

Review Article

Systematic Review of Models Examining Factors Influencing SaaS Adoption in Higher Education Institutions

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Abstract

Since the early 2000s, Higher Education Institutions (HEIs) have increasingly adopted Software as a Service (SaaS). Despite benefits such as improved collaboration, efficiency, and reduced costs, adoption remains low in many developing regions, particularly Sub-Saharan Africa. Most research emphasizes organizational-level adoption, especially in East Africa, with limited focus on individual user factors. Using the PRISMA protocol, this review analyzed 34 studies from 2015–2025 sourced from Google Scholar, ScienceDirect, SpringerLink, and IEEE. The review examines factors influencing individual SaaS adoption in HEIs and evaluates three key models: TAM, UTAUT, and TRI, highlighting their strengths and limitations. Results show that UTAUT explains up to 70% of behavioral intention variance, compared to 40–60% for TAM. UTAUT expands TAM with additional constructs, while TRI is most effective when integrated with other frameworks. Key variables influencing user adoption were identified, offering insights to enhance individual uptake of cloud technologies in HEIs. Many studies apply TAM and UTAUT without contextual adaptation. Core constructs such as Perceived Usefulness (PU–39%), Perceived Ease of Use (PEU–94%), Facilitating Conditions (FC–50%), Social Influence (SI–44%), and Effort Expectancy (EE–50%) show higher significance than local/ External factors like skill transfer (6%), transition to e-learning (6%), and institutional policies (6%). Security and price emerge as the most prominent contextual factors that are addressed in roughly 39% and 17% of the studies respectively, this highlights their relative influence on technology adoption. Regionally, 80% of studies originate from Asia, reflecting strong academic interest and rapid digital growth. The Americas (20%) show less focus, possibly due to maturity in cloud adoption. Europe (40%) exhibits moderate engagement, while the Middle East/West Asia and Africa (30% each) show emerging research hindered by infrastructure, trust, and capacity challenges, leading to more emphasis on organizational adoption. The review identifies key variables shaping user adoption, offering insights to strengthen individual uptake of cloud technologies in HEIs across the region.

Keywords

Cloud Computing, Software as a Service, Higher Educational Institutions, Individual Level Adoption, Technology Acceptance Model, Technology Readiness Index, UTAUT

1. Introduction

Cloud computing refers to a model for providing computing resources, including servers, storage, databases, net-

working, software, via the internet (“the cloud”) instead of hosting and maintaining them in local data centers. Among

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these, the most commonly utilized are software services, known as Software as a Service (SaaS), which deliver applications online, removing the need for local installation or management. From the 2000s into the 2010s, cloud computing began penetrating the education sector, with higher education institutions increasingly deploying SaaS tools for example, virtual libraries, student information systems, learning management systems, email, and collaborative software. In a move to encourage HEI to adopt Cloud computing, Cloud Providers like IBM and Google Started a number of educational cloud services. Google also established Google Apps for Education for free of charge, which applications availed many services such as Google Mail, Talk, Docs, Video, Sites and Calendar [1, 2]. Despite the many benefits such as Improved Collaboration, creativity and productivity among learners [3], Quik deployments and low costs among others [4] that are present by SaaS to higher educational institutions, there is still a low adoption rate for cloud services [5], especially in developing countries, many studies in Sub Saharan Africa and more specifically in East African have concentrate on organizational level adoption [6-8]. There is a need to explore factors influencing users to adopt technologies like SaaS so as to increase the uptake at both organizational and Individual levels. To be able to explain adoption, theoretical models are used since they help to provide an understanding of factors influencing adoption decisions and technology actual use. This study examines three key theoretical models used to explain individual technology adoption, and offers a critical assessment of those frameworks and the variables that have been used to investigate what drives individual users to adopt SaaS or cloud computing highlighting both their strengths and limitations [9, 10].

2. Methodology

2.1. Review Protocol

A review Protocol was adopted for the study so as to provide a well-defined way of identifying, assessing and analyzing published primary studies in order to investigate a specific research question.

2.2. Research Process Overview

The research question and objectives are defined; Databases used in the study are clearly stated. After the selection of relevant studies, they were filtered and assessed using a set of exclusion and inclusion quality criteria. All the relevant data from the selected studies are extracted, and eventually, the extracted data were synthesized in response to the research

question and objectives.

3. Research Question

What factors influence the adoption of software as a service/ Cloud computing in Higher Educational Institutions among individual users.

3.1. Objectives

- 1) To review the TAM, UTAUT AND TRI frameworks used in the adoption of technologies at individual level.
- 2) To review the frameworks used to explore factors influencing adoption of SaaS/Cloud computing in Higher educational Institutions among individuals.
- 3) Reviewing adoption studies done in Sub Saharan Africa on SaaS.
- 4) To analyze the Variables explored in the process of investigating factors influencing adoption of SaaS at individual level.

3.2. Search Strategy

There are a number of theoretical models used to explore adoption of technology including Cloud computing at individual level, each of the models have strength and weakness that require in-depth analysis, The study used the PRISMA process [11, 12] to guide the process of literature review.

3.2.1. Exclusion Criteria

An exclusion criterion was used to set boundaries of the study for the systematic review.

The exclusion criteria are outlined below:

- 1) Publication is not related with Cloud computing/SaaS Adoption.
- 2) Publication not related to higher educational institutions/Universities.
- 3) Publication is not related to frameworks for adoption of technologies.
- 4) Publication is not written in English.
- 5) Publication that is a duplicate or already retrieved from another database, Full text of the publication is not available.
- 6) Publication has been published before 2015.

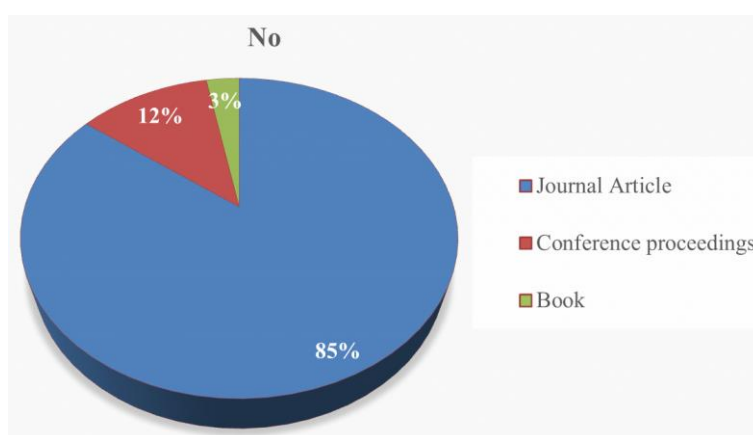
3.2.2. Information Sources

Studies were searched from four different databases and a string of words relevant to the study were used to filter the databases;

Table 1. Databases and search strings.

Database	Search String for each Database
Google scholar	“SaaS/cloud computing Adoption” AND “Higher Educational Institutions” “SaaS/Cloud computing adoption using UTAUT” “SaaS/Cloud computing adoption using TAM”
Science Direct	[“SaaS/Cloud computing Adoption” AND “Higher Educational Institutions”]
Stringer link	“Cloud Computing Adoption” AND “Higher Educational Institutions”
IEEE	“Cloud Computing” “Adoption in Higher Educational Institutions”

3.2.3. Type of Source

**Figure 1.** Type of source.

3.2.4. Study Selection and Quality Assessment

The study only picked out papers from 2015 to 2025, articles were excluded based on titles and abstracts. This study developed an assessment criterion, to ensure that the study accurately covered what was required.

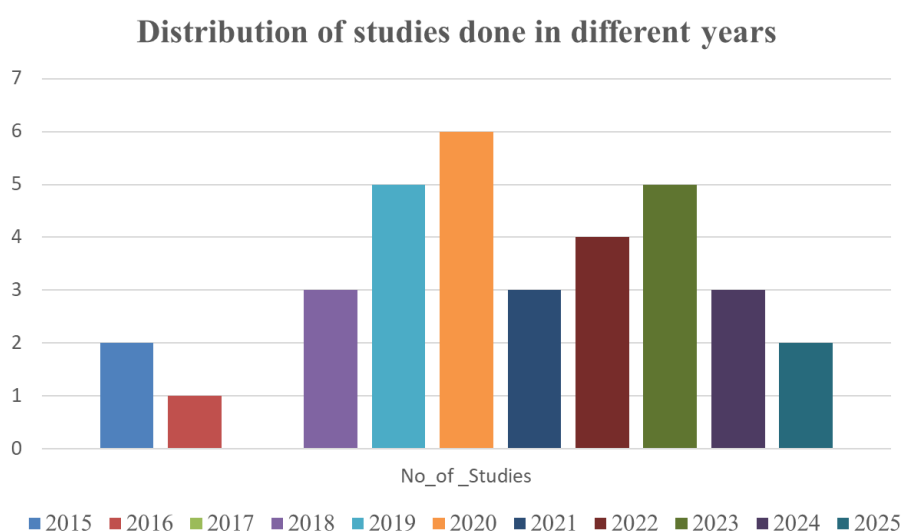
**Figure 2.** Distribution of studies per year.

Table 2. Assessment.

Assessment Questions	
Q1	Does the title of the paper clarify the idea of the research
Q2	Does the Abstract indicate the paper as a review/ Comparative analysis/Survey of SaaS adoption in Higher educational institutions
Q3	Does the Writer follow the systematic/Standard arrangement of the research paper?
Q4	Does the paper specify the SaaS adoption in HEIs?
Q5	Does the paper review multiple Adoption frameworks for SaaS?
Q6	Does the paper provide a review of Adoption frameworks?

3.2.5. Selection Process

Flow Chart showing the selection process of the study.

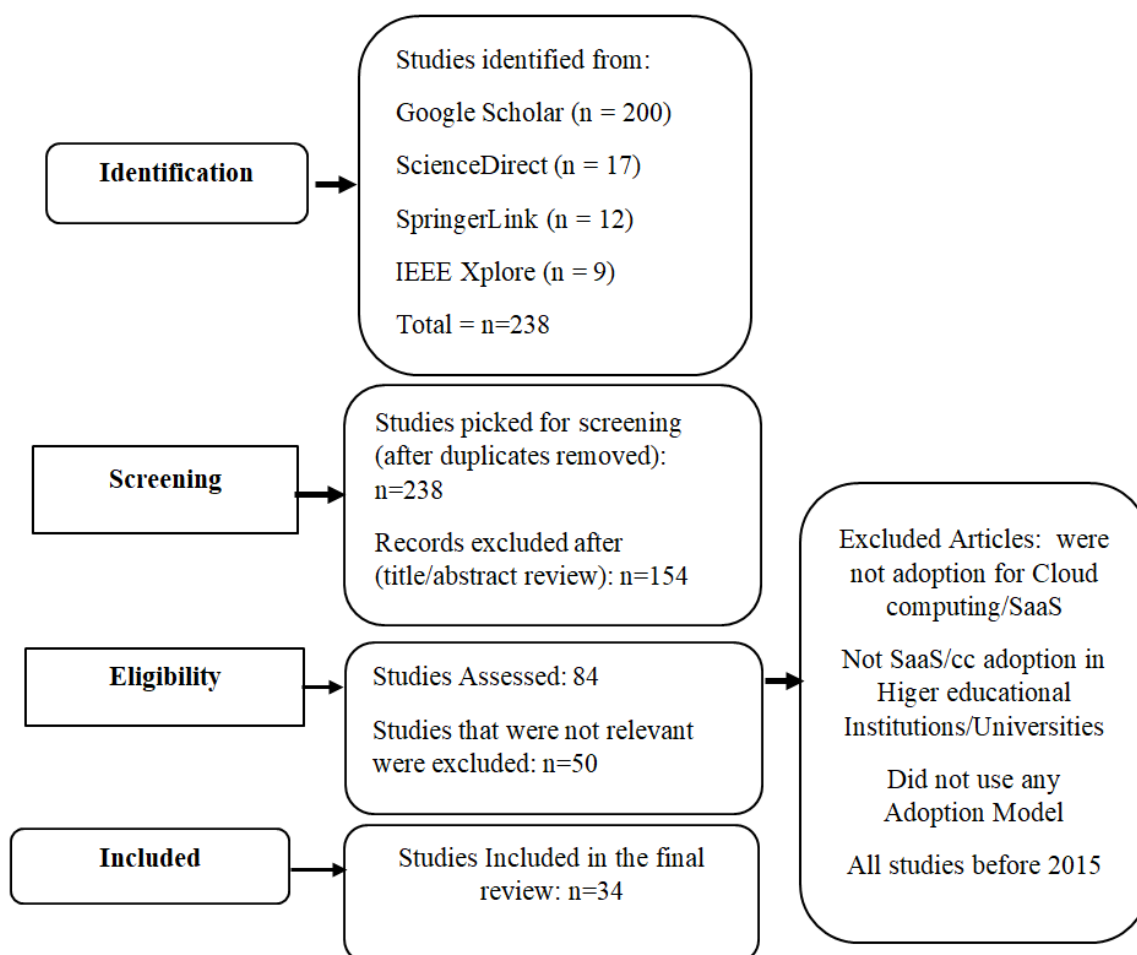


Figure 3. Flow diagram of the study using PRISMA [13] Adopted from [14].

3.2.6. Variables Extracted for Analysis

The review included studies published between 2015 and 2025, with data from each year extracted and analyzed. The majority of the reviewed materials were journal articles, conference proceedings, and books, which were examined to determine which types were most prevalent. In the results section, studies from various regions were also analyzed.

Table 3. *Extracted Variables.*

Item	Data Extracted
Years	Studies between 2015 to 2025
Type of Source	Journal, Conference Processing, books
Region	Different Countries/Continents
Variables	Variables were extracted in order to analyse how frequently they occurred.

3.2.7. Data Extraction and Analysis

All the data was extracted from each paper and entered into Excel for analysis.

3.3. Results from Objectives

This section presents a detailed analysis and discussion of the findings from all study objectives, highlighting existing gaps and offering recommendations for future research.

3.4. Objective 1: Review of TAM, UTAUT, and TRI Frameworks for User SaaS Adoption

This objective discusses theories and constructs of three Models commonly adopted by studies exploring technology adoption among individual users; they include Technology Readiness Index (TRI), Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology (UTAUT).

3.4.1. Technology Readiness Index (TRI)

The Technology Readiness Index (TRI), developed by Parasuraman in 2000, is a framework designed to gauge how mentally prepared individuals are to embrace new technologies. Instead of focusing on what people *can* do, TRI examines how they *feel* that is their mindset about using technology. It comprises four dimensions: optimism (a belief that technology brings efficiency, control, and flexibility); innovativeness (a willingness to explore new tech first and serve as a thought leader); discomfort (feeling overwhelmed by technology or lacking control); and insecurity (distrust in technology's reliability and concerns about privacy or negative outcomes) [15].

Like TAM and UTAUT, TRI looks largely at technology adoption at the individual level. However, it does not typically include external or environmental factors such as organizational culture, infrastructure, or social influence, nor does it always address domain-specific issues like regulation or risk tolerance. Because of its narrower scope, many studies combine TRI with TAM or UTAUT to improve its predictive power, [16] combined TRI and TAM in a cloud computing

adoption study [15].

3.4.2. Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM), is a framework used to explain and predict the adoption of various technologies, it was introduced by Davis in 1986, it was adopted from the Theory of Reasoned Action (TRA), however it provides more accurate measures compared to (TRA) [17]. It identifies two main factors: perceived usefulness (PU) (a belief that technology improves job performance) The second construct in the framework is perceived ease of use (PEOU), the belief that it is easy to use [18, 19].

TAM has proved to be simple and effective for adoption studies across sectors like healthcare [17], education, and business hence contributing to its popularity. However, its focus on individual perceptions limits its ability to account for broader contextual and organizational influences. TAM also assumes rational decision-making and may overlook other important adoption factors in complex settings [18, 19].

3.4.3. The Unified Theory of Acceptance and Use of Technology (UTAUT)

The Unified Theory of Acceptance and Use of Technology (UTAUT), developed by Venkatesh et al. (2003), expands on TAM by including additional variables. It identifies four main factors influencing users' intention to adopt technology: performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating conditions (FC). PE is the belief that technology will improve job performance, while EE reflects how easy the technology is to use. SI refers to the perceived pressure from others to use the technology, and FC involves the availability of resources and support. UTAUT has been applied in diverse fields including cloud computing adoption, e-learning adoptions among others [20], UTAUT's comprehensive nature makes it effective across various individual, organizational, and environmental contexts but largely used for individual adoption studies [18]. TAM and UTAUT tend to overlook critical factors or domain specific challenges such as cultural differences, trust, clinical decision-making, and regulatory constraints. Addressing these gaps is essential for a more complete understanding of technology adoption in healthcare and other domains [18].

3.5. Objective 2: To Review the Frameworks That Have Been Used to Explore Factors Influencing Adoption of SaaS/Cloud Computing in Higher Educational Institutions Among Individuals

Table 4. Frameworks for SaaS/Cloud computing Adoption.

Reference / Study	Model/Level of adoption	Variables	Setting	Limitation
[21]	UTAUT2- Researcher integrated 6 different Variables	E-trust, Skill transferability, social influence, facilitating conditions, Techno-Philia, Complexity, Perceived Risk, Technophobia, Behavioural Intention	Faculty members and Students in Bangladesh Public and Private universities	Does not breakdown vital facilitating conditions like internet connectivity (coverage and cost)
[16]	TRI and TAM- Researcher integrates 4 different variables into the original TRI and TAM Models	Perceived Usefulness (PU) and Perceived Ease of Use (PE) (Optimism-Attitude) and Inventiveness-Organizational construct), (Discomfort - anxiety and uneasiness and Insecurity-	Individuals from Malaysian HEI	Limited external factors investigated. Does not take into consideration any Facilitating conditions
[4]	TAM	PU, PEU-Information, cultural difference: compares turkey and Malaysia	Students in Turkey and Malaysia	Few variables to provide a wholistic view of adoption
[16]	TAM	PU, PEU-Security and Learning Environment (shift from face to face)	Students, lecturers, and staff at HEI in Malaysia	Critical External factors are not included in the study
(Sayginer, 2023)	UTAUT	EE, PE, SI, FC, Behavioural intention (BI), and Use behaviour (UB),	students from HEI schools in the district of Izmir, Turkey	Did no introduce any specific/External
[23]	UTAUT	EE, SI, Facilitating conditions, trust and attitude-No moderating variables	Undergraduates- Indian educational institutes.	Need to contextual by identifying more variables.
[24]	UTAUT	BI and attitudes, Information management practices	Undergraduate students in HEI in Turkey	Limited variables.
[20]	UTAUT	PE, EE, SI, FC, Moderator-Work type	Jordanian Universities	Proposes a study on more FC Like Supportive Policies, Motivations and Trainings
[25]	UTAUT2	PE, EE, SI, FC, Hedonic motivation, Price value, Habit, Behaviour intention	Vietnamese Universities	No demographic variables included in the study like age, gender and locations
[26]	UTAUT	PE, EE, SI, FC	Ghana Universities	Specific to only Video Conferencing applications. SaaS applications, no modifications of framework.
[27]	TAM 3	PU, PEU, Subjective Norms, Image, Perceived enjoyment, Job Relevance, Output Quality and Result Demonstrability, Computer Playfulness, Computer Self Efficacy and Perceived External Control, Computer Anxiety, BI.	Turkey and UK	Examined a number of variables but with limited variables focusing on facilitating conditions
[28]	TAM	PE, EE, SI, FC, Hedonic motivation, Habit, Content of platforms	India	Limited variables SaaS application was only tailored to MOOC
[29]	TAM	Attitude, Ease of use, intention to use, SI, PE, Context of use, Infrastructure Perceived utility, of process, scalability, Availability of information, Price	Colombia	Well contextualized constructs but facilitating conditions are not elaborated.
[30]	TAM	BI, PEU, Perceived usefulness, Reliability,	Oman	Very few external variables

Reference / Study	Model/Level of adoption	Variables	Setting	Limitation
		Responsiveness		in cooperated into the framework
[31]	TAM	PEU, PU, Perceived Security, Perceived ease of access, perceived cost of usage.	Thailand	Very few external variables in cooperated into the framework
[32]	UTAUT	PE, Attitude towards using technology, EE, Anxiety, FC, BI, Self efficacy	South Africa	Facilitating conditions are not decomposed
[33]	TAM	PU, PEOU, BI, External Variable: Security Concerns, Institutional Support, Financial support	Nigeria	Study done only on undergraduates leaving out important users like the instructors
[34]	TAM	PE, EE, SI, FC, Trust in Technology, Attitude, Continued Intention	India	Limited decomposition of Facilitating conditions
[35]	TAM	perceived usefulness and perceived ease of use	US	Limited External Variables

3.5.1. Discussions

The Unified Theory of Acceptance and Use of Technology (UTAUT) explains up to 70% of the variance in behavioral intention, offering a more comprehensive framework compared to the Technology Acceptance Model (TAM), which accounts for approximately 40–60%. UTAUT builds upon TAM by incorporating a broader set of constructs that enhance its explanatory power [36]. These include Performance Expectancy, which aligns with TAM's concept of Perceived Usefulness; Effort Expectancy, like Perceived Ease of Use; Social Influence, which captures the impact of peers, management, and institutional culture; an extension beyond TAM's original scope; and Facilitating Conditions, referring to the availability of infrastructure and support, also an extension of TAM. Together, these constructs provide a more robust understanding of technology adoption behaviors in organizational settings.

3.5.2. Most Common Constructs / Variables Extracted from Table 4

Table 5. Common Constructs/Variables.

Construct/Variable	No of studies	Frequency of Construct use
PU	7	39%
PEU	17	94%
FC	9	50%
SI	8	44%

Construct/Variable	No of studies	Frequency of Construct use
BI	7	39%
Attitude	6	33%
EE	9	50%
Security	7	39%
Institutional Policies	1	6%
Shift to E-learning	1	6%
Price	3	17%
Content	1	6%
Skill Transferability	1	6%

Many studies based on the UTAUT and TAM framework tend to use its original constructs without adapting them to the specific local context. As shown in Table 5, constructs such as PU-39%, PEU-94%, FC-50%, SI-44%, and EE-50% are rated significantly higher than context-specific variables like skill transfer=6%, transition to e-learning=6%, and institutional policies=6%. Security and Price stand out as the most influential contextual/ External factor with (39%) and (17%) respectively.

This can lead to very broad categories that fail to deliver precise insights. Emotional responses such as fear, anxiety, or resistance are often rolled into a generic “attitude” construct and not examined separately. Some exceptions do isolate emotional variables: for example, [16] splits attitude into “Optimism,” while [21] distinguishes between “Technophilia” and “Technophobia” underscoring how useful it can be to unpack these elements.

Similarly, “facilitating conditions” is often treated as a single block, even though in higher education SaaS adoption depends on many specific factors: funding, reliable internet access, pricing/affordability, training, technical support, etc. Lumping them together obscures which are the biggest bottlenecks in each institution. Because institutions differ (some may suffer from poor infrastructure, others from weak policy or low technical expertise), breaking down this construct leads to a more context-sensitive and useful model.

In a few studies, constructs are decomposed, and external contextual variables relevant to each setting are included. However, many studies continue to group too many constructs together, making it hard to know what really influences adoption. For example, when variables like internet access, technical support, infrastructure, policies, and cost are all subsumed under “facilitating conditions,” it becomes impossible to tell which is most limiting, cost? or network reliability? Without such decomposition, policy makers and institutions can’t prioritize interventions effectively. If external variables

are omitted, models tend to be under-specified, weaker in explanatory power, possibly biased; narrow constructs also reduce generalizability.

Another limitation is focusing on single SaaS applications (for example video conferencing or MOOCs). These applications may have different adoption determinants compared to broader tools (cloud storage, collaboration, full Learning Management Systems). What matters for real-time bandwidth, trust, latency etc. in video conferencing may be less relevant for other tools.

Additionally, many studies treat cloud services broadly rather than distinguishing among types (SaaS, PaaS, IaaS), which mixes up insight into what actually drives user adoption for specific services.

Also, many studies neglect demographic or contextual moderators (gender, age, experience, location, culture, without including them, studies cannot capture the heterogeneity of adoption determinants for example differences between rural/urban users, younger/older, or instructors vs. students.

3.5.3. Regional Distribution of Studies on Cloud Computing Adoption in Higher Educational Institutions at Individual Levels

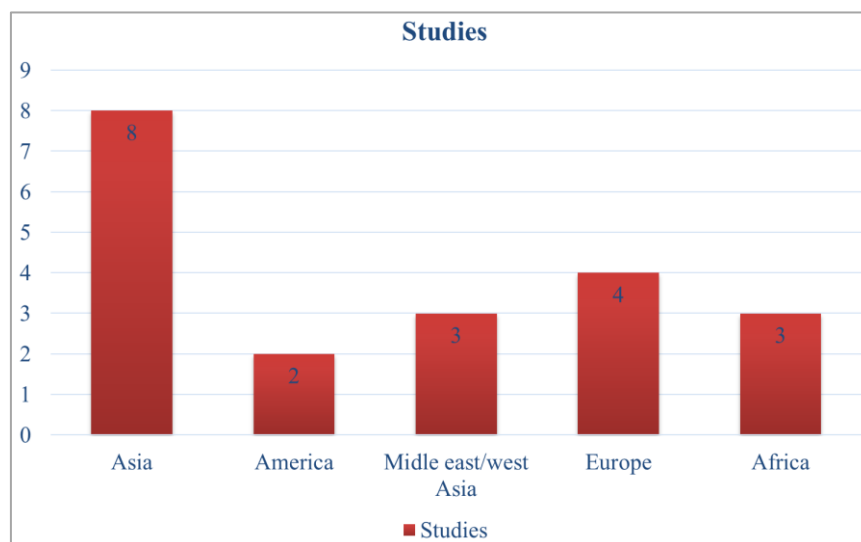


Figure 4. Regional distribution of studies.

Regional distributions indicate that Asia and Europe have carried out more studies for individual level adoption of Cloud computing. Research on adoption at the individual level remains comparatively scarce in African countries. In East Africa in particular, most studies focus on organisational-level adoption, especially within higher education institutions, rather than on individual users.

Statistical Analysis of Regional distribution of studies

Asia accounts for the majority of studies (80%), reflecting strong interest driven by its large academic population, rapid digital transformation, and substantial infrastructure investments. In contrast, America contributes only 20% of the

research, which may indicate that institutions in the region have already reached a mature stage of cloud adoption, thereby reducing the need for exploratory studies. Europe shows moderate research activity at 40%, suggesting a balanced approach to both implementation and investigation. Meanwhile, the Middle East/West Asia and Africa each represent 30% of the research output. Despite this presence, institutions in these regions face notable challenges such as limited infrastructure, trust concerns, and capacity constraints. Consequently, research efforts often focus on strategies to promote organizational uptake to overcome adoption barriers.

3.6. Objective 3: Reviewing Adoption Studies Done in Sub Saharan Africa on SaaS/Cloud Computing

Table 6. SaaS computing in Sub Saharan Africa.

Study	Level/Enterprise	Model Used	Variables	Country
[37]	Organizational Level Higher Educational Institutions	TOE	Cost saving, Relative advantage, Complexity, Security, Scalability, Time saving, dependent on external providers, technological readiness or existing culture, size of HEI, HE top Management, Cloud professional availability, SLA of providers, ministry of higher education support, pressure from competitor, promotion and marketing effort of providers, trainings, incentive availability in the environment	Somalia
[38]	Organizational level-HEI	TOE	Technological, organizational and environmental factors	Kenya
[39]	Organizational Level-HEI	TOE	Relative advantage, Complexity, compatibility, Competition, Pressure from partners, regulatory compliance Management support, Organization size, technology readiness	Malawi
[40]	Organizational Level -HEI Libraries.	TOE	Staff skills, storage, Bandwidth, internet access, security and privacy, Funds for the project and intuitional policies	Kenya
[41]	Higher education	Components of TOE	Top Management support Technical support User preparedness	Kenya
[42]	Organizational Level Higher Educational Institutions	TOE With moderating Variables	Technological: Usability, Reliability, Security Organizational Readiness: ICT infrastructure, Cost Effectiveness, Top Management Organizational Environment: Institutional Pressure, Government Regulation, Vendor Support Moderating Variables: Quality of service, Trust, Experience	Kenya
[43]	Organizational Level	TOE	Technological Factors, organizational Factors, Environmental, Social cultural factors	Ethiopia

3.6.1. Discussion

In the Context of sub-Saharan Africa, in Particular, East African, a comparison from Table 4 and Table 5 reveals that approximately 70% of the studies focus on adoption at the organizational level, while only 30% of the studies examine adoption at individual level. This pattern suggests that research in the region tends to emphasis how higher educational institutions as whole organizations adopt SaaS/Cloud computing, rather than how individual staff and students adopt it.

3.6.2. Adoption in East Africa

In East Africa, much of the research emphasizes adoption at the institutional, organizational, or infrastructure levels, often using the TOE (Technology-Organization-Environment) framework. Institutional adoption (for instance in universities)

has driven technology uptake like cloud computing, for example to facilitate online learning, after COVID-19 many institutions have made large investments in ICTs (including cloud computing), building up capacity in policy, infrastructure, regulation, leadership, and financing. Despite all this, user-adoption remains relatively low. It is therefore crucial that institutions first identify what influences individuals' adoption, even as they continue investing in technology or setting up Organizational implementation of technologies. Boosting individual adoption will greatly increase actual usage of these technologies.

3.7. Objective 4: Analysis of Variables Affecting Individual SaaS Adoption Behavior

The core internal variables from the TAM and UTAUT frameworks consistently appear across most of the studies,

since these models are widely recognized for explaining IT/IS adoption across domains. The insights presented here are drawn from [Table 4](#) of the study.

Table 7. Variables.

Variable	Occurrence from Reviewed papers	Description
Perceived Usefulness (PU)	39%	Very frequent. Almost every adoption that explores user adoption includes PU.
Perceived Ease of Use (PEU) / Effort Expectancy (EE)	94% 50%	Very common and it demonstrates Ease, simplicity, how much effort is required in using a technology.
Facilitating Conditions (FC)	50%	Frequently used, often as an organizational / environmental factor or external condition.
Social Influence / Subjective Norms / Social Pressure (SI / SN)	44%	Appears many times; especially in UTAUT / TAM. Explains how much friends/workmates can influence one to use a technology.
Performance Expectancy (PE)	39%	Commonly used in UTAUT Model
behavioural Intention (BI)	39%	It is a dependent or intermediary variable in many models.
Attitude	33%	in a few studies the variable is decomposed but for most studies it a general attitude toward adoption.

3.7.1. External Variables

Beyond the main constructs, researchers incorporate additional variables to tailor foundational frameworks to specific contexts, deconstructing or adding certain constructs to obtain deeper insights relevant to those settings.

Table 8. External Variables.

Variable	Description
Perceived Risk or Security	Very common variables in most studies.
Price / Financial factors, Compatibility, Complexity	These are also predominant variables added by many researchers, these variables
Least frequently used variables across the studies	
Technophobia, Techno-philia	These variables are split from the attitude construct, very few studies decompose the construct
E-trust	Used in few studies.
Skill Transferability	This variable is a decomposition from facilitating conditions and is further sub divide from variable training, according to the research, training may not be sufficient, the ability to transfer skills from training will facilitate adoption
Cultural difference	Used in comparative studies like Turkey vs Malaysia.
Information management	Some studies consider information management practices.
Moderating variables like work type, (age, gender, experience, rural/urban etc.)	From the literature provided many studies omit or under-use these, though UTAUT and others recommend them.
Hedonic motivation, habit	Used mostly in the UTAUT 2
Content of platforms	Specific SaaS applications like You Tube, MOOC and others
Discomfort, anxiety, uneasiness, insecurity	These are under the broader construct of Attitude and part of TRI Framework constructs

Variable	Description
Environment (shift from face to face)	Only a single study has explored this variable, despite the fact that numerous institutions worldwide and in Uganda have undergone a significant shift toward blended learning.

3.7.2. Discussion

In addition to leveraging internal variables from existing frameworks, researchers must also tailor and break down these variables to align with their specific contexts. This contextualization allows for more clear insights into research outcomes; splitting variables offers deeper understanding of the specific factors influencing SaaS adoption.

3.7.3. Conclusion

This study critically examined how well the TAM, UTAUT, and TRI models account for individual - level technology adoption, especially in the context of SaaS/cloud computing in higher education across sub-Saharan and East Africa. While these models deliver useful constructs such as perceived usefulness, ease of use, performance expectancy, and user readiness, they fall short in several ways. Originating mostly in Western settings, they assume rational decision making and understate crucial influences present in more complex or regulated environments.

In East Africa, research has largely focused on organizational or institutional levels, deploying frameworks such as TOE. Following disruptions such as COVID-19, institutions made large ICT investments improving policies, infrastructure, leadership, regulation, and financing and organizational adoption has indeed increased. But such top-level changes will not automatically translate into individual adoption unless user perceptions or domain-specific constraints are addressed.

3.8. Discussion and Recommendations

This section presents an in-depth discussion of the TAM, UTAUT, and TRI frameworks applied to individual-level technology adoption. The insights derived are expected to support the development of modified models that address the specific factors influencing the adoption of SaaS in higher education institutions, thereby providing guidance for educators.

3.8.1. Objective 1: Review of TAM, UTAUT, and TRI Frameworks for User SaaS Adoption

Theoretical models like TAM, UTAUT AND TRI have inherent limitations, most of the models were developed in western countries, making them contextually limited for the developing world, TAM assumes that users make rational calculations when adopting technology, which can cause it to

overlook additional adoption drivers in complex environments [18, 19]. Both TAM and UTAUT tend to ignore domain-specific or contextual challenges such as cultural differences, trust, clinical judgment, and regulatory restrictions. The models often neglect issues specific to the domain, including regulation or individuals' tolerance for risk.

3.8.2. Recommendations from Objective 1

Future research on SaaS adoption in higher education should be designed to address context-specific needs related to particular applications and environments, in order to better identify the factors that influence individual adoption.

3.8.3. Objective 2: Frameworks Used to Examine Individual SaaS Adoption Factors in HEI

Although adoption studies in the Middle East/West Asia and Africa are present (each accounting for around 30%), the overall rate remains modest. This suggests that while some research activity exists, actual adoption of technologies such as SaaS continues to be hindered by issues like infrastructural deficits, trust-concerns and capacity limitations in these regions. As a result, many studies emphasize how to encourage uptake at the organizational level, yet individual-level drivers still pose a significant barrier to technology adoption.

Several studies have combined existing frameworks with other theoretical models, while in some cases, researchers have developed new frameworks that incorporate a few external variables. Although internal constructs such as Performance Expectancy (PE), Effort Expectancy (EE), Perceived Ease of Use (PEU), Facilitating Conditions (FC), and Attitudes are significant, they are not sufficient on their own. External contextual factors also have substantial influence; when these are excluded, models often become underspecified, exhibit weaker explanatory power, and may yield biased results. Furthermore, narrowly defined constructs can limit generalizability.

Many studies approached cloud computing services broadly, encompassing Platform as a Service (PaaS), Infrastructure as a Service (IaaS), and Software as a Service (SaaS), while others focused specifically on certain SaaS applications.

3.8.4. Recommendations from Objective 2

- 1) It is important to conduct more adoption studies at the individual level in order to understand personal-level influences.
- 2) Future researchers should first study their settings so as

to in cooperate variables that will provide sufficient evidence for factors influencing user adoption of technologies within a specific domain.

- 3) Different applications have different factors that influence whether people adopt them, for example, video conferencing tools will be heavily affected by things like real-time bandwidth, latency, and trust, whereas those concerns may be far less relevant for, say, file storage or collaboration tools.
- 4) Since SaaS solutions are used directly by end users more than many other cloud services, the drivers of their adoption tend to differ. Because of this, it makes sense to study each type of service separately to understand which factors matter most for that particular kind of tool.

3.8.5. Objectives 3: Studies Done in Sub Saharan Regions on SaaS Computing Adoption

In East Africa, much of the previous research has focused on adoption of technology at the organizational or institutional level using frameworks like TOE (Technology-Organization-Environment). Institutional adoption (for example in universities) has driven uptake of tools such as cloud computing. After COVID-19 many institutions have made major ICT investments, strengthening policy, infrastructure, regulations, leadership, and financing.

3.8.6. Recommendations from Objectives 3

It is essential that institutions first ascertain what shapes individuals' willingness to adopt technology as they continue investing in infrastructure or implementing technologies organization-wide, so that their efforts and resources are not wasted.

3.8.7. Objective 4: Analysis of Variables Affecting Individual SaaS Adoption Behavior

The most frequently investigated variables in cloud computing adoption studies were largely original constructs from established models. According to statistics, constructs such as perceived usefulness (PU) appeared in 39% of studies, perceived ease of use (PEOU) in 94%, facilitating conditions (FC) in 50%, social influence (SI) in 44%, behavioral intention (BI) in 39%, attitude in 33%, and effort expectancy (EE) in 50%. Among external constructs, security and Price stand out as the most influential contextual/ External factor with (39%) and (17%) respectively, while all other variables were considered in fewer than 10% of the studies [44]. This suggests that the adoption of cloud computing may also be driven by additional contextual variables that fall outside the classic blocks of models like the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT). Examples include infrastructure, training, technical support, cost, financial assistance, institutional policies or regulations, vendor support, Internet access, and connec-

tion reliability. Breaking down these broader categories such as facilitating or environmental conditions into country or application-specific factors can yield a deeper understanding of what specifically influences SaaS adoption.

3.8.8. Recommendations from Objective 4

In addition to leveraging internal variables from existing frameworks, researchers must also tailor and break down these variables to align with their specific contexts.

Abbreviations

SaaS	Software as a Service
PaaS	Platform as a Service
IaaS	Infrastructure as a Service
UTAUT	Unified Theory of Acceptance and Use of Technology
UTAUT2	Unified Theory of Acceptance and Use of Technology 2
TAM	Technology Acceptance Model
TRI	Technology Readiness Index
TOE	Technology Organization Environment
MOOC	Massive Open Online Course
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
PE	Performance Expectancy
EE	Effort Expectancy
SI	Social Influence
FC	Facilitating Conditions
PU	Perceived Usefulness
PEOU	Perceived Ease of Use
BI	Behavioral Intention
ICTs	Information and Communication Technologies
E-Trust	Electronic Trust
UB	User Behavior
HEI	Higher Educational Institutions

Conflicts of Interest

The authors declare that they have no financial, commercial, or other relationships that could be perceived as a potential conflict of interest with respect to the research, authorship, and/or publication of this article.

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