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Research Article

A study on Role and Application of Cloud Engineering & Cloud Computing in Business Reengineering with reference to Netflix

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Abstract:

The high-end technology innovations and digitalization have reshaped the business front rapidly with changing consumer needs and behavior patterns. This shift in consumer behavior pattern is driven by the technological innovations and upgraded business front. These IT innovations are also known as IT disruptive forces which helps to reshape and rebuild the business fronts and strategies to cater to the changing needs of the consumers.

Cloud computing and engineering is one of the IT disruptive forces which plays an important role in shaping up the business to cater to the changing needs of the customers. Cloud computing is a metaphor that represents the on-demand availability of the cloud infrastructure by a third party which is managed by the service provider itself. Thus, reduces the operational cost and maintenance overhead for its clients. It also helps to improve the flexibility, efficiency and scalability of the core operations of the client.

This study focuses on the role and application of the cloud engineering infrastructure and cloud computing technology in reshaping and reengineering business with reference to Netflix. Netflix is a US based online entertainment service provider, offering service across the globe. Netflix has gone through an interesting journey from being a DVD rental company to a multi-million global ott tv service provider giant.

The main objective of the study is to understand how cloud computing infrastructure helps a business to shape up and grow in a short span of time. It also captures the opportunities and challenges associated with cloud computing services and infrastructure.

The study reveal various fronts on which Cloud computing and cloud engineering has played an important role in reengineering Netflix's business to cater its unique worldwide client segments. Major findings of the study highlight the role of cloud computing infrastructure in reshaping Netflix strategic front which helped it to become a global giant serving 195 countries worldwide.

Key words: Digitalization, Cloud Computing, Cloud Engineering, OTT, IT Disruptive Forces.

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Introduction:

Cloud Computing is a metaphor that is used to define the concept of online on-demand availability of the computer resources like infrastructure, platforms, and applications, by the cloud computing service providers (CSP). The cloud computing resources can access from multiple locations using various devices using internet.

Cloud computing allows the user to use these online computer resources from multiple locations according to their requirements, without the burden of managing the IT infrastructure. Therefore, the cloud computing users can focus on their core business functions and let the cloud service providers handle the IT operations and management of computer resources.

It is a case study research based on secondary data. More than 150 recent and relevant research articles are reviewed to study the role and application of cloud computing services with reference to Netflix. The study area considered for this study is Netflix (an online entertainment service provider). The main aim of the study is to explore the role and application of cloud engineering services in reshaping business with specific reference to Netflix. The data is taken from Netflix's research and development web pages which are open sources made available to public for learning purpose.

This study reveals that high capacity and low-cost cloud computing networking services are known for its huge data storage capacity and the faster processing speed. The operating cost for private networks might go up in case of poor resource management capabilities of the user. But the public cloud services can be used for free as well with some data cap. The cloud service providers have introduced "pay-as-you-go" model, which allows the user to pay for the resources needed at any point of time. It allows the flexibility as well as scalability of the operations with economies of scale.

The study concludes that cloud engineering and cloud computing services play an important and significant role in reshaping the business as per the changing needs and demands of the consumer. Cloud engineering services not only improve the scalability and flexibility of business operations, but it also helps to reduce the product innovation time. Thus, it plays a major role in business reengineering to cater to the rapidly changing needs and demands of the consumers with reference to Netflix.

Research Objectives:

Mention one outcome based objective like Examine/Analyze/Evaluate

1) To understand the role of Cloud Computing& Engineeringin reshaping business at Netflix.
2) To explore the Cloud Computing Infrastructure adaptation strategy And Challenges faced by Netflix.
3) To study the overall impact of Cloud Computing technology on Business Reengineering at Netflix.

Literature Review:

Research Gap and Need and Scope of Study

According to Reed Hasting, CEO, Netflix, at AWS reinvent conference, the high capacity, and low-cost cloud computing networking services are known for its huge data storage capacity and the faster processing speed. The operating cost for private networks might go up in case of poor resource management capabilities of the user. But the public cloud services can be used for free as well with some data cap. The cloud service providers have introduced “pay-as-you-go” model, which allows the user to pay for the resources needed at any point of time. It allows the flexibility as well as scalability of the operations with economies of scale.

The Digital TV Europe Industry Survey, 2019 offers a three-fold study capturing 7 major area related to cloud computing, broadband network, and Ott tv industry. The study captures the responses from 560 industry executives from 64 countries. The respondent survey was done online to capture the responses form the Pay tv and Ott tv service providers. The study focuses on the evolution of cloud computing and broadband infrastructure to enhance the user experience amongst the industry and service providers.

According to DTVE survey ,2019, Security & privacy are two of the major concerns in cloud computing services. The data stored in the cloud can be accessed by the service provider depends up on the legal terms and conditions decided between the client and service provider. Some of the

mechanisms and systems used to fix the security and privacy concerns are 'Identity Management System', Legal ownership of data and Encryption applications.

According to the Cloud Security Alliance, there are 3 major threats in the cloud computing services:

a) Insecure Interfaces & API's
b) Data loss & Leakage
c) Hardware Failure

All the above Cloud service security issues accounts for 29%,25% and 10% respectively.

According to Eugene Schult, chieft technology officer at Emagined Security, hacking is also one of the major issues related to the secure cloud computing service infrastructure trying to penetrate the cloud. Hackers can take control over the huge information in a single attack using "Hyperjacking". Dropbox security breach and icloud 2014 leak are some of the examples of the past hacking attacks. The problem of Legal ownership of data is also one of the major concerns with the cloud computing services. There are many terms on cloud computing service agreements which are silent about the legal ownership of the data. Fundamentally the private clouds are secure with better control over the information stored as compared to the public cloud. Public clouds are known for its flexibility, scalability, and economic application.

According to Bruce Schneier, one of the limitations of the cloud services are as follows:

a) Limited Customization Options
b) Limited control over the backend infrastructure
c) Limited control over the management of the applications, data and services
d) Data Caps
e) Privacy & Confidentiality Concerns

Neil Hunt, chief product officer at Netflix at 'AWS Re invent', discusses that "how AWS supports deployment of new tools and features at Netflix". Netflix run everything on AWS which adds on to a new state of infrastructure every year. Netflix started the migration to AWS cloud infrastructure in 2008 and completed the same in 2016. Netflix does not have any local data centers at present. The big data handling and management is done by AWS.

Tom Macaulay, in his research article titled "How Netflix completed a historic cloud migration with AWS", 2018, has captured the journey of Netflix being a DVD rental company to million-dollar online entertainment giant. The article also covers the role and significance of cloud computing technology services in making of Netflix a global leader in ott tv service industry with viewers spread across 190 countries worldwide.

The case study by Tom Macaulay in his article has explained in detail how Netflix moved from its local data centers to AWS cloud. AWS stands for Amazon Web Services; it is a cloud infrastructure services run and managed by Amazon. It all started in year 2008, after a technical fault at one of the local data centers of Netflix which caused delay in DVD delivery and affected the Netflix business operations for long period. The migration was one of the challenging task to do. It took Netflix 8 years to completely move from its local data centers to AWS cloud infrastructure.

The case study titled" Netflix Builds its Open-Sourced Cloud Technologies on the CloudBees platform, 2015 by Gareth Bowles, Senior Tools Engineer, Netflix explains the role and significance of the CloudBees platforms at Netflix. The case study captures the challenges faced by Netflix while its migration to the AWS cloud infrastructure. It also captures the role of cloudbees technology platform as solution to open-sourced technology related challenges at Netflix.

Some of the key benefits of AWS cloud services according to Hahn, Netflix Technical Team head, is improved scalability, reduction in lead time and deployment of the new products, freedom to test, cost effectiveness, economies of scale, flexibility, and velocity with which the content is created and delivered. With Aws allowed Netflix to move to Recommendation Algorithms which requires huge amount of storage space. Freedom to experimentation due to AWS cloud infrastructure, Personal touch and customization became the key ingredients of core Netflix Digital Marketing strategies.

Problem Statement:

Cloud Engineering and Cloud Computing Technology was defined by Prof. Ramnath Chellappa in 1997. Instead, being an old concept, this area is yet be explored and researched upon from its role, application, and adaptation strategic perspective by the academia as well as industry. This Study explores the role, application of Cloud Computing Technology and the adaptation strategy with reference to Netflix.

Research Methodology:

The study undertaken is **descriptive and analytical** in nature. The **case study approach** is used to capture the role and application of Cloud Computing in Business Reengineering with reference to Netflix. The research undertaken revolves around both **Qualitative as well as Quantitative**secondary data to capture the details related to the subject.

The focus area of the study is Netflix Inc, which is an online entertainment service provider with huge customer base across the globe. The study revolves around the data analysis done of the **secondary data** collected from various **sources**like Netflix Technology blogs, Articles, Business Reports, Magazines, Netflix Research articles and learning videos. Netflix's Open connect

network material is one of the major sources of data taken for this research. More than **150 articles** are reviewed to develop the in depth understanding about the cloud computing technology and its applications at Netflix.

Data Collection & Data Analysis:

To Make it Organize and put it in proper Sequence

Sr.	Objectives	Source	Outcome
1	To Understand the Role of Cloud Computing & Engineering in Reshaping business at Netflix.	a) Peter Mell; Timothy Grance (September 2011). b) Tom Macaulay, (10th September 2018. c) Niccolai, James (11th August 2009).	Secondary Source given studied to understand the Role of Cloud Computing & Engineering in Reshaping Business at Netflix.
2	To Explore the Cloud Computing Infrastructure Adaption Strategy and Challenges faced by Netflix.	a) Eadline, Douglas,2019 b) Mills, Elinor (2009-01-27). c) Wang (2012).	Secondary Source given studied to understand the Cloud Computing Infrastructure Adaptation strategy and Challenges faced by Netflix.
3	To Study the impact of Cloud Computing technology on Business Reengineering at Netflix.	a) Tom Macaulay, 10th September 2018. b) Gareth Bowels, 2015. c) "What is Cloud Computing? ", *Amazon Web Services*. 2013-03-19.	Secondary Source given studied to analyse the impact of Cloud Computing technology on Business Reengineering at Netflix.

Table 1: Data Collection (Source: Data Analysis)

Data Analysis

In depth analysis of the research articles is done and found that:

- Cloud computing technology & engineering plays significant role in Reshaping business at Netflix.
- Cloud Computing Infrastructure Adaptation Strategy of Netflix includes the shift from local data centers to AWS cloud infrastructure with dedicated micro services designed as per the application.
- The Challenges includes adaptation of Cloud infrastructure and Streamline the Open-Source Technology.

Major Findings:

- Cloud computing plays a significant role in business reengineering. The cloud computing services can be availed in two ways:

1. Enterprise Cloud (Private cloud computing services limited to single organization)
2. Public Cloud (Shared Cloud Computing services to multiple organizations)

Both Enterprise Cloud computing services and Public cloud computing services have theiradvantages and disadvantages.

- **The benefits and the limitations of Private as well Public Cloud services a**re listed in the table below:

Sr. No.	Cloud Computing Service Category	Key Benefits	Limitations
1	Enterprise Cloud	a) Private Cloud Computing services dedicated to single organization. b) Control over the resources c) High Capacity d) Faster Processing e) Improved Manageability	a) Unexpected Operating Cost. b) Expensive c) Security / Privacy Concerns.
2	Public Cloud	a) Economies of scale b) Resource Sharing	a) Security Issues b) Privacy Concerns

		c) High Capacity d) Faster Processing e) Improved Manageability f) Flexibility g) Scalability	

Table 2 Types of Cloud Computing Services, Benefits & Limitations (Source: Data Analysis)

The table above highlights that the key benefits of both the categories of cloud computing services are same. Even the infrastructure of Private and Public cloud computing network is almost same. The security and privacy concerns remain with both the categories as the service provider is solely responsible for the maintenance and management of the network and therefore, possess the access to data stored on the cloud.

- **The Advantages & Challenges of Cloud Computing Technology:**

The DTVE industry survey,2019 captures following advantages and challenges of Cloud computing technology:

Advantages	**Challenges**
Scalability: The ability to scale up the services as and when required without investing in big upfront infrastructure.	**Uncertainty**: in terms of Service Quality & Service Level Agreements with service providers.
Reduced Time to Market: Quick New product launch.	**Lack of clear Standards:**regarding the service quality standards.
Flexibility: Effective usage of the infrastructure and resources as and when required.	**Lack of Control:**over the service infrastructure.
Cost Efficiency: Ability to reduce the operational cost as well as capital cost for infrastructure.	**Lack of Professional in-house support:** infrastructure is managed by the cloud service provider.
Reliable: Ability to support the scale up and scale down of the infrastructure to support smooth operations.	**Migration to new cloud-based models:** APEX model to an OPEX model.

Table 3: Advantages and Challenges of Cloud Computing Technology, Source: Data Analysis (Reference: DTVE Industry survey, 2019)

- **Challenges Faced by Netflix:**

Some of the challenges faced by Netflix while offering their open-sourced technologies to the public development community are as follows:

1) **Simplify the Open-Sourced Technologies**: One of the key challenges faced by Netflix with open-source technology development was the simplification and ease of access to the algorithms and builds to the developer community.
2) **Streamline the Open-Sourced Technologies:** Another challenge with open-source technology was to smoothly streamline the open-sourced technology. The migration of the prototypes builds was done with Jenkins plugins on the cloudbees platform. According to Bowles the technical team at cloudbees have been incredibly supportive throughout the transition period.

Industry Implication:

Cloud computing is one of the most sought subjects for research which needs to be explored further. Major cloud service provider organizations spend majority of their revenue in cloud research and development. In 2011, Microsoft committed 90% of its R&D budget i.e., $9.6 billion in cloud computing infrastructure related research. The study offers a base for further research in similar domain with reference to various related industries.

Recommendation & Suggestions:

Eight to Ten suggestions

- Cloud Computing technology related topics must be researched further to develop better understanding of the topic from the Business Strategic Perspective.
- Cloud Computing infrastructure adaptation strategies can be considered as base to develop an effective and efficient technical infrastructure to meet the fluctuating market demand.
- There is a should be a well-defined guidelines and standards regarding the application of the could engineering infrastructure as there is a lack of standard rules regarding the service standards by the Cloud service providers.
- The security related concerns related to the application of the public cloud must be taken care of by incorporating the security and privacy related legislations and rules.

Conclusion:

Netflix's journey with Amazon web services started in 2006, when Netflix decided to move to AWS cloud infrastructure from its local data centers. The migration to AWS cloud was bit challenging for Netflix. It took around 7 years for Netflix to completely move to AWS and shut its last data center. The shift allowed Netflix to improve the bandwidth, scalability, flexibility as well as the overall efficiency of the system in term of cost and service quality.

According to Neil Hunt, Head Technical Team, Netflix, with AWS services Netflix has become one of the pioneers in cloud computing technology application. The credit goes to the Netflix technical team which was involved in designing the specific applications as per the cloud

infrastructure requirements. Interestingly the cloud computing technology was invented and innovated by companies like Amazon, Netflix, and Facebook, instead of traditional IT companies like Oracle, IBM and Microsoft etc.

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