 2-3 months on average due to setting up data centers, services and other hardware (Fortt). To resolve this problem Amazon created Elastic Compute Cloud (EC2). This product allowed Amazon to expand compute power on demand. This cut the beginning of projects down to hours rather than months. As a result, the cloud computing industry began. In the following sections I will describe in further detail the information management problem AWS solves, provide an environmental scan from AWS's perspective and three information management strategic options for AWS.

Company Profile

In articles about Amazon's "early days" much is made about a focus on innovation, customer obsession and a no excuses attitude (Skok). With its continued focus on these traits the company has attained over $208 billion in revenue (Mergent). Now, in 2018, Amazon has extended its reach to grocery stores, Internet of Things products and business to business enterprise services. A segment of Amazon, called Amazon Web Services (AWS), the segment this case study is about, is an arm of the company providing information management products in the form of Infrastructure as a Service (IaaS). As this Case Study is about AWS's IaaS services I define IaaS from the AWS website below.

> Infrastructure as a Service, sometimes abbreviated as IaaS, contains the basic building blocks for cloud IT and typically provide access to networking features, computers (virtual or on dedicated hardware), and data storage space. Infrastructure as a Service provides you with the highest level of flexibility and management control over your IT resources and is most similar to existing IT resources that many IT departments and developers are familiar with today.

In the first quarter of 2018 Amazon had $1.93 billion in operating income. Out of that amount AWS accounted for 73 percent, $1.4 billion (Skok). What these numbers show is that an innovation originally put in place to solve an internal business problem has turned into a major component of the company's services.

Information Management Problem

A Forbes's article, written by Michael Skok, contains a synopsis of the information management problem Amazon faced. As an online retailer Amazon had quickly grown and had several innovative ideas to improve the site, enhancing the customer experience. Yet "…problems Amazon was having scaling its eCommerce infrastructure and the realization that many of its internal software projects took too long to implement…" became readily apparent. At the time, information management infrastructure in its current form could not scale fast enough.

Amazon's CEO, Jeff Bezos, assigned Andy Jassy to look into this problem and solve it. According to Skok, Jassy underwent an evaluation and "…realized many Amazon team projects weren't scaling and weren't being leveraged across the company. They were effectively starting from scratch with each new project." On top of that "…the team thought if they were having difficulty with certain technology infrastructure problems, it was highly likely that other companies were experiencing similar problems. Thus, if they could solve these issues for themselves, as an internal customer, they could potentially solve it for others." The team faced a technology issue of a grand size. Another factor was the forward thinking to suspect other organizations likely faced a similar issue. Looking back Amazon uniquely had the right position to view an issue other company's faced. By working in eCommerce Amazon knew what other technology companies did not.

Environmental Scan

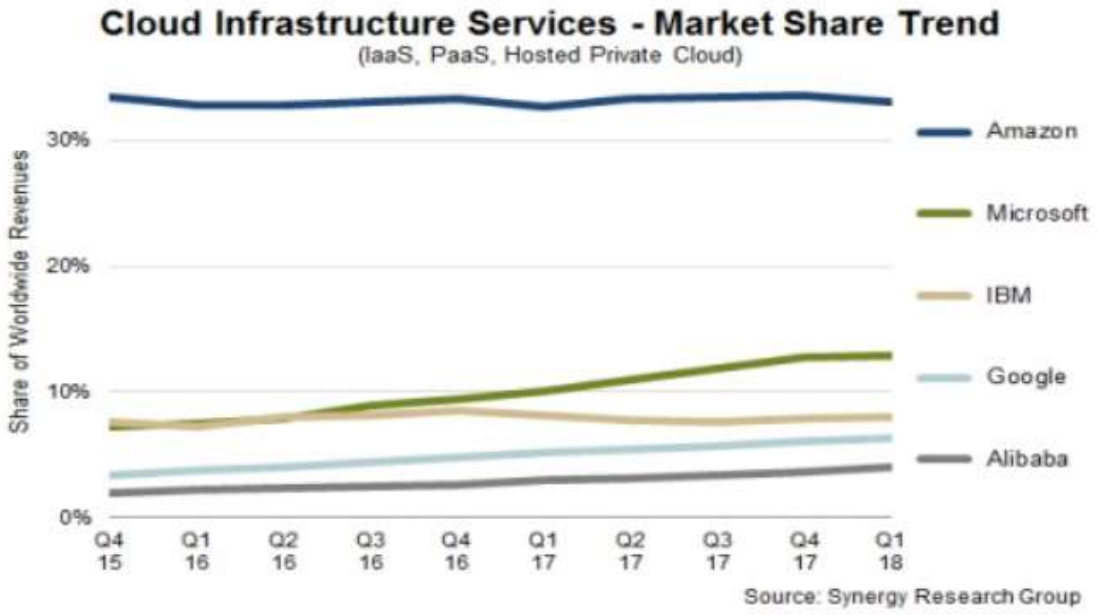
An Environmental Scan as described by Choo and Albright in separate sources consists of an analysis of an organization's external threats and opportunities. I determined that for this case study I would use Albright's following sections: Industry, Technological, Social and Regulatory.

Industry

Out of the Environmental Scan categories "…the industry's environment is the most significant" (Albright 41). By looking at competitors we can gain "useful information on trends and potential problems for competing organizations…" as well as potential positives for the competition (Albright 41). AWS's primary competitors in the IaaS industry include the other technology companies Microsoft and Google.

By entering the technology market with the creation of AWS Amazon shifted from not only competing with consumer product retailers but also into direct competition with technology giants Microsoft and Google. On the surface it seems a little surprising Amazon, a retailer, is able to compete. Yet these companies had not come out with an IaaS product. In fact, Amazon's culture of innovation and customer obsession led to an ability to compete (Hern). The original reason to create AWS was to resolve internal company issues with sharing data (Hern). Even if the IaaS tools were not able to be sold externally, the company still solved an internal issue so the benefits outweighed costs. In that sense Amazon had little to lose and much to gain. So this could be seen as a competitive advantage compared with Microsoft and Google. Similar to Amazon, Google has data centers around the world (Garcia 19). If Google had seen this opportunity and acted first the IaaS industry could look much different. Once AWS services began in 2006 Google and Microsoft were behind. Microsoft did not release its competing service, Azure, until 2010. Google joined the cloud services market in 2012 (Garcia).

When it comes to industry risk, although AWS beat other technology giants to the new cloud computing market Google Cloud and Azure have quickly caught up. Azure, with Azure Stack, has come up with creative options to ensure IaaS is compliant with regulations (Delewalla). Google has released open source products such as containers ("What is Kubernetes…). These two topics will be discussed in further detail in the Technology, Social and Regulatory sections. From an industry perspective it appears AWS's greatest factor on its side has been the "first mover" advantage (Hern). Now, over 10 years later, that advantage has remained. This can be seen in the evidence of a majority market share. Except as the chart on the next page from a CNBC article shows Azure and Google Cloud are slowly increasing market share, especially Azure.



Technological

From a technological lens current trends are critical to AWS's success. "The emergence of new technologies can impact organizations' overall business and production processes. It is useful, therefore, to monitor changes in technologies, particularly those that influence business efficiencies, changes in production, existing infrastructures (e.g., energy, transportation, and communication), and the rise of new products or services" (Albright 41). For this section Albright's mentioning of the "emergence of new technologies" is significant.

On the AWS website the services provided are described in a white paper called "Overview of Amazon Web Services." AWS customers are provided with "…on-demand delivery of compute power, database storage, applications, and other IT resources through a cloud services platform via the Internet with pay-as-you-go pricing." The focal point of AWS is the business community because " With cloud computing, you don't need to make large upfront investments in hardware…Instead, you can provision exactly the right type and size of computing resources you need." On top of that a key component is scale. A business entity "…can access as many resources…almost instantly…" leading to massive computing power on an as needed basis." A review of all three company's websites (Google Cloud, Azure and AWS) left me with the impression each provides a similar service.

Behind the ability to provide compute power, databases and several other IaaS services on demand is cutting edge technology. Pervez Delawalla, in a *Smart Business* magazine interview, describes the cloud as follows. "Some examples of cloud computing include…Microsoft products with which data is backed up on SkyDrive, Google Drive, Salesforce.com or Dropbox. A business may approach a data center for complete automation of its infrastructure and take care of the software itself." Since Delewalla said this in 2012, the focus within IaaS has evolved to support emerging technologies such as artificial intelligence (AI), containers and edge computing. Competing in this territory with Azure and Google Cloud is critical for AWS's future. Without the previously mentioned "first mover advantage" these three areas of technology carry high risk and reward for AWS.

Artificial Intelligence (AI), Edge Computing and Containers

The AI market is a strength for Google Cloud, Azure and AWS. IaaS plays a large function with AI by allowing the use of containers and edge computing to utilize distributed computing. Viewing the AI webpages for these companies reveals no differentiation. Google Cloud's AI page says it is "Advancing AI for everyone." AWS's page says it plans to place "Machine Learning in the hands of every developer and data scientist." Azure has this statement: "Artificial Intelligence productivity for virtually every developer and scenario." Each company has an AI product "for all" and seemingly little to differentiate.

Another critical emerging technology running in conjunction with IaaS is edge computing. "Edge computing speaks to a computing topology that places content, computing and processing closer to the user/things or 'edge' of the networking" (Panetta 7). Bringing compute power closer to where it is needed, reducing latency and allowing a process to take place locally. Products like Google AI or Amazon's Alexa run by utilizing edge computing. Again, this is a technology with little differentiation. Each company provides an edge computing capability. When it comes to technology perhaps AWS's risk is standing out from a competitive crowd.

Regulatory

Compliance with regulation has been a hot topic for IaaS. Albright said, "Changes in laws and regulatory guidelines may also have a significant impact on the organization" (41). The

most significant factor seems to be securing data. Europe's recent release of its General Data Protection Regulation (GDPR) and also Canada's privacy law provide good examples.

While reviewing Canada's privacy law online a person can find a section on where citizen's data must be physically located ("Summary…"). Citizens data must remain within the country. So an IaaS provider such as AWS must give organizations an option for choosing data centers and servers in Canada. This sort of law's impact is that it causes businesses to be a little reluctant to using IaaS (Butler). On top of this sort of regulation GDPR has requirements about what organizations may do with European resident's data ("EU…). In this field Azure may have taken the lead over AWS and Google Cloud with a Hybrid IaaS product called Azure Stack.

Azure Stack is a hybrid IaaS product. "The term refers to companies maintaining their own computing capability as well as running some computing jobs off their premises" (Clark). According to industry information hybrid could be where IaaS settles especially when it comes to regulation (Clark). Azure Stack is a product that "…gives customers a way to use a popular and familiar cloud platform without shipping their sensitive data into a multi-tenant environment" (Butler). When it comes down to it the movement of sensitive data is what privacy regulation is about. "And Microsoft is the first of the three major IaaS vendors - Microsoft, Amazon Web Services and Google Cloud Platform - to offer a hybrid cloud that consists of an on-premises hardware/software bundle that runs the same software management tooling as the public cloud" (Butler). Customers value the ability of Azure Stack to shift between on-premises and off-premises because it allows ease in terms of privacy compliance. So Azure appears to have the advantage in terms of regulation.

Social

An important movement referred to as "open source" timed well with AWS's entrance to the computer infrastructure market (Garcia 14). According to Albright, "Market changes are sometimes driven by changes in society…Additional, qualitative indicators (e.g., consumer attitudes) are also important and should be monitored." Albright's comment about consumer attitudes is the focus on how open source culture impacts IaaS providers.

Steps in the timeline of IaaS have been quick. A product originally thought up to power organizations as a utility has provided a foundation for several innovative technologies. This means software developers are a primary stakeholder with IaaS. When creating AWS, Amazon

also released Application Programming Interfaces (APIs) to allow easier configuration of IaaS with organization's existing software (Novet). Thus providing the ability to quickly start companies that utilize hardware on demand. The software developer culture highly values open source products such as APIs.

Google has made big moves in the field of open source products. Recently the creation and subsequent release of Kubernetes as an open source product was seen as a definitive moment for Google to secure the containers market, a key tool for IaaS. IaaS containers are also a product that offers abilities critical to edge computing and artificial intelligence ("What is Kubernetes…"). Moreover, Google has cultivated a strong open source presence by releasing its AI products to open source in 2015. According to a Wired magazine article, with this activity Google has attained "…goodwill among the world's software developers" (Metz). So with open source Google may have the advantage.

Information Management Strategies to Help AWS

Out of the four areas of this scan. There appear to be two that AWS has a disadvantage: Regulatory and Social. In the strategies below two address the Regulatory and Social topics. The third is a recommendation to continue the information management strategy that created AWS.

Regulatory - Hybrid is seen as the future due to compliance and Azure has taken the first step toward winning (Butler). AWS will want strengthen its product within this space to provide customers a streamlined option to meet regulatory requirements.

Social – AWS does participate in the open source community. For example, Alexa, Amazon's AI voice product has the ability to build apps open sourced. Developers build skills for Alexa, and as of this writing over 7,000 have been created (Hern). But the algorithm itself is not shared. AI comes from the academic community and carries an open source culture with it. AWS may want to share more information in this community (Carey).

Continue to Turn Problems into an Advantage – The management method introduced by Jeff Bezos has worked so far. When discussing the information management problem earlier in this case study, part of Jeff Bezos management style was not brought up. He required teams within Amazon to NOT share information in typical ways, such as with email, talking, instant

messaging, etc. The only way to share data was through setting up an interface with other teams (Hern). Partly due to this information management strategy the innovation to create AWS was forced upon staff. This needs to be used with open source and IaaS.

Conclusion

Amazon created AWS out of its spirit to become an “everything store.” By providing compute power on demand the extent of Amazon has reached beyond retail. As shown in the Environmental Scan AWS is in a fiercely competitive industry. It is so competitive that it is tough getting its technology to stand out. Ensuring its strategy includes competing with Azure Stack and engaging with the open source community should strengthen AWS’s position in the IaaS industry. Finally, AWS came from innovating methods to share information. That same unique information management style applied to the regulatory and social issues discussed could certainly help.

Works Cited

Albright, Kendra. "Environment Scanning: Radar for Success" Information Management Journal 38, no. 3 (May/June 2004): 38-44

Butler, Brandon. “Azure Stack: Microsoft’s Private-Cloud Platform and What IT Pros Need to Know about It: AWS and Google Cloud Have Nothing like It Yet.” CIO (13284045), July 2017, p. 1. EBSCOhost, dom.idm.oclc.org/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=bth&AN=124175095&site=ehost-live&scope=site. 12 Oct 2018.

Carey, Scott “How Google decides to open source its technology” (3 Aug 2018). Computerworld UK. https://www.computerworlduk.com/open-source/how-google-decides-open-source-its-technology-3681832/. 12 Oct 2018.

Clark, Don “Big Computer Makers Cozy Up to Microsoft’s Cloud” (Sep 2016). *Wall Street Journal (Online)*. https://dom.idm.oclc.org/login?url=https://search-proquest-com.dom.idm.oclc.org/docview/1811255754?accountid=10528. Wed 20 Sep 2018.

Choo, Chun Wei. “Chapter 1: The Intelligent Organization,” in Information Management for the Intelligent Organization: The Art of Scanning the Environment. 3rd Edition. Medford, NJ: Information Today, 2002. pp. 1-5

Delawalla, Pervez interviewed by Jayne Gest “Deciphering the cloud: How cloud computing can lower your costs and increase your security” (Sept 2012) *Smart Business Los Angeles*. file:///C:/Users/curness002/Desktop/how%20cloud%20computing%20works.pdf. Tues 9 Oct 2018.

“EU General Data Protection Regulation is the most important change in data privacy regulation in 20 years” (May 2018) *EU GDPR.org*. https://eugdpr.org/. 12 Oct 2018.

Fortt, John “Amazon Web Services CEO Andy Jassy on how he snagged his dream job” (2018). CNBC News. CNBC. https://www.cnbc.com/video/2018/01/07/amazon-web-services-ceo-andy-jassey-on-how-he-snagged-his-dream-job.html. Wed 20 Sep 2018.

Garcia, Ari Liberman “The Evolution of the Cloud: The Work, Progress and Outlook of Cloud Infrastructure” (February 2015). Master’s Thesis: Master of Science and Engineering and Management at the Massachusetts Institute of Technology. http://hdl.handle.net/1721.1/100311. Wed 20 Sep 2018.

Hern, Alex “Amazon Web Services: the secret to the online retailer’s future success” (2 Feb 2017). *The Guardian*. https://www.theguardian.com/technology/2017/feb/02/amazon-web-services-the-secret-to-the-online-retailers-future-success. Wed 10 Oct 2018.

Mergent, Inc. (n.d.) Amazon company details: synopsis. Retrieved 10 Oct 2018. www.mergentonline.com.

Metz, Cade “Google Just Open Sourced Tensor Flow Its Artificial Intelligence Engine” (9 Nov 2015). *Wired Online. Wired Magazine*. https://www.wired.com/2015/11/google-open-sources-its-artificial-intelligence-engine/. 13 Oct 2018.

Novet, Jordan “Amazon cloud revenue jumps 49 percent in first quarter” (26 Apr 2018). *CNBC online. CNBC*. https://www.cnbc.com/2018/04/26/aws-earnings-q1-2018.html. Tues 9 Oct 2018.

Novet, Jordan “Microsoft narrows Amazon’s lead in the cloud, but the gap remains large” (27 Apr 2018). CNBC online. CNBC. https://www.cnbc.com/2018/04/27/microsoft-gains-cloud-market-share-in-q1-but-aws-still-dominates.html. 12 Oct 2018.

“Overview of Amazon Web Services” (April 2017). *Amazon Web Services*. *Amazon*. https://d1.awsstatic.com/whitepapers/aws-overview.pdf. Tues 9 Oct 2018.

“Salesforce and AWS Expand Global Strategic Alliance to Accelerate Enterprise’s Digital Transformations” (25 Sep 2018). *Business Insider. Press Release PR Newswire.* https://markets.businessinsider.com/news/stocks/salesforce-and-aws-expand-global-strategic-alliance-to-accelerate-enterprises-digital-transformations-1027562195. Wed 10 Oct 2018.

Skok, Michael “Amazon Turned a Problem into an Opportunity with Advanced Problem Solving” (16 Dec 2013). *Forbes*. https://www.forbes.com/sites/michaelskok/2013/12/16/amazon-turned-a-problem-into-an-opportunity-with-advanced-problem-solving/#7020831d9fe5. Mon 8 Oct 2018.

“Summary of Privacy Laws in Canada” (Jan 2018). *Office of Privacy Commisioner of Canada online*. https://www.priv.gc.ca/en/privacy-topics/privacy-laws-in-canada/02_05_d_15/. 12 Oct 2018.

“Types of Cloud Computing” (9 Oct 2018). *Amazon*. https://aws.amazon.com/types-of-cloud-computing/. Tues 9 Oct 2018.

“What is Azure Stack?” (October 5, 2018). Microsoft. https://azure.microsoft.com/en-us/overview/azure-stack/. Fri 5 Oct 2018.

“What is Kubernetes?” (October 5, 2018). Kubernetes. https://kubernetes.io/docs/concepts/overview/what-is-kubernetes/#why-containers. Fri 5 Oct 2018.