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A Survey Paper Based on Implementation of Cloud in healthcare Sector

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ABSTRACT : The research focuses on ways of implementing cloud in the health care sector and thus, a small survey has been conducted to develop an effective strategy. In this process, a questionnaire has been used to record the responses of participants and visualize the data using graphs based on a sample of 13 respondents. Along with this, secondary research has also been applied to explore its benefits on the health care service providers as well as hospitals. Moreover, theoretical approach helps in developing a firm framework to successfully implement cloud in health care sector.

I. INTRODUCTION

Cloud based healthcare technologies allow allied professionals and nurses in accessing health care records of patients, mobile apps, big data analytics, and devices with IOT. Using this technology, it is easy to improve the decision-making process with hassle-free flexibility and scalability. Thus, the research seeks to identify the best strategies to implement cloud in the healthcare sector. In this way, broad aspects of cloud both benefits and disadvantages are compared to come up effective strategies. However, the purpose of the research is to minimise potential threats on the health care sector.

II. BACKGROUND OF THE RESEARCH

Cloud based computing is enabling hospitals and doctors to increase the engagement of patients and accessing medical data of patients such as patient engagement as well as doctors' prescription. In this way, patients have more power and control over their sensitive information, which eventually makes them aware about the medical conditions.

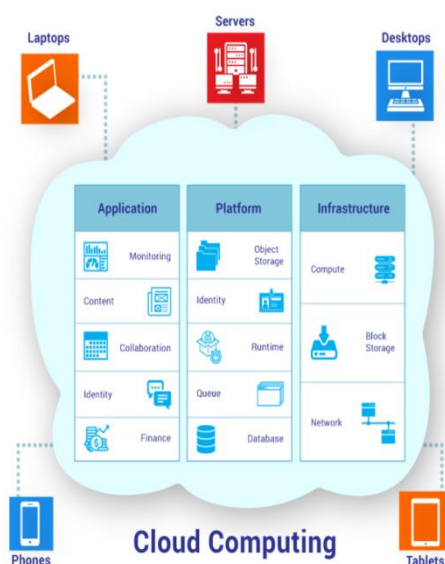


Figure 1: Cloud Computing[10]



Aside from all these, the primary advantages of implementing cloud are improving privacy, reduced costs, and facilitating better patient care through interoperability and collaboration. Similarly, cloud computing is effective in aligning patient outcomes and healthcare providers broadly for continuous development or growth. According to the recent report, the global market of healthcare cloud computing is predicted to grow from USD 39.4 billion in 2022 to USD 89.4 billion by 2027 at a CAGR 17.8% [9]. However, the major factors that help in enhancing the growth of cloud computing are telehealth, e-prescription, m-health and adoption of big data analytics. Through successful implementation of cloud, the flexibility, storage and scalability of data can be improved by the cloud. Hence, this research is helpful in determining the most reliable and feasible solutions of implementing cloud in the health care sector.

III. AIM AND OBJECTIVE

The aim of the research is to study the effective strategies or planning to successfully implement cloud in the health care sector

- To discuss the broad aspects of cloud computing in healthcare sector
- To identify potential issues and threats that may arise while implementing cloud
- To examine the potential benefits of using cloud based technology to allied professionals
- To recommend the most effective strategies to implement cloud computing in the health care sectors

IV. RESEARCH QUESTIONS

Q1: What is the role of cloud computing in the healthcare sector?

Q2: What are the potential issues and threats that may arise while implementing cloud?

Q3: How allied professionals are benefitted from using cloud based technology in the health care sector?

Q4: What are the effective strategies to implement cloud computing in the healthcare sector?

V. PROBLEM STATEMENT

One of the major problems of implementing cloud is cost management that can easily ramp up its processing capabilities rather investing in costly hardware. Similarly, the scalable nature and on-demand of cloud computing services increase difficulties to predict the exact cost and quantities. In the process of reducing the costs, around 32% of businesses use multi-cloud cybersecurity tools so that the risk of financially devastating data breaches can be reduced. The second major problem is lack of resources or expertise that create problems in managing workload and adopt advancement of cloud technologies positively. Along with this, compliance of health care regulations with cloud is also a major challenge that includes Payment Card Industry Data Security Standard (PCI DSS) and Health Insurance portability and Accountability Act of 1996 (HIPAA) [2].

VI. LITERATURE REVIEW

6.1 Concept of Cloud in health care

Cloud computing can be considered as an innovative paradigm that offers on-demand access to a shared pool of configurable computing resources such as applications, storage and servers. Cloud computing services help healthcare professionals in accessing medical records of patients and provide better treatment facilities to them [6]. The key features of cloud are resource pooling, broad network access, measured services and on-demand self-services. Cloud computing is an effective health care technology that improves flexibility, high availability of IT infrastructure and reduces the IT maintenance costs gradually. Moreover, it is an effective approach to eliminate traditional approaches to health care settings by using three different service models such as infrastructure as a service (IaaS), Software as a service (SaaS) and platform as a service (PaaS). In this way, Cloud computing is useful and feasible for the healthcare sector by delivering platforms, storage and processing together with programming languages.



6.2 Identification of key problems in implementing cloud computing in healthcare sector

Cloud computing is playing an essential role in the health care sector and thus, an effective strategy is required to be formulated to implement cloud. In this way, key problems in the implementation process are needed to be identified such as management, technology and legal perspectives. In management, the major problem is the lack of skill and experience of health care professionals to handle such software from a broader perspective. Similarly, uncertain provider's compliance and resource exhaustion issues are technological problems [8]. These problems are needed to be considered while implementing cloud and compliance with key resources broadly. Aside from all these, legal aspects can be a problem in successfully implementing cloud due to privacy issues and data jurisdiction. Through analysing all these issues, hospitals and healthcare service providers are needed to comply with health care rules and regulations for continuous growth.

6.3 Key benefits of cloud computing to health care services providers and hospitals

Implementation of cloud in the healthcare sector is beneficial for health care organisations in different ways. One of the benefits is focusing on patient care health service so that the treatment of patients and clinical assessment improve gradually [11]. Along with this, it improves the response system and health care service providers to monitor patients in real-time. The second major benefit is enhancing health team collaboration within the organisation by enhancing vital resources and information within the teams to reduce the risks of failure. The primary benefits of cloud to organisations is minimising cost of internet operation such as pay on-demand plans by which health care service providers can reduce cost of acquiring computing hardware [7]. These benefits indicate that cloud-based health care services are needed to be implemented within the organisations so that sustainability and feasibility of the business can be improved gradually.

6.4 Theories and models

6.4.1 Infrastructure as Services (IaaS)

Infrastructure as a service (IaaS) is one of the effective service models. It is essential to integrate a level of the cloud computing paradigm and its infrastructure needs. According to this approach, customers are given computational resources to utilise for their applications. A communication network is used to deliver the computing capabilities in a virtual machine that is in the cloud [1]. Amazon Cloud Formation and Amazon EC2 are the most well-known examples of IaaS. It may be put into practice by employing ideas like "Organisation network", and "Virtual Data Centers" (VDC). A subcategory of cloud infrastructure services known as "Network as a Service" (NaaS) allows users to access network connection as a service. Naas incorporates network resource computing and resource allocation optimization.

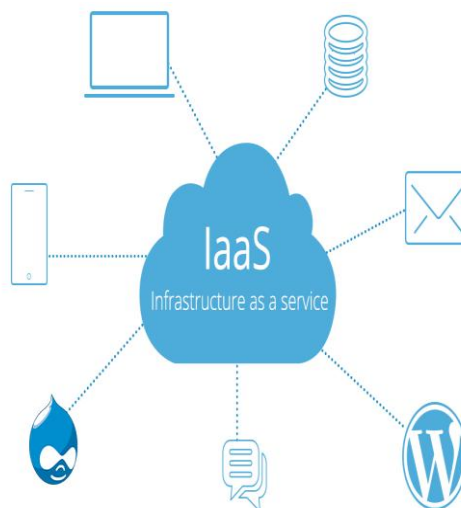


Figure 2: Infrastructure as a service (IaaS) [10]



6.5 Determination of potential solutions or strategies to implement cloud in healthcare sector

The project is required to be clearly defined in which specific software and infrastructures that need to move are clearly defined. The second step is to select the platform to safely deploy the information such as Azure and Amazon AWS to support the business model. Similarly, the third step is establishing secure policies in which the responsibilities and roles are needed to be clearly defined so that the right resources can be utilised wisely [3]. Further, the recovery of essential data and information can be an effective approach to avoid the risks of losing data. In this way, an effective framework can be established to implement necessary information and data.

VII. METHODOLOGY

The data has been collected by conducting a **short survey** among the 13 (thirteen) health care professionals to understand key benefits and ways of implementing cloud in health care. In this process, five close ended questions have been triggered to health care professionals and service providers to determine the most effective solutions to implement cloud in the health care sector. For recording the response of participants, likert scale has been used to depict the broad image of the research. Along with this, **secondary research** has also been followed to identify key pitfalls in implementing cloud in the health care sector by analysing and reviewing broad perspectives of authors. **Inductive research approach** has been applied to develop a firm concept of the topic by using relevant theories. It facilitates identifying relevant solutions and strategies. The major limitation of the research is non-identification of challenges and threats in implementing cloud in the health care sector.

VIII. FINDINGS

A short survey has been conducted to identify the potential strategy to implement cloud by reviewing the response of health care professionals and services providers. The list of questions has been prepared below:

Common problems in implementation

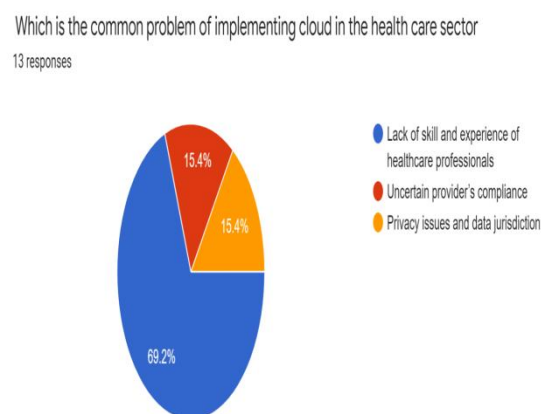


Figure 3: Common problems in implementation

(Source: Created by the researcher)

The above image shows that 69.2% of respondents are agreeing that lack of skill and experience of healthcare professionals are major problems. In arguing with this, 15.4% of participants are agreeing that uncertain provider's compliance is also a major problem in implementing cloud in health care.



Improvement in health care services by implementing cloud

How far are you agreeing that cloud computing improves the health care services in the organization?

13 responses

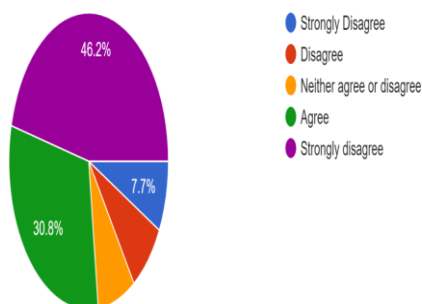


Figure 4: Improvement in health care services by implementing cloud

(Source: Created by the researcher)

The above question helps in understanding the advantage of cloud in health care services in the organisations. Approximately 30.8% of respondents are agreeing that implementation of cloud helps in enhancing the health care services. Similarly, around 46.2% are strongly agreeing that implementation of cloud helps in enhancing patient care services gradually. However, around 7.7% of healthcare professionals strongly disagree with the facts.

Accessibility of medical records and tests of patients

Do you agree that cloud enables allied professionals and nurses to access patients' medical records and tests to provide better treatment facilities?

12 responses

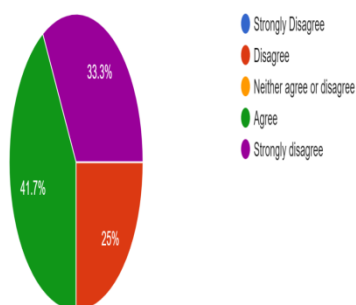


Figure 5: Accessibility of medical records and tests of patients

(Source: Created by the researcher)



The above figure clearly indicates that 41.7% of respondents are agreeing that cloud computing in health care helps allied professionals and personnel's to access medical records of patients from a broader perspective. In arguing this, 25% of respondents are disagreeing. However, the mixed response of the respondents is creating problems in developing an effective strategy to implement cloud.

Benefits of implementing cloud to health care organisations

Which are the most desirable benefits of cloud to health care organizations?

13 responses

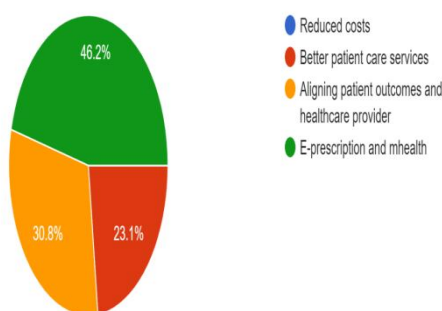


Figure 6: Benefits of implementing cloud to health care organisations

(Source: Created by the researcher)

The above figure helps in understanding the broad benefits of cloud in healthcare organisations. As around 46.2% of respondents are agreeing that cloud helps in developing e-prescription and m-health that allows the patients to access medical reports from any place and any place. In this way, it is easy to be aware of patients. On the contrary, 23.1% of respondents are disagreeing and said cloud helps in improving better patient care services gradually.

Strategies to implement cloud computing in the healthcare sector

Which is the most feasible strategy to implement cloud computing in the healthcare sector?

13 responses

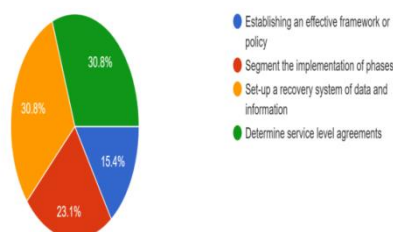


Figure 7: Benefits of implementing cloud to health care organisations

(Source: Created by the researcher)



From the above data and information, around 30.8% of respondents are agreeing that service level agreements need to be formed that include key benefits and facilities. Similarly, 23.1% of respondents state that segmentation of implementation of phases are needed to be established that help in enhancing productivity and feasibility of the business.

IX. CONCLUSION

The study concludes that a systematic approach needs to be applied to implement a cloud in which a back-up of necessary data and information needs to be formed to avoid the risk of data loss. The second step is gradually moving the information and software to another platform such as Amazon AWS and Azure to ensure the work can be operated in a regular manner. On the other hand, the short survey helps in understanding the best way to implement the cloud and ensure it will benefit the healthcare professionals in improving patients care services.

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Appendices

Appendix 1: Questionnaire

Q1: Which is the common problem of implementing cloud in the health care sector?

• Lack of skill and experience of healthcare professionals
• Uncertain provider's compliance
• Privacy issues and data jurisdiction

Q2: How far are you agreeing that cloud computing improves the health care services in the organisation?

• Strongly Disagree
• Disagree
• Neither agree nor disagree
• Agree
• Strongly disagree

Q3: Do you agree that cloud enables allied professionals and nurses to access patients' medical records and tests to provide better treatment facilities?

• Strongly Disagree
• Disagree
• Neither agree nor disagree
• Agree
• Strongly disagree



Q4: Which are the most desirable benefits of cloud to health care organisations?

• Reduced costs
• Better patient care services
• Aligning patient outcomes and healthcare providers
• E-prescription and m-health

Q5: Which is the most feasible strategy to implement cloud computing in the healthcare sector?

• Establishing an effective framework or policy
• Segment the implementation of phases
• Set-up a recovery system of data and information
• Determine service level agreements



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