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Literature Review for Human Computer Interface (HCI) & Cloud Computing

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ABSTRACT

This paper provides the literature review for human computer interface (HCI) and Cloud computing. This review presents the clear theoretical basis for authors, research scholars, technology enthusiasts and readers. Both HCI & Cloud computing is an multidiscipline topic which covers various types of field. The literature review shall be clearly define the need and further improve HCI & Cloud computing review methodology. We have reviewed around 245 literature review published from many sources like IEEE, Springer, IJHCI, IJISRT, JGIM, iJET, IJIM, HCIVR, JVLC, ACM, Harvard University, Chalmers University of Technology. Only 24 most relevant papers were considered for this literature review. This paper literature review summarizes 4 important topic which includes theoretical concepts, contemporary studies, gap analysis and framework used. This research paper examines the gaps and trends for HCI & cloud computing future research developments.

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I. INTRODUCTION

The systematic literature review requires study of many research paper, articles and books to present the clear understanding and theoretical basis defined in papers published all over the world. This paper considers both HCI and cloud computing as a base topic. In 21st century, there is a growing need and increasing the number of publication and contribution in the field of HCI & cloud computing. HCI and cloud computing is a multi-discipline and diverse field applied to any engineering stream. HCI and

cloud computing enables greater human friendly, bigger scalable and multi user collaboration for creating a better plant for everyone. Hence HCI have become increasingly popular in today's internet age. Interface and user friendly experience play a key role for user satisfaction. This paper brings both quantitative and qualitative approaches in literature survey.

The intent of this paper to help many scholars to bring and establish the common understanding on HCI and cloud. One way to build such platform is laying the foundation for effective and literature reviews. Total research paper considered for this review are 245 international papers were chosen over past few decades to till date. Only 24 most relevant papers were considered for this literature review. Many research authors, scientists and technology enthusiasts have contributed in development of HCI and cloud computing till date. A study of literature review enables the researchers to analyze the technological advancements in these particular field, identify the gaps and keep focus on future trends for continuous improvement and developing cutting edge technologies.

In addition, there is a need on other hand for accessing the picked research paper to access and analyze its research paper quality and understand the methodologies to bring the common framework.

A. *Objective*

- Explore HCI & cloud computing improvement.
- Confronts in cloud computing & HCI interfaces.
- Highlight the future trends and contemporary gaps in cloud computing interface

B. *Research Questions*

- Why cloud computing influence the design of HCI interface?
- What are the major challenges in HCI and cloud computing interface?
- Why future belongs to HCI integrated with cloud computing?

II. LITERATURE REVIEW

Literature review of this paper are written based on the study of several research paper listed in references section. surrounds the essential insights about how all HCI and cloud technologies can be applied with better user interface for bringing the digital transformation. The traditional HCI focus on only interfaces like keypad, mouse, desktop monitor and joystick. But due to development in cloud, this have changed the way HCI and cloud computing integrates and collaborates.

As per Bodker argument, contemporary HCI must address not only usability but also collaborations, contexts & cultural differences in cloud. [20]

Cloud computing facilitate the real time integration and collaboration for new technology advancement like synchronous interactions. J. Grudin highlights the necessary requirement for efficient and effective framework that accommodate the customer feedback, real time data processing, centralized share control, and group dynamic. [21]

Security, privacy and IT trust are the most important in both cloud computing and HCI. The interface that shall be clear, transparent and sensitive. HCI researchers promote the interface that should support a better usage of data privacy, sharing, policy agreements and encryptions. H. R. Lipford shows that user often struggle settings with privacy concerns and confidentiality.[22]

Another important topic cloud and HCI is adoptability, context interface and automation. *K. Z. Gajos* states that system are automatically generate user interface models and patters based on user defined requirements and tasks performed. The Artificial intelligence (AI) in cloud computing

and HCI will even empower the capability to resolve any dynamic complex problems [20]

Following are the study models and they are:

A. Theoretical Models Review

HCI focus on interface between computers and human beings. HCI theories addresses for creating the user approachable and responsive digital environment for users. Cloud computing enables the common platform to integrate many digital tools and technologies for enhancing the HCI efficiency.

India's national institute of standards & technology (NIST) provides cloud computing definition as Cloud contains five basic and essential characteristics like demand self-service, pooling of resources, flexible elasticity, access to network and cloud services. These basic foundational principles enables flexibility, cost optimization and scale expansion.

In addition, HCI is a user centered survey emphasizing the famous Fitts' law and Norman's action cycle. Fitts' law states that it predicts the time required to move the target area. Norman's action cycle states that are essential in survey intuitive digital interface.

The interface between HCI and cloud computing enables the users for establishing the efficient infrastructure without any much technology complications.

B. Contemporary studies Review

Contemporary studies highlights the artificial intelligence (AI) powered HCI advancements in cloud center for gesture control, voice commands, customized HCI solutions and proactive automation.

Artificial intelligence (AI) and computational machine learning (ML) with cloud computing make a perfect combinations for advancement in HCI. Many studies finds that AI & ML makes HCI a better bridge for efficient user friendly tools integration.

There are few key enablers for these efficient tool integrations like gesture based user interface, Voice command interface and Adaptive user experience (UX). These helps in creating a platform to suit and support a efficient user interface.

C. *Gap Analysis*

Past and contemporary research paper and articles defined in references mainly focuses on technology usages, scalability, remote access etc., But only few paper highlights on challenges like unresolved latency, real time instant response, application for heterogeneous devices & its software applications, limited data security and integration of global cloud computing for betterment of human kind.

In addition, there are limitation in contemporary research like results of long term sustainable solutions, limited research on culture acceptance technologies and trust building on automated cloud infrastructure for secured storage. Limited integration of core HCI interface with cloud computing.

The cross skilled integrated technologies the needs to be explored further. Very minimal research in brain computer interface which lack the technical expertise and investigation for potential studies on future technologies.

III. METHODOLOGY

A. *Procedures*

This paper make uses of mix methodology approach of qualitative and quantitative method. But a structured literature search shall be conducted using the internet source database. The database includes IEEE, SpringerLink, ACM, Harvard, Elsevier, IJHCI, IJISRT, IJPREMS, UPSEC, JVLC, JGIM, iJET, ijin, IJHCI, ZJP, Google scholar, Wiley publication and many university research papers.

Both qualitative and quantitative data driven study about literature review are taken into account. The following methods are used to evaluate the efficiency:

- Qualitative data driver
  The key qualitative data driver are system learnings, cognitive, satisfactory, user friendly and adoptability.
- Quantitative data driver

The key quantitative data drivers are system usability scale (SUS), Technology acceptance model (TAM) and NASA-TLX to evaluate the human key factors. [20]

Surveys and structured questionnaire are used to acquire user satisfaction, perceived workload and stress levels, providing insights into user experience.

B. *Samples data accessed*

Literature review paper accessed are 245 international papers which includes papers from all around the world. These paper were chosen from several international famous journals published as stated in above journals. Total 245 papers / articles were identified to review from the selected databased. Out of which only 125 papers were selected based on preliminary screening based on relevant abstracts, methodologies and key words. 75 paper were eligible for consideration for this research paper consideration. But only 46 papers were included only to make this paper relevant to research topic based on HCI & cloud computing, methodology relevance, citation impact, peer reviewed, research scope, research objective and citation quality. Only 24 papers were most relevant paper considered for this research paper. Paper eligibility was set purely based on papers / articles research depth on contemporary technological advancements in both HCI and cloud computing.

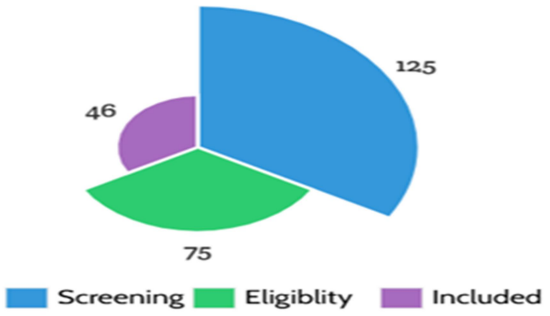

Fig.1 Quantitative Survey Result: Eligible papers

C. *Data Tool and Analysis*

Data analysis methods like thematic analysis which is based on finding research paper / articles on themes. The themes included are accessibility, real time collaboration, privacy, trust, adoptive context interfaces, device centric, technology adaptation, security, interface and emerging trends.

Below are the key factors of HCI and cloud computing. These factors are the common factors considered in most of research papers.

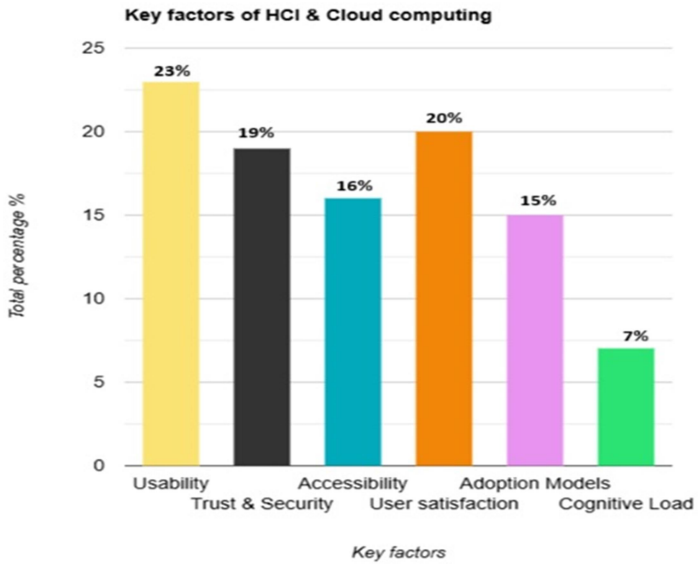

Fig. 2 Key factors of HCI & Cloud computing

D. *Limitations*

- All the English published paper were only considered.
- Non-peer reviewed & Non-DOI papers are not considered
- Rapid technological advancement in AI, HCI and cloud might miss some findings
- Duplicates, similar studies or redundant studies

IV. RESULTS & FINDINGS

This study results illustrate the improved HCI survey for user friendly cloud computing interface for efficient and effective HCI. Also research study showcase the HCI increased user safe adaptation, increased efficiency and wider accessibility.

Qualitative and Quantitative analysis tools used are user friendly testing platforms like Hotjar, User Zoom. AI driven analytics like Open AI, Tensor Flow. Cyber security platform like Metasploit and Kali Linux.

V. DISCUSSION

A. *Conclusion*

Both cloud computing and HCI plays an most important role in technological development.

Quantitative analysis is essential in HCI for objectively evaluating user experiences, validating design changes and supporting continuous improvement of digital products. When integrated with qualitative analysis, will get more efficient and effective HCI.

The integration of multimodal systems and adaptive systems into HCI marks a significant shift towards intelligent, personalized and natural user experience (UX).

B. *Suggestion*

Emergency and Future research trends will be on cutting edge advanced cloud integration with AI, Augmented reality (AR), Total experience (TX) and Advanced user experience (UX) will reshape the near future. Many studies and upcoming articles need to deep drive on implementing more AI driven automation for HCI integrated cloud solutions for better and sustainable technologies usage for better life. An unified approach Generative AI can personalize and enhance human computer interactions in real time.

Most of current research paper mainly focuses on user experience (UX) but future research need to focus on total experience (TX).

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