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Integrating TAM and UTAUT to Assess ICT Adoption for Scientometric and Informetric Practices in Academic Libraries: A Conceptual Framework.

Hemant Kumar Katiyar
Research Scholar, Department of Library & Information Science,
Banasthali Vidyapith, Rajasthan, India- 304022.
Email: Hemanthkatiyar@gmail.com

Dr Rajendra Kumar Gupta
Faculty, Department of Library & Information Science,
Banasthali Vidyapith, Rajasthan, India- 304022.
Email: Rajendrakumar23@yahoo.co.in

Abstract

An integration of Information and Communication Technology (ICT) has redefined research & support operations functions of research and academic libraries. Specifically, the settings of scientometric and informetric practices namely quantitative measurement of research productivity, citations, and scholarly impact increasingly rely on sophisticated ICT tools. Applications of such technologies for research evaluation services by libraries are not well examined in conceptual literature.

This research posits an integrated conceptual model of Technology Acceptance Model (TAM) & Unified Theory of Acceptance and Use of Technology (UTAUT) to investigate factor affecting adoption of ICT in university libraries for scientometric and informetric purposes. As the main forecaster of technology adoption, whose effect is mediated by behavioral intention on actual ICT usage. Demographic factors, organizational support, and technology infrastructure are also posited as moderating factors.

The research makes a contribution to the library and information science (LIS) body of knowledge with its response to key research gaps in the area of technology-enabled research evaluation services. It makes a theoretical contribution by complementing existing adoption models and presents practical implications for library managers in improving ICT-based research support services. The framework also provides opportunities for future empirical testing using survey-based methods and structural equation modeling (SEM).

Keywords: ICT Adoption; E-Resources and Services, Academic Libraries; Scientometrics; Informetrics, TAM, UTAUT, Research Evaluation; Conceptual Framework

1. Introduction

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Use of Information and Communication Technologies (ICT) has transformed research and academic libraries from mere provision of information to active involvement in research management and evaluation. Scientometric and informetric activities, entailing research outputs, citation, and scholarly influence studies, more depend on ICT tools for data collection, analysis, and reporting. The use of ICT in libraries has been extensively debated in areas such as digital resource management and user services, but in facilitating scientometric and informetric activities, it has never been seriously considered.

Existing literature focuses primarily on ICT integration operational issues, providing little information on its impact on research assessment and knowledge measurement management. Moreover, while TAM and UTAUT have been used across different information systems, their combined use within the context of library-based research support services has not been widely explored.

This research attempts to fill such gaps by suggesting a conceptual model synthesizing TAM and UTAUT constructs to investigate determinants of ICT adoption towards academic library scientometric and informetric practices. The model also takes into account mediating effect of behavioral intention and possible moderating demographic effect and organizational variables. The research hence attempts to build improved insights into ICT-facilitated support services to research and into research improvement efforts.

Notwithstanding added integration of ICT into research & academic libraries, there is little conceptual understanding of how they affect scientometric and informetric practice. Current literature mainly examines operational ICT applications like digital resource management and user services, with little focus on how they support research assessment, bibliometric analysis, and data driven decision making. In addition, despite the extensive use of TAM and Unified UTAUT in information system research, their combined use in scientometric and informetric contexts in academic libraries is under-theorized in the literature. Based on it, this study has the following research objectives:

1. To analyze the principal determinants in the use of ICT tools for scientometric and informetric operations in research and academic libraries.

2. To explore the applicability and integration of TAM and UTAUT constructs in explaining ICT adoption behavior in research library settings.

3. To formulate a conceptual model that combines TAM and UTAUT constructs to measure ICT adoption and its impact on scientometric and informetric activities.

4. To determine the mediating influence of behavioral intention between adoption of ICT drivers and actual use of ICT-based scientometric and informetric tools.

5. To explore how demographic characteristics, organizational support, and technological infrastructure mediate ICT adoption and usage patterns.

6. To suggest potential methodological strategies for empirically testing and validating the suggested conceptual framework in the research applications in LIS.

2. Literature Review

1. ICT Adoption in Academic and Research Libraries

Academic and research libraries have increasingly utilized ICT in management of digital collections, e-learning systems, and user-focused services. Their engagement in research evaluation services like scientometrics and informetrics remains relatively underdeveloped compared to others (Tenopir et al., 2011). Recent research has begun highlighting the increased significance of ICT-based bibliometric services. Bello et al. (2021) have identified infrastructural issues and professional competencies in ICT uptake for bibliometric services among university libraries, especially in developing nations. These results imply the need for libraries to establish ICT infrastructure and professionalize human capacity for research evaluation purposes.

2. Scientometric and Informetric Practices in Digital Libraries

Scientometrics and informetrics relate to the quantitative measurement of research productivity, citation, scholarly influence, and research output at the institution. Although previous literature cited their promise (Hirsch, 2005; Bar-Ilan, 2008), digital maturity of these services has only been the focus of research in recent years. Arunachalam and Mishra (2020) described how open science platforms and new-generation citation analysis tools have revolutionized scientometric practices and compelled academic libraries to re-engineer services to include advanced ICT tools in today's research evaluation.

3. The Technology Acceptance Model (TAM) and Its Modern Uses

TAM, initially proposed by Davis (1989), is mostly applied model to explain technology adoption behavior in terms related perceived ease of use and perceived usefulness. Venkatesh and Davis (2022) subsequent revisions through a meta-analysis reaffirming TAM's ongoing utility in contemporary information system environments indicate the inclusion of infrastructural and organizational variables for enhanced predictive validity. Their results strongly support this study's conceptual model in academic library environments.

4. Unified Theory of Acceptance and Use of Technology (UTAUT) and Extensions

UTAUT formulated by Venkatesh et al. (2003) with the core interaction of constructs like performance expectancy, effort expectancy, social influence, and facilitating conditions. A recent published work such as Afolabi et al. (2022) leveraged UTAUT2 to investigate the adoption of ICT that propel research service delivery in the University libraries and found a very strong impact of performance expectancy, effort expectancy and social influence on the behavioral intention. These findings substantiate the incorporations of the UTAUT constructs when probing ICT adoption for scientometric and informetric services.

5. Combining TAM and UTAUT for Scientometric and Informetric Practice

Although both the models TAM and UTAUT have been used as single interpretations in the literature (Aharony, 2010; Khan & Wood, 2015), there has been little research on their combined application in the scientometric and informetric environments. Chen and Xu (2023) have disclosed that the ICT infrastructure and organizational support are the main drivers of the innovation of research-oriented library services. The findings of this research endorse the conceptual framework of the two models integration as indicated by this study.

6. New Bibliometric Metrics and Research Evaluation Technologies

The call for new scientometric indicators and the demand for ICT-based tools for research assessment have been raised by the worldwide digital scholarship trend. To add more demand for sophisticated ICT

tools in library-based research assessment, Bornmann (2021) proposed brand new metrics that are well-suited for the digital era. These projects are grounded in the rationale of the framework which is aimed at research support to prioritize new technological components.

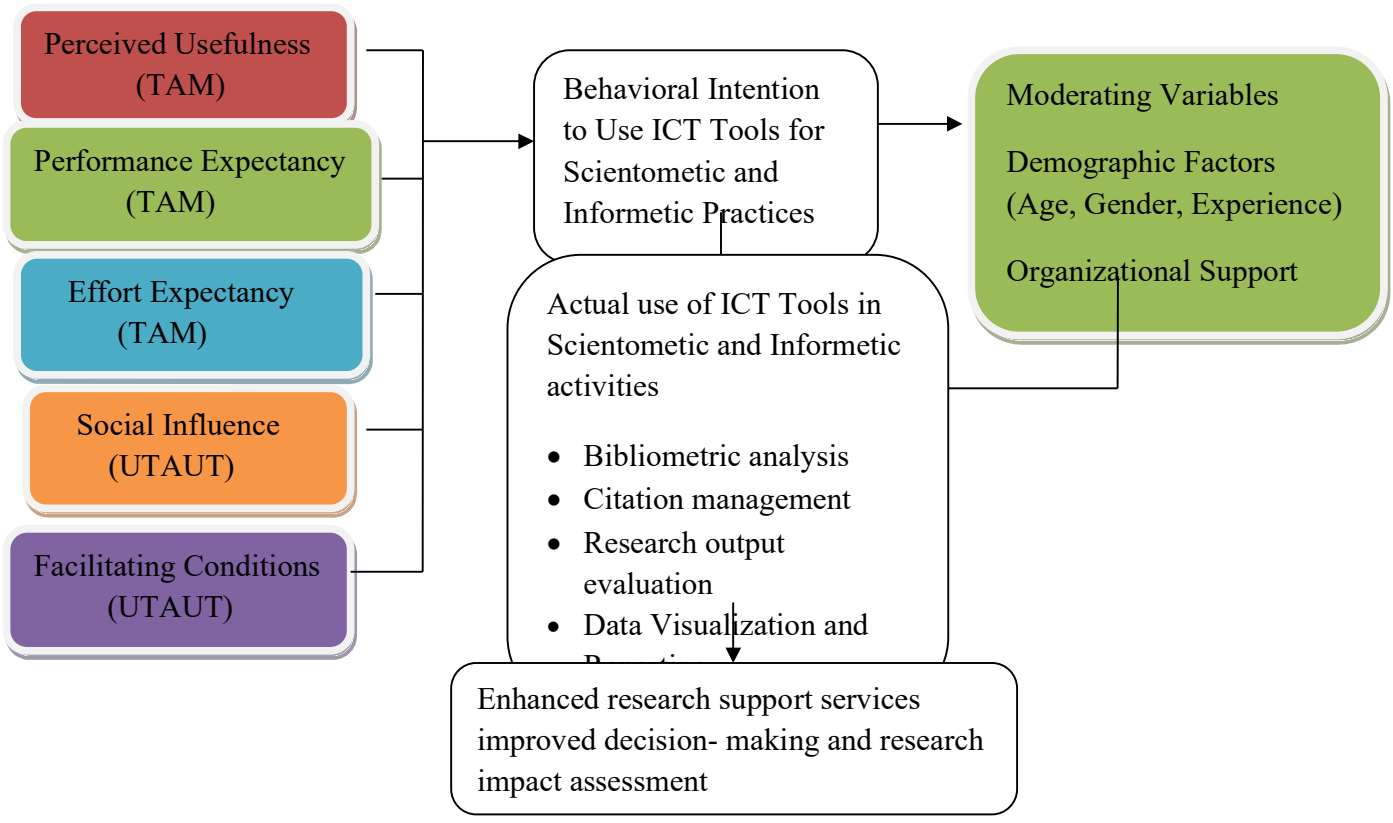
7. Research Gaps Identified

Although there has been a proliferation of research works that have investigated the adoption of ICT in the operationalization of library services, little or no conceptual agreement has been reached on its research contribution to research evaluation services (Cronin & Sugimoto, 2014; Tenopir et al., 2021). The latest pieces of evidence (Venkatesh & Davis, 2022; Bello et al., 2021) imply that models of ICT adoption should be further developed especially with regard to research evaluation and knowledge metrics management in academic libraries.

Problem Statement

In research and academic libraries, ICT adoption is central to informing research assessment, especially in informetric and scientometric research. Despite this, there remains a paucity of integrative, theory-based models of explaining and predicting determinants of the effective adoption of such technologies in research support services. Without a conceptual model, libraries risk losing the chance to maximize ICT innovations that would maximize research productivity, institutional exposure, and data-informed decision-making. To address this, this study postulates a conceptual framework which combines TAM and UTAUT constructs to measure driving factors influencing ICT adoption for scientometric and informetric services in research and academic library contexts.

Conceptual Framework Diagram Structure



3. Research Methodology

This research has a conceptual design which objective is to formulate a theoretical framework that synthesizes constructs of the TAM and UTAUT to investigate determinants of ICT adoption of scientometric and informetric research and academic library practices. Being a conceptual research, it entails extensive review and integration of literatures, models, theories of ICT adoption in libraries, research evaluation tools, and technology acceptance models.

1. Conceptual Synthesis and Literature Analysis

A structured reading of scholarly literature, reports, and theory articles was carried out to determine the most relevant variables and constructs of TAM and UTAUT models that can be used for ICT adoption in library-based research support services. The usage of these models in library and information science (LIS) and other research settings was critically examined to determine their applicability in scientometric and informetric practice.

2. Framework Building

From the constructs identified, namely perceived usefulness, perceived ease of use, effort expectancy, performance expectancy, social influence and facilitating conditions, a conceptual framework was derived. The framework positions behavioral intention to use ICT tools as an intervening variable, which influences actual ICT use in scientometric and informetric services, influencing, in turn, research support services and decision-making outputs.

3. Determination of Mediating and Moderating Variables

In addition to the main variables, the model envisages the inclusion of demographic variables (experience, age, gender), organizational support, and technological infrastructure as potential moderators, which can influence the relations between the determinants of ICT adoption and the actual usage behavior.

4. Research Hypotheses

1. Perceived Usefulness (PU) has significant and positive impact on behavioral intention to utilize ICT tools in scientometric and informetric practices.

2. Perceived ease of use (PEOU) positively influences perceived usefulness and intention to use ICT tools within research libraries.

3. PE has positive impact on behavioral intention to use ICT applications in order to access scientometric and informetric services.

4. Effort expectancy has considerable impact on behavioral intention to utilize ICT-based research support tools.

5. Social influence has a positive effect on behavioral intention to use ICT technologies for scientometric and informetric ends.

6. Facilitating condition (FC) has a positive effect on level of utilization of ICT tools in research libraries.

7. Behavioral intention is a mediator between ICT adoption drivers (PU, PEOU, PE, EE, SI, FC) and usage of ICT tools for scientometric and informetric purposes.

8. Increased usage of ICT applications for informetric and scientometric purposes positively affects improved research support services and enhances decision-making and research impact evaluation.

9. Organizational support, demographic factors (professional experience, gender, age), and technological infrastructure moderate the relation between real ICT use behavior and behavioral intention.

5. Formulation of Testable Hypotheses

According to the framework developed, research hypotheses were developed to direct future empirical studies to test. Such hypotheses challenge the relationships between ICT adoption constructs, behavioral intentions, ICT use, and research service outcomes.

6. Suggested Future Empirical Testing Strategy

Although this conceptual study is not empirical, it is a basis for future empirical testing using quantitative survey-based research in research and academic library settings. The model suggested and the relationships between them can be empirically tested using Structural Equation Model (SEM) approaches for assessing strength and significance of relationships implied.

7. Proposed Conceptual Framework Summary

• Independent Variable : Perceived Usefulness, Perceived Ease of Use, Effort Expectancy, Performance Expectancy, Social Influence and Facilitating Conditions

• Mediating Variable: Behavioral Intention to Use ICT Tools

• Dependent Variable: Actual ICT Tool Usage in Scientometric and Informetric Procedures

• Outcome Variable: Enhanced Research Support and Decision-Making

• Experimental Variables: Demographics, Organizational Support, Technological Infrastructure

8. Rationale for Methodology:

This conceptual framework enables the use of established theories of technology adoption while bridging a gap in their use in research evaluation service in academic libraries. By proposing an empirically testable model, the study advances LIS technology adoption theory development and library-based research support service enhancement.

1. Anticipated Contributions

This theoretical study is expected to contribute through the literature by proposing an integrated model based on TAM and UTAUT constructs to quantify ICT adoption for scientometric and informetric practice in university libraries. The study adds theoretical LIS knowledge by applying existing technology adoption models to a less-researched research evaluation environment. The study also provides a rigorous foundation for follow-up empirical studies and offers library managers clear practical recommendations for ICT-based research support service improvement.

2. Implications for Practice

The proposed model is expected to advise research and academic libraries on how to determine primary determinants affecting adoption of ICT tools for research evaluation service. It encourages the institutions to invest in professional development, improve technological capacity, and instill organizational cultures of data-informed decision-making. The study will also provide a guide on how research metrics services can be incorporated into existing library services to enhance research productivity and institutional reputation.

4. Results / Findings

This theoretical investigation suggests that the above variables, for example, perceived usefulness, perceived ease of use, performance expectancy, effort expectancy, social influence, and facilitating conditions significantly affect library professionals' behavioral intention to use tools of ICT for scientometric & informometric activities

The present conceptual framework illustrates that the behavioral intention has directly impact on employment of ICT devices in bibliometric analysis, citation management, research output evaluation, and data visualization. Also, demographic factors, organizational support, and technological infrastructure might be the agents that mediate these relationships.

The entire structure is led to believe that proper ICT use will not only facilitate the research support services to be more effective, but also allow for data-driven decision-making and, in general, the institutional research visibility will enhance within academic libraries.

5. Discussion

The suggested conceptual framework explains the technology adoption theories in a different way so as to accommodate the characteristics of the newly discovered domain — the use of scientometrics and informetrics in research libraries. The TAM and The UTAUT are mainly used in context of operational library services; however, their combined application in research evaluation services is still an open question.

The present work reveals that the integration of both models unravels more individual, organizational, and technical factors which influence the adoption of ICT. As well, addition of moderating variables allows model to be more adjustable for different academic libraries.

The paper also highlights the role of professional development and organisational infrastructure in effective use of research support technologies.

6. Conclusion and Recommendations

This conceptual research responds to a significant but under-researched problem in library science, use of ICT in Scientometric and informetric research and academic library activities. Although ICT uses in standard library operations have been extensively researched, their use in facilitating research assessment and bibliometric services has been scantily researched. Drawing on constructs from the TAM and UTAUT, this research presents a conceptual model that endeavors to establish determinants of ICT adoption in research support services. The model describes intention to behavior as one of the main

variables that is influenced by adoption factors and actual ICT use and also demographic, organizational, and technological variables are considered as moderating variables.

• To initiate a series of well-equipped and professionally instructed ICT skill training courses is the most desirable mode of skill development in the field of scientometrics and informetrics in academic libraries.

.• Institutions need to enhance technological infrastructure and offer suitable organizational assistance to facilitate successful ICT incorporation in research evaluation services.

• Library management should create a culture of evidence-based research support through the incorporation of ICT-based research metrics services.

• Empirical validation of this model by subsequent research using surveys and structural equation modeling (SEM) in university libraries needs to be undertaken.

The mode disclose that perceived usefulness, perceived ease of use, performance expectancy, effort expectancy, social influence and facilitating condition are major factors that drive library professionals to use ICT tools. Effectively, adoption will lead to enhancing research support services, decision-making, and elevating the visibility of institutional research. The current research is a progression of TAM and UTAUT application in a specialized sector and provides practical implications to library managers and policy-makers. Nevertheless, it is a theoretical one and thus, it should be tested later by empirical methods such as surveys and structural equation modeling across various academic libraries.

6.1. Limitations and Future scope of the study

Given that it is a conceptual study, this study is limited to the creation of theory-based models sans empirical basis. The findings are based on the assumption of synthesis of literature, which can't capture context-specific problems in different library environments. Future studies are proposed to empirically test this model using survey data and structural equation modeling (SEM) methods in different academic library environments. Cross-validation and model refinement are proposed for conducting comparative studies in terms of disciplines and geographical locations.

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