International Journal of Computer Information Systems and Industrial Management Applications
ISSN 2150-7988 Volume 18(8s) 2026 pp. 52-70
https://doi.org/10.70917/ijcisim-2026-3218
Article

Beyond Acceptance: Introducing Linguistic-Cognitive Accessibility Friction in the DURA Model of Digital Resource Utilisation in Indian Higher Education

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Abstract: Indian higher education has acquired a large digital library footprint over the past decade. The National Digital Library of India reports over 8.25 crore content items in more than 70 languages, with an NDLI Club network covering more than 5,800 institutions and roughly 1.7 million registered members (NDLI, 2024); e-ShodhSindhu reports access to over 10,000 full-text journals and 164,300 e-books for member institutions (INFLIBNET, 2024); and Shodhganga had received theses from 739 universities by December 2023 (INFLIBNET, 2023). These figures are provider self-reports of registrations and holdings, and are treated in this paper as indicators of the scale of provision only, not as evidence of use. The empirical record from Indian universities tells a more uneven story: studies repeatedly find that quality of access, infrastructure, and language barriers depress actual usage well below what the headline numbers might suggest (Bhatt & Rana, 2011; Lwoga, 2014; Siwach & Malik, 2019; Pandey, 2024). The dominant frameworks used to explain technology use, the Technology Acceptance Model (Davis, 1989), the Unified Theory of Acceptance and Use of Technology 2 (Venkatesh, Thong, & Xu, 2012), and the DeLone–McLean Information Systems Success Model (DeLone & McLean, 2003), were built mainly in well-resourced, English-medium settings. This paper is offered explicitly as a conceptual, theory-building contribution (MacInnis, 2011; Jaakkola, 2020) and makes two contributions. The first is the Digital Usage and Resource Accessibility (DURA) Model, built through a narrative integrative review (Whittemore & Knafl, 2005) of the literature on digital resource utilisation in Indian higher education, with supporting evidence from comparable contexts. DURA has four interdependent components: Digital Infrastructure Accessibility (D), User Digital Competency (U), Resource Relevance and Quality (R), and Awareness and Motivational Factors (A). The second contribution is a new construct, Linguistic-Cognitive Accessibility Friction (LCAF), grounded in Cognitive Load Theory (Sweller, 2011) and accompanied by a proposed measurement strategy that adapts established cognitive-load instruments (Paas, Tuovinen, Tabbers, & Van Gerven, 2003; Hart & Staveland, 1988). LCAF captures the extra cognitive cost a non-English-medium learner pays when working with predominantly English-language scholarly content, and it is theorised to act as a non-linear moderator on usage. Ten falsifiable propositions are advanced, including two explicitly conjectural boundary-condition predictions, and a staged validation roadmap covering expert content validation, pilot instrument development, and confirmatory testing is specified. The model's claims are scoped to Indian higher education; extension to other developing-nation contexts is framed as a hypothesis for comparative research rather than an assumption.

Keywords: Digital resources; academic libraries; technology acceptance; India; DURA Model; Linguistic-Cognitive Accessibility Friction; cognitive load; digital divide; higher education; Uttar Pradesh; conceptual framework.

1. Introduction

Digital resources are no longer a peripheral concern for Indian academic libraries. Electronic journals, institutional repositories, e-books, open educational resources, and consortium databases now carry a substantial share of the curriculum and the research workflow. The National Digital Library of India (NDLI), e-ShodhSindhu, Shodhganga, and SWAYAM, supported by the broader Digital India programme, have built out a national digital ecosystem of considerable scale. The National Education Policy (NEP) 2020 explicitly treats this digital infrastructure as a strategic pillar of higher-education reform **(Government of India, 2020)**.

The numbers are striking. NDLI reports more than 8.25 crore content items across over 70 languages, a network of more than 5,800 NDLI Clubs, and roughly 1.7 million registered members **(NDLI, 2024)**. e-ShodhSindhu reports over 10,000 full-text journals and 164,300 e-books for its member institutions **(INFLIBNET, 2024)**. By December 2023, Shodhganga had received theses contributed by 739 universities **(INFLIBNET, 2023)**.

A caveat is required at the outset. All of these figures are self-reported by the providers concerned. They describe registrations, holdings, and memberships rather than verified active use; they have not been independently audited; and they may include inactive accounts, dormant memberships, or double-counted items. They are therefore used in this paper only as indicators of the scale of provision, never as evidence of utilisation. Indeed, the distance between provision statistics of this kind and independently observed usage is part of the very puzzle this paper sets out to theorise.

That puzzle is real. Provision is one thing; actual use is quite another. Surveys conducted across Indian universities and several South Asian contexts repeatedly find that awareness, infrastructure, and language barriers sit between the resource and the student in ways that the headline statistics do not show **(Bhatt & Rana, 2011; Kaur & Verma, 2009; Lwoga, 2014; Siwach & Malik, 2019; Verma, Deori, & Verma, 2022; Pandey, 2024)**. In Uttar Pradesh, a recent socio-economic analysis of the digital divide among university students in Lucknow documents marked inter-institutional and rural–urban disparities **(Pandey, 2024)**. The implication is uncomfortable: the determinants of usage in state universities and affiliated colleges are structurally different from those in centrally funded technical institutions, and most of the existing models do not pick this up.

Much of the relevant literature interprets these patterns through familiar acceptance frameworks. TAM **(Davis, 1989)**, UTAUT and UTAUT2 **(Venkatesh et al., 2003, 2012)**, and the DeLone–McLean IS Success Model **(DeLone & McLean, 2003)** are now well established, and recent meta-analyses confirm that their constructs hold up across a range of educational settings **(Xue, Mat Rashid, & Ouyang, 2024; Ali & Warraich, 2024; Zheng et al., 2025)**. The concern, raised by several authors, is that these frameworks were developed in environments with reliable connectivity, high digital literacy, and English-language content as the default. Indian state universities and affiliated colleges meet none of those conditions uniformly **(Lwoga, 2014; Arora, 2019; Roy, 2025)**.

This paper makes two related arguments. The first is that the literature can be synthesised into a context-sensitive framework, the Digital Usage and Resource Accessibility (DURA) Model, drawing on TAM, UTAUT2, the digital divide tradition, and the IS Success Model. The integrative-review method of **Whittemore and Knafl (2005)** is used; Section 2 explains why a narrative integrative design, rather than a PRISMA-type systematic review, is the appropriate vehicle for theory-building of this kind, and states plainly that no claim of PRISMA compliance is made. The second argument is more direct. Existing frameworks recognise digital literacy and treat language somewhere within it, or as an unspecified barrier. They do not theorise language as a distinct cognitive cost. This paper introduces Linguistic-Cognitive Accessibility Friction (LCAF), grounded in Cognitive Load Theory **(Sweller, 2011)**, to do precisely that. LCAF captures the additional load that a non-English-medium learner carries when reading predominantly English-language scholarly content, and it is theorised to act non-linearly on usage.

The paper is offered explicitly as a conceptual, theory-building contribution in the sense described by **MacInnis (2011)** and **Jaakkola (2020)**: its purpose is to specify constructs, relationships, and falsifiable propositions with sufficient precision that subsequent empirical work, by the authors and, more importantly, by independent research teams, can confirm, refine, or reject the model. The scope of its claims is Indian higher education. Applicability to other developing-nation systems is advanced as a comparative hypothesis, not asserted as established.

The objectives of the paper are therefore as follows:

- To examine where dominant technology acceptance frameworks fall short when applied to Indian higher education and comparable resource-constrained settings;
- To synthesise the relevant theoretical traditions into a single context-sensitive framework, the DURA Model;

- To introduce LCAF as a novel construct, place it on a firm theoretical footing, and propose a concrete strategy for its measurement; and
- To advance ten falsifiable propositions, two of them explicitly conjectural boundary-condition predictions, together with a staged validation roadmap.

The paper is organised as follows. Section 2 sets out the review methodology, the paper's positioning as a conceptual contribution, and a reflexive note on authorial positionality. Section 3 covers the literature, including adjacent frameworks that are engaged but not incorporated wholesale. Section 4 identifies the gap. Section 5 sets out the theoretical foundations. Section 6 introduces the DURA Model and LCAF, together with a proposed operationalisation of LCAF and an analysis of construct distinctiveness. Section 7 lists the propositions. Sections 8 and 9 discuss the model against existing frameworks and outline implications. Section 10 states the limitations at the level of specificity a reviewer would demand and specifies the validation roadmap, and Section 11 concludes.

2. Methodology of the Integrative Review

The review follows the integrative method described by **Whittemore and Knafl (2005)**. An integrative review was chosen because the aim here is conceptual model development rather than effect-size estimation, and the integrative method allows empirical, theoretical, and methodological literature to be synthesised together.

One point of reporting discipline should be stated at the outset. This is a narrative integrative review, not a PRISMA-compliant systematic review, and no claim of PRISMA compliance is made. A systematic review in the PRISMA sense requires exhaustive and documented database coverage, reported record counts at each stage of identification, screening, and inclusion, dual-reviewer screening with inter-rater reliability statistics, and a flow diagram **(Page et al., 2021)**. Those elements were not implemented here, and invoking PRISMA loosely would overstate the rigour of the evidence base. The searches described below were purposive and iterative, in keeping with established integrative-review practice, and were directed at theoretical saturation of the construct families relevant to model-building rather than at exhaustive retrieval.

2.1 Search strategy and sources

Searches were run in Scopus, Web of Science, Google Scholar, INFLIBNET-indexed Indian journals, and the institutional repositories of selected Indian universities. The query combined three concept clusters: (a) digital resources, e-resources, or digital library; (b) usage, utilisation, or acceptance; and (c) higher education, academic libraries, or college students. Country qualifiers including India, South Asia, and developing nations were applied where appropriate. Searching proceeded iteratively: reference lists of included sources were hand-searched, and searching stopped when additional sources ceased to yield new construct families rather than at a predetermined record count.

2.2 Inclusion and exclusion criteria

Studies were included if they (i) addressed digital resource utilisation in academic libraries or higher-education contexts, (ii) used an established acceptance framework (TAM, UTAUT, UTAUT2, IS Success) or contributed theoretically to the digital divide or information quality literature, (iii) were peer-reviewed, and (iv) were published in English between January 2003 and August 2025. Studies focused exclusively on K-12 settings, on faculty rather than student users, or on technology acceptance unrelated to digital information resources were excluded. The restriction to English-language publications is itself a source of bias, discussed in Section 2.5.

2.3 Synthesis approach

Following **Whittemore and Knafl (2005)**, data extraction was done in three stages. First, each source was coded for the theoretical constructs it employed or proposed. Second, the constructs were grouped into families. Third, the families were synthesised into the four-component DURA structure. The LCAF construct emerged inductively. Several Indian and sub-Saharan African studies repeatedly identified language as a sub-component of usage barriers, sometimes labelled simply as a limitation **(Bhatt & Rana, 2011; Lwoga, 2014; Siwach & Malik, 2019)**, but no prior framework had given it formal theoretical standing. It must be acknowledged that this inductive emergence rests on a comparatively small set of repeatedly cited studies; the implications of that fact for researcher bias are taken up in Sections 2.5 and 10.

In the typology of review methodologies, the approach adopted here is integrative rather than systematic **(Snyder, 2019)**: it aims at synthesis and reconceptualisation across heterogeneous literatures rather than at the exhaustive, protocol-driven coverage of a PRISMA-compliant systematic review **(Page et al., 2021)**, and it accepts in exchange a documented risk of selection bias in the literature drawn upon. That risk is addressed rather than concealed: the search strategy and inclusion criteria are reported in Sections 2.1 and 2.2, and the residual bias is analysed in Sections 2.5 and 10.

2.4 Positioning as a conceptual contribution

Conceptual papers occupy a recognised, if demanding, position in information systems and library science. **MacInnis (2011)** and **Jaakkola (2020)** distinguish theory-building articles, whose contribution lies in construct specification, integration, and proposition development, from empirical articles, whose contribution lies in testing. Publishing the model prior to validation is justified here on three grounds. First, the propositions are stated in falsifiable form with explicit boundary conditions, which allows multiple independent teams to test them in parallel rather than waiting on a single validation study by the originating authors. Second, the operationalisation strategy set out in Section 6.7 supplies the measurement groundwork that any validation requires; a construct cannot be tested before it is specified precisely enough to be measured. Third, premature empirical testing with unvalidated instruments would risk construct contamination, particularly for a construct such as LCAF whose discriminant validity against digital competency must be established with care (Section 6.8). Specification, in short, must precede measurement, and measurement must precede testing. A staged validation roadmap covering expert content validation, pilot instrument development, and confirmatory testing is set out in Section 10.

2.5 Reflexivity and positionality

A reflexive note is warranted, not least because this paper theorises linguistic friction for non-English-medium learners while being itself written, and destined to be published, in English. The authors are bilingual Hindi–English researchers working in a state university in Uttar Pradesh. That position gives first-hand familiarity with the phenomenon LCAF describes; it also creates a risk, since constructs can be over-fitted to the context the theorist knows best. Second, the corpus reviewed here is dominated by published, English-language, peer-reviewed studies, which is precisely the linguistic selection bias the paper critiques: regional-language scholarship on library use, where it exists, is largely invisible to the databases searched, so the evidence base for a theory of linguistic disadvantage is itself linguistically skewed. Third, the choice to write in English is a pragmatic concession to the current publication system rather than an endorsement of it. The theory-building process should accordingly be understood as situated within, not outside, the linguistic hierarchy it analyses, and independent re-derivation of the construct by researchers in other linguistic contexts would be a meaningful robustness check.

3. Literature Review

3.1 Digital resources in Indian academic libraries

Indian academic libraries have moved from physical to hybrid environments over the past two decades, and digital resources now mediate a large share of access. National consortia, including e-ShodhSindhu, NDLI, Shodhganga, and SWAYAM, have widened the scholarly base available to students. **Bhatt and Rana (2011)** surveyed ICT-based resources at the Dr Zakir Husain Library, Jamia Millia Islamia, and identified awareness, access, and training as recurrent determinants of usage. **Kaur and Verma (2009)**, examining electronic journal use at IIT Delhi, documented engagement patterns and access barriers that have since been corroborated across other Indian institutions **(Siwach & Malik, 2019; Verma, Deori, & Verma, 2022)**. More recent contributions extend the line of inquiry to the post-COVID period **(Patil & Undale, 2023; Verma et al., 2022)** and to AI-enabled environments **(Kumar, Tyagi, Gaumat, & Rani, 2025)**.

Even with provision expanding, the gap between availability and actual utilisation persists in the data. **Siwach and Malik (2019)**, in a survey of 668 faculty and research scholars across five universities of North India, document substantial heterogeneity in e-resource use, methods of access, and the kinds of hindrances respondents face. Infrastructure, lack of training, and limited awareness recur as the main barriers. **Verma, Deori, and Verma (2022)** identify persistent accessibility and usability problems in their analysis of central university library websites during COVID-19. **Pandey (2024)**, in a socio-economic analysis of the digital divide among university students in Lucknow, documents pronounced inter-institutional and rural–urban disparities. Taken together, these findings point to a context-sensitive framework rather than a re-application of existing acceptance models.

3.2 The evolution of technology acceptance theory

Davis's (1989) Technology Acceptance Model proposes that perceived usefulness and perceived ease of use determine attitude and, in turn, actual use. The Unified Theory of Acceptance and Use of Technology **(Venkatesh et al., 2003)** consolidated several earlier models around four core constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions. UTAUT2 **(Venkatesh, Thong, & Xu, 2012)** extended this for consumer contexts by adding hedonic motivation, price value, and habit.

Recent reviews confirm the empirical robustness of these models. **Xue, Mat Rashid, and Ouyang (2024)** synthesised 162 SSCI/SCI-E articles applying UTAUT in higher education between 2008 and 2022 and found that performance expectancy consistently exhibits the strongest effect on behavioural intention, with notable variation across regions. **Ali and Warraich (2024)** conducted a meta-analytic synthesis of UTAUT applications in academic and digital library contexts and confirmed significant relationships between UTAUT2 constructs and behavioural intention. **Zheng, Han, Huang, Wu, and Wu (2025)** extended the analysis to e-learning during COVID-19, drawing on 91 empirical studies and 37,910 participants, and identified habit as the single most influential antecedent of behavioural intention.

Several recent applications push these frameworks into newer technologies. **Sergeeva, Zheltukhina, Shoustikova, Tukhvatullina, Dobrokhotov, and Kondrashev (2025)** applied UTAUT2 to higher-education students' adoption of generative artificial intelligence and found habit and performance expectancy to be the most influential predictors. **Patil and Undale (2023)** tested an extended UTAUT model with Indian students after the pandemic and report that performance expectancy and the availability of resources predicted continued-usage intentions. **Kumar, Tyagi, Gaumat, and Rani (2025)** apply UTAUT to assess student readiness for AI-enhanced learning in Indian higher-education institutions and confirm the importance of performance expectancy alongside infrastructural and equity constraints.

There is also a recurring concern in this literature. UTAUT and UTAUT2 were calibrated in environments with reliable access conditions and relatively uniform digital literacy. When these frameworks are applied to developing-nation contexts without modification, they tend to under-specify infrastructural constraints, linguistic barriers, and institutional support **(Lwoga, 2014; Roy, 2025)**.

3.3 Digital divide theory

Van Dijk (2006) conceptualises the digital divide as operating across four sequential forms of access: motivational, material or physical, skills, and usage access. **Warschauer (2003)** argues that the divide is not reducible to device ownership, and that content, literacy, and institutional dimensions all matter. **Arora (2019)**, writing on the so-called next billion users, makes a related case: patterns of digital engagement in the Global South cannot be read off frameworks developed for affluent Western users. **Pandey (2024)** provides contemporary empirical support in the Indian context, documenting significant ICT-access inequalities among university students in Uttar Pradesh.

3.4 Information systems success and information quality

DeLone and McLean (2003) identify information quality, system quality, and service quality as antecedents of use and user satisfaction. **Wang and Strong (1996)** specify intrinsic, contextual, representational, and accessibility dimensions of information quality. **Lwoga (2014)**, applying the IS Success Model to web-based learning management systems in Tanzania, found that quality-related factors (instructor and system quality) predict perceived usefulness and user satisfaction in a developing-nation context. **Lwoga and Komba (2015)** subsequently extended this to continued usage intentions and identified self-efficacy as a significant determinant of actual usage.

3.5 Cognitive load theory and linguistic accessibility

Sweller's (2011) Cognitive Load Theory distinguishes three types of cognitive load: intrinsic load, inherent in the material itself; extraneous load, imposed by the manner of presentation; and germane load, devoted to schema construction. The framework has been applied widely in instructional design, and, importantly for present purposes, it brings with it a mature measurement tradition: subjective mental-effort rating scales **(Paas, 1992; Paas, Tuovinen, Tabbers, & Van Gerven, 2003)**, multidimensional workload instruments such as the NASA-TLX **(Hart & Staveland, 1988)**, and dual-task performance paradigms **(Paas et al., 2003)**. Its application to digital information-resource utilisation in non-English-medium learner populations nonetheless remains under-developed in the LIS literature, and prior LIS treatments of language barriers have not exploited the measurement tradition at all. The

present paper draws on both the theory and its measurement apparatus to develop the LCAF construct introduced in Section 6.6 and operationalised in Section 6.7.

3.6 Indian and South Asian empirical studies

Studies conducted in Indian higher education report converging patterns: moderate awareness, uneven utilisation, and recurring infrastructural and linguistic constraints **(Bhatt & Rana, 2011; Kaur & Verma, 2009; Siwach & Malik, 2019; Patil & Undale, 2023; Verma et al., 2022; Pandey, 2024; Kumar et al., 2025)**. Similar patterns are reported in Tanzanian higher education **(Lwoga, 2014; Lwoga & Komba, 2015)** and in South Asian meta-analytic material **(Ali & Warraich, 2024)**.

Supporting evidence from comparable multilingual, resource-constrained settings outside South Asia's immediate neighbourhood reinforces these patterns. In Pakistan, technology-acceptance research on the Higher Education Commission's National Digital Library finds that perceived usefulness and ease of use, together with system and interface characteristics, drive research students' adoption **(Khan & Qutab, 2016)**, while survey evidence reports infrequent use shaped by awareness and access factors **(Mubeen, Soroya, & Mahmood, 2021)**. In Bangladesh, faculty across eight public universities identified limited titles, difficulty of access from home, and slow connectivity as the principal constraints on e-resource use **(Ahmed, 2013)**. The canonical developing-country application of TAM to a digital library likewise found that contextual and individual variables condition acceptance well beyond the two classical beliefs **(Park, Roman, Lee, & Chung, 2009)**. Most directly relevant to the construct proposed in Section 6.6, a large multi-country survey has quantified the language penalty in science: non-native English speakers from low-proficiency countries reported spending a median of roughly 91 per cent more time reading an English-language paper than native speakers **(Amano et al., 2023)**. These converging observations extend the evidential context of the model beyond India, although the corpus formally reviewed remains Indian-dominated and the scoping stated below is unaffected.

It should be stated plainly that the evidence base assembled here is dominated by Indian studies, supplemented by a small number of Tanzanian studies and regional syntheses. Convergence across these settings is suggestive, not demonstrative, and roughly thirty-five references is a modest corpus on which to rest an integrative framework. Accordingly, the model's claims are scoped to Indian higher education, where the underlying evidence is thickest. Whether DURA and LCAF travel to 'developing nations' or the 'Global South' as broader categories is advanced in Section 10 as a comparative hypothesis to be tested, not asserted as an established property of the model.

3.7 Adjacent frameworks engaged but not incorporated wholesale

Three further frameworks deserve explicit treatment, both because a knowledgeable reader would expect it and because each informs a component of DURA without being adopted as a foundation.

First, TAM3 **(Venkatesh & Bala, 2008)** elaborates the antecedents of perceived ease of use, including anchors such as computer self-efficacy, perceptions of external control, and computer anxiety. These antecedents inform the User Digital Competency component of DURA, and TAM3's attention to individual differences is congenial to the present argument. TAM3 nonetheless retains the individual-cognitive frame of the TAM family: infrastructural conditions and resource-side attributes remain external variables, which is exactly the limitation that motivates DURA in infrastructure-constrained settings.

Second, the Task-Technology Fit model **(Goodhue & Thompson, 1995)** holds that performance effects depend on the correspondence between task requirements and technology functionality. The fit logic directly anticipates DURA's Resource Relevance and Quality component: curricular alignment is, in TTF terms, a fit variable between the student's academic tasks and the content of the digital collection. TTF, however, does not address structural access, competency heterogeneity, or language, and so supplies an ingredient rather than an architecture.

Third, Self-Determination Theory **(Ryan & Deci, 2000)** distinguishes intrinsic from extrinsic motivation and specifies the conditions under which motivation is internalised. SDT informs the motivational sub-dimension of the Awareness and Motivational Factors component, and it suggests a refinement future work should consider: awareness (an informational state) and motivation (an energetic state) may ultimately deserve decomposition into separate constructs, a possibility flagged in Section 10.

Finally, the recent wave of AI-adoption studies extending UTAUT2 to generative AI in higher education **(Sergeeva et al., 2025; Kumar et al., 2025)** intersects with this paper's implication that AI-mediated translation and summarisation may reduce LCAF (Section 9.2). Formalising that intersection, in which an emerging technology acts

on the moderator rather than on the predictors, is identified as a direction for future theoretical work rather than attempted here.

4. Identification of the Research Gap

Five interrelated gaps emerge from the literature reviewed above, and they motivate the development of the DURA Model and the LCAF construct.

First, dominant acceptance frameworks treat infrastructural conditions as facilitating conditions or external variables rather than as primary determinants. In Indian state universities and comparable resource-constrained settings, infrastructural constraints are often the binding factor on usage rather than a background condition. Recent reviews and empirical studies say so explicitly **(Xue et al., 2024; Zheng et al., 2025; Pandey, 2024)**.

Second, existing models assume a relatively uniform level of digital literacy among users. That assumption does not hold in heterogeneous higher-education systems such as India's, where students enter universities with markedly different prior exposure to digital tools and different levels of competency **(Siwach & Malik, 2019; Pandey, 2024)**.

Third, resource-side variables, including curricular fit, regional-language availability, and interface usability for first-generation digital users, are under-specified in the dominant frameworks, notwithstanding the fit logic available in TTF **(Goodhue & Thompson, 1995)**.

Fourth, awareness and motivational variables are partially captured by social influence in UTAUT2, but they do not fully reflect the role of institutional promotion, faculty endorsement, and peer networks repeatedly identified in Indian empirical studies as decisive **(Bhatt & Rana, 2011; Patil & Undale, 2023)**.

Fifth, and most consequential for the theoretical contribution of this paper, the linguistic dimension of digital resource access has been recurrently identified in empirical studies but has never been formalised theoretically. **Bhatt and Rana (2011)**, **Siwach and Malik (2019)**, and **Pandey (2024)** all identify language- or literacy-related variables as relevant. In each case, however, language is treated as a sub-dimension of digital literacy or as an unspecified barrier. None of these studies, and to the authors' knowledge no prior theoretical contribution in LIS, has formalised language as a distinct cognitive-load construct that operates non-linearly on usage. LCAF is introduced to fill this gap.

5. Theoretical Foundations

The DURA Model integrates five established theoretical traditions:

(i) Technology Acceptance Model (Davis, 1989)

Davis's (1989) TAM provides the cognitive-behavioural foundation, in particular perceived usefulness and perceived ease of use, and informs the Awareness and Motivational Factors component.

(ii) Unified Theory of Acceptance and Use of Technology 2 (Venkatesh, Thong, & Xu, 2012)

Venkatesh, Thong, and Xu (2012) contribute the social and habitual dimensions, in particular social influence and facilitating conditions, which inform both the Awareness and the Digital Infrastructure components.

(iii) Digital Divide Theory (van Dijk, 2006; Warschauer, 2003; Arora, 2019)

The work of **van Dijk (2006)**, **Warschauer (2003)**, and **Arora (2019)** provides the structural foundation for the Digital Infrastructure Accessibility and User Digital Competency components, and distinguishes DURA from purely cognitive acceptance models.

(iv) DeLone and McLean IS Success Model (2003)

DeLone and McLean (2003) contribute the resource-quality perspective, which informs the Resource Relevance and Quality component.

(v) Cognitive Load Theory (Sweller, 2011)

Sweller's (2011) Cognitive Load Theory provides the theoretical foundation for the LCAF construct, framing language as a source of extraneous cognitive load that modulates effective access to digital content.

Task-Technology Fit **(Goodhue & Thompson, 1995)** and Self-Determination Theory **(Ryan & Deci, 2000)** inform individual components, as set out in Section 3.7, but are engaged as sources of specific insights rather than treated as foundations of the architecture.

6. The DURA Model: Constructs and Framework

The DURA Model identifies four interdependent determinants of digital resource utilisation, moderated by the LCAF construct and a set of demographic and institutional variables. The model is shown in Figure 1.

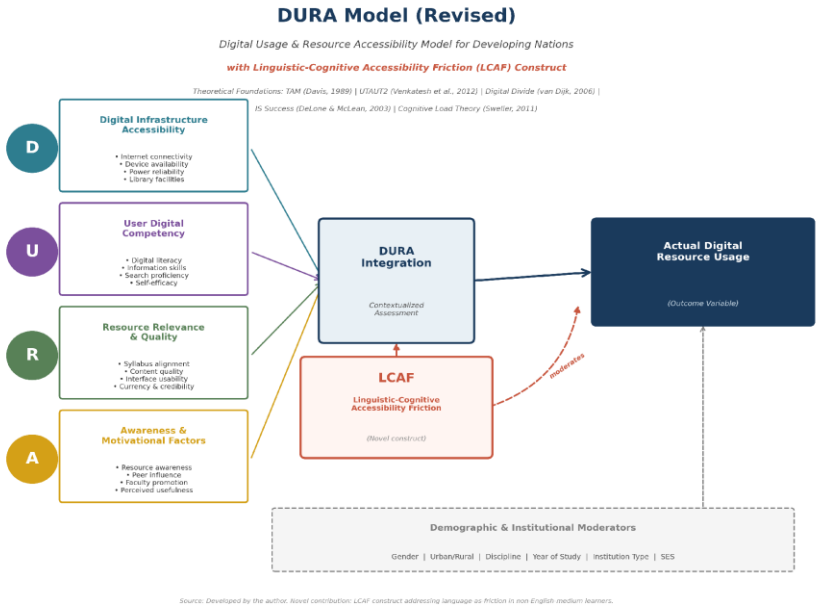

Figure 1. *The DURA Model with the LCAF moderator construct.*

Because the full framework carries four predictors, one novel moderator, and two contextual moderators, Fig. 1a distils the core testable model (Tier 1 of Section 7) to which first-stage empirical work should be confined: the four direct paths and the single LCAF moderation. Readers approaching the framework for the first time may find it easiest to read Fig. 1a first and Fig. 1 and Fig. 3 thereafter.

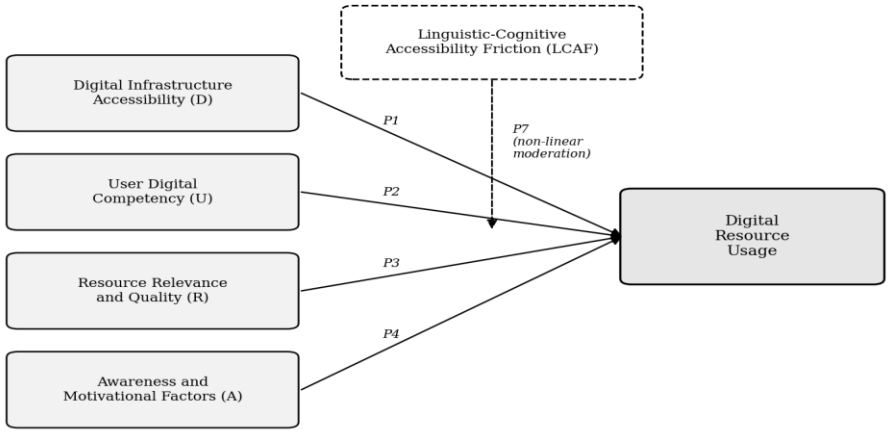

Figure 1a. *The simplified core DURA model: four direct effects (P1–P4) moderated non-linearly by LCAF (P7). The contextual moderators and boundary-condition conjectures of the full framework (Figs. 1 and 3) are omitted for visual clarity.*

6.1 Digital Infrastructure Accessibility (D)

This component refers to the availability, reliability, and quality of the infrastructural conditions that permit access to digital resources. Four sub-dimensions are included: (a) internet connectivity and bandwidth, (b) device availability and suitability, (c) reliability of electricity and ancillary infrastructure, and (d) physical library infrastructure, including computer terminals and institutional subscriptions. In Indian state universities and comparable contexts these conditions vary substantially and frequently form the binding constraint on usage **(Pandey, 2024)**. DURA treats infrastructural accessibility as a primary determinant rather than a background facilitating condition.

6.2 User Digital Competency (U)

This component captures user-side capabilities that enable effective engagement: (a) general digital literacy, (b) information literacy, including evaluation, synthesis, and citation, (c) search and navigation proficiency, and (d) digital self-efficacy **(Lwoga & Komba, 2015)**. Language ability, which is frequently subsumed under digital literacy in prior frameworks, is here treated separately and theorised as part of the LCAF construct (Section 6.6); the conceptual and empirical basis for that separation is set out in Section 6.8.

6.3 Resource Relevance and Quality (R)

This component captures the resource-side attributes that determine whether available digital content is actually useful: (a) curricular and syllabus alignment, (b) content quality, including accuracy, currency, and scholarly credibility, (c) interface usability, particularly for first-generation digital users, and (d) availability of regional-language or simplified formats. The component draws on the IS Success Model **(DeLone & McLean, 2003)**, **Wang and Strong (1996)**, and the fit logic of **Goodhue and Thompson (1995)**, and is empirically supported by **Lwoga (2014)**, who found that instructor and system quality predict perceived usefulness and user satisfaction in developing-nation settings.

6.4 Awareness and Motivational Factors (A)

This component captures the cognitive and social variables that shape willingness to engage: (a) awareness of resource availability and scope, (b) peer influence within student networks, (c) faculty and librarian promotion, and (d) perceived usefulness as conceptualised in TAM, with the intrinsic–extrinsic motivational distinction of **Ryan and Deci (2000)** informing the motivational sub-dimension. Empirical studies repeatedly find that even when infrastructure and resources are adequate, low awareness and weak institutional promotion suppress actual usage **(Bhatt & Rana, 2011; Patil & Undale, 2023; Kumar et al., 2025)**.

6.5 Demographic and institutional moderators

Six moderators reflect documented heterogeneity in Indian higher education: gender, urban versus rural institutional location, academic discipline, year of study, institutional type (central, state, private, affiliated college), and student socioeconomic status **(Pandey, 2024)**.

6.6 Linguistic-Cognitive Accessibility Friction (LCAF): a novel construct

The central theoretical contribution of this paper is the LCAF construct. LCAF is defined as the additional extraneous cognitive load incurred by a learner whose primary medium of instruction differs from the dominant language of the digital resources to which they seek access, and which materially reduces the marginal utility of each unit of access.

LCAF is theoretically distinct from existing constructs in three respects.

The first concerns its relation to language ability. Language ability is a stable user attribute, a competency. LCAF is a dynamic friction that emerges only in the interaction between a user with a given language ability and a resource with a given language demand. A student with intermediate English proficiency may experience low LCAF when accessing simplified course content but high LCAF when working with complex peer-reviewed scholarly articles. LCAF is therefore a property of the user–resource interaction, not of the user alone.

The second concerns its relation to digital literacy. Digital literacy concerns the operational and evaluative skills required to navigate and interpret digital information. LCAF concerns the cognitive cost of comprehension once

navigation has been accomplished. A student may possess high digital literacy and still experience high LCAF if scholarly content is presented exclusively in a non-native language.

These first two distinctions can be anchored in the defining literature of each neighbouring construct rather than asserted in the abstract. Digital literacy is standardly conceptualised as a competence spanning technical, cognitive, and social-emotional dimensions **(Ng, 2012)** and is measured through skills inventories covering operational, formal, information, and strategic internet skills **(van Deursen & van Dijk, 2011)**; an instrument of that type measures what a user can do, whereas LCAF indexes what a particular resource costs that user, and the two can therefore diverge for the same person across resources. Cognitive load theory, from its original formulation **(Sweller, 1988)** to its contemporary measurement instruments distinguishing intrinsic, extraneous, and germane load **(Leppink, Paas, van der Vleuten, van Gog, & van Merriënboer, 2013)**, supplies the parent category: LCAF is a language-induced species of extraneous load, not a new load type. The nearest empirical neighbour is the literature on online searching in English as a non-native language, which documents distinctive difficulties of query formulation and reformulation for non-native searchers **(Chu, Komlodi, & Rózsa, 2015)**; that literature describes behavioural challenges of the search stage, whereas LCAF is specified as the comprehension-stage load that persists after retrieval has succeeded — an emphasis consistent with recent evidence that non-native English speakers require substantially more time than native speakers to read scholarly material **(Amano et al., 2023)**.

The third concerns its functional form. Drawing on **Sweller's (2011)** cognitive-load formulation, LCAF is hypothesised to exhibit a threshold effect. Below a critical level of friction, marginal increases in infrastructural access translate proportionally into marginal increases in usage. Above the threshold, additional infrastructural access yields diminishing returns because the cognitive cost of comprehension dominates. This non-linear specification distinguishes LCAF from the linear additive constructs typical of TAM and UTAUT2.

In the Indian context, LCAF is empirically motivated by the substantial proportion of higher-education students whose schooling has been in regional languages but who confront predominantly English-language scholarly content. NDLI states that it provides interface support in ten Indian languages **(NDLI, 2024)**; the underlying scholarly content, however, remains predominantly English-medium, and interface translation does not eliminate content-level friction. LCAF therefore captures a structurally important variable that has been recurrently observed but never formalised in the LIS literature **(Bhatt & Rana, 2011; Siwach & Malik, 2019)**. Because LCAF is grounded in Cognitive Load Theory, it inherits that theory's measurement tradition **(Paas, 1992; Hart & Staveland, 1988; Paas et al., 2003)**; Section 6.7 adapts that tradition into a concrete operationalisation strategy.

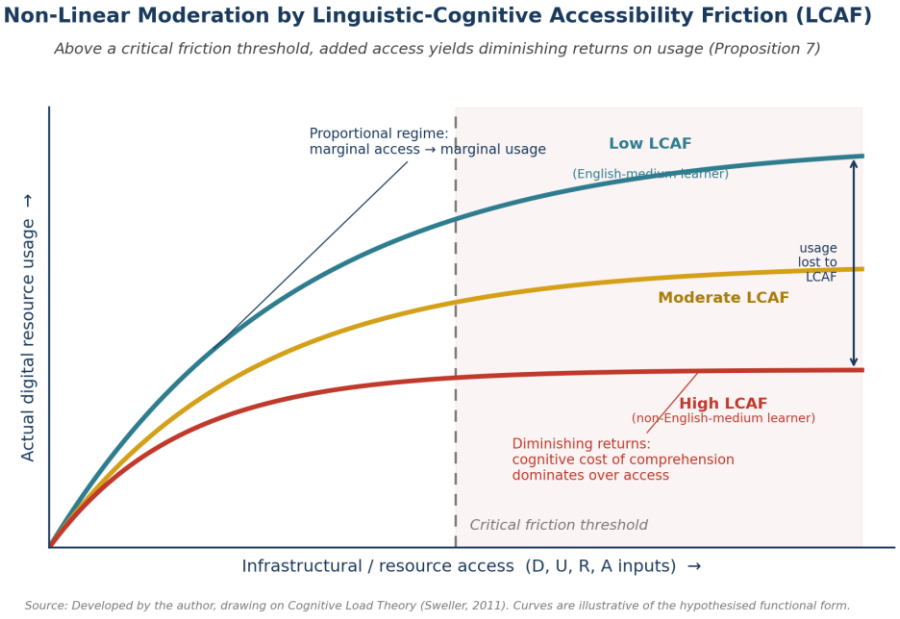

Figure 2. *The hypothesised non-linear moderation of digital resource usage by LCAF. Below a critical friction threshold, access converts proportionally into usage; above it, the cognitive cost of comprehension dominates and additional access yields diminishing returns (Proposition 7). Curves are illustrative of the hypothesised functional form, not fitted to data.*

6.7 Toward operationalising LCAF: a proposed measurement strategy

A construct without a measurement pathway is a metaphor. This section therefore sets out a three-route measurement strategy for LCAF, adapted from the established cognitive-load measurement paradigms that prior LIS treatments of language barriers have not engaged.

The strategy follows the staged logic of established scale-development practice — item generation, expert content validation, pilot testing with exploratory analysis, and confirmatory testing with formal discriminant-validity assessment **(Hinkin, 1998; MacKenzie, Podsakoff, & Podsakoff, 2011)** — and the items presented below are located at the first of those stages only.

(a) Subjective self-report. The most practical route for field research adapts two established instruments. The first is the nine-point mental-effort rating scale of **Paas (1992)**, widely used in cognitive-load research **(Paas et al., 2003)**, administered immediately after a defined resource-use episode with a language-specific referent ("How much mental effort did understanding the English of this material require?"). The second adapts the mental-demand and effort subscales of the NASA-TLX **(Hart & Staveland, 1988)** with language-specific anchors. In addition, a dedicated multi-item Likert scale is proposed; Table 1 presents an illustrative item pool. These items are explicitly provisional: they are offered as a starting point for content validation, not as a validated instrument.

Table 1. *Illustrative LCAF item pool, offered for content validation. LCAF6 is designed specifically to support discriminant-validity testing against User Digital Competency (Section 6.8).*

Code	Illustrative item (five-point Likert scale: strongly disagree to strongly agree)
LCAF1	When I read scholarly material in English, I have to re-read sentences to understand them.
LCAF2	I understand course content faster when it is available in my medium of instruction than in English.
LCAF3	Reading English-language journal articles tires me more quickly than reading equivalent material in my medium of instruction.
LCAF4	I sometimes stop using an e-resource because the effort of understanding the English is too high, even when I can access it easily.
LCAF5	I rely on translation tools to understand English-language digital resources.
LCAF6	Difficulty with English affects how often I use the digital library, separately from any difficulty in using the technology itself.

(b) Performance-based indicators. Where study designs permit, LCAF can be indexed behaviourally: comprehension-score differentials on matched passages presented in English versus the student's medium of instruction; time-on-task and re-reading counts derived from platform usage logs; and task-completion differentials on retrieval tasks of equivalent difficulty. Behavioural indicators avoid the self-presentation biases of self-report and permit triangulation.

(c) Dual-task measures. Where laboratory conditions are available, the dual-task paradigms of the cognitive-load tradition **(Paas et al., 2003)**, in which performance on a secondary task indexes the load imposed by the primary reading task, offer the most direct measurement of the extraneous load that LCAF theorises.

Validation sequence. Whichever routes are adopted, instrument development should proceed in four steps: (i) expert content validation of the item pool by a panel of LIS and educational-psychology experts, using Lawshe's **(1975)** content validity ratio or a structured Delphi procedure; (ii) cognitive interviews with Hindi-medium and other regional-medium undergraduates to check item comprehension; (iii) pilot administration with exploratory factor analysis; and (iv) confirmatory factor analysis with formal discriminant-validity testing as specified in Section 6.8. Testing the threshold form of Proposition 7 additionally requires analytic techniques sensitive to non-linearity, such as segmented regression, quadratic moderation terms, or latent moderated structural equations.

6.8 Construct distinctiveness and discriminant validity

Two areas of potential construct overlap deserve explicit treatment rather than narrative assertion. The first is between User Digital Competency (U) and LCAF, both of which touch language-related capability. The second is

between Resource Relevance and Quality (R) and the Awareness component (A), where curricular fit (an R attribute) and institutional promotion of that fit (an A variable) sit close together. Table 2 states the shared territory, the conceptual distinction, and the empirical test proposed for each pair.

Table 2. *Construct distinctiveness: shared territory, conceptual distinction, and proposed discriminant-validity tests.*

Construct pair	Shared conceptual territory	Distinction	Proposed empirical test
U vs LCAF	Language-related capability appears in both.	U is a stable attribute of the user, measured on the user alone; LCAF is an interactional state of the user–resource dyad, varying across resources for the same user. High-U/high-LCAF combinations are theoretically possible and empirically expected.	CFA discriminant validity: Fornell–Larcker criterion (Fornell & Larcker, 1981) and HTMT ratio (Henseler, Ringle, & Sarstedt, 2015); item LCAF6 written to separate the factors. If U and LCAF collapse into one factor, the central claim of this paper is falsified.
R vs A	Curricular fit (R) and faculty promotion of resources (A) both concern the resource's standing in the curriculum.	R is an attribute of the resource, assessable by expert raters independently of any user; A is a user-side cognition. Different measurement sources (expert coding vs self-report) also limit common-method inflation.	Distinct measurement sources by design; CFA cross-loading inspection; HTMT ratio between A items and any self-reported R items.
D vs R	Institutional subscriptions appear in both component definitions.	Subscription existence and terminal availability are access conditions (D); the quality and fit of subscribed content is a resource attribute (R).	Item wording separates access to content from quality of content; CFA cross-loading inspection.

Distinctiveness is defended here conceptually; it is asserted, not demonstrated. Empirical discriminant validity is therefore a pass–fail condition for the model. Should confirmatory factor analysis show that U and LCAF cannot be separated, the central theoretical contribution of this paper would be falsified. That is stated deliberately: it is a strength of a specification that it can fail.

7. Propositions for Empirical Validation

Ten propositions are advanced. P1 to P4 specify direct effects, P5 to P8 specify moderating relationships, and P9 and P10 are boundary-condition conjectures intended as strong tests of the model.

To keep the framework tractable, the ten propositions are organised in three tiers rather than offered as a single undifferentiated agenda. **Tier 1, the core testable model,** comprises the four direct effects (P1–P4) and the LCAF moderation (P7); it involves five constructs and one moderator, is depicted in Fig. 1a, and can be estimated in a single adequately powered cross-sectional study using the measurement strategy of Section 6.7. **Tier 2** comprises the contextual moderations (P5, P6, P8), which require multi-site designs with genuine institutional variation. **Tier 3** comprises the boundary-condition conjectures (P9–P10), which presuppose a validated Tier-1 model and are long-run strong tests rather than first-study hypotheses. No single study is expected, or advised, to test all ten propositions; the tiering is intended precisely to prevent the framework's breadth from becoming an obstacle to its testing.

P1. Digital Infrastructure Accessibility (D) is positively associated with actual digital resource usage.

P2. User Digital Competency (U) is positively associated with actual digital resource usage.

P3. Resource Relevance and Quality (R) is positively associated with actual digital resource usage.

P4. Awareness and Motivational Factors (A) are positively associated with actual digital resource usage.

P5. The four DURA components interact such that the effect of each is conditional on the presence of minimally adequate levels of the others. In particular, User Digital Competency exerts little effect when Digital Infrastructure Accessibility is substantially deficient.

P6. Institutional location moderates the effect of Digital Infrastructure Accessibility, such that the marginal effect is greater in rural institutions.

P7. LCAF moderates the effects of D, U, R, and A non-linearly. Beyond a critical friction threshold, the marginal effects of all four components on usage exhibit diminishing returns.

P8. Awareness and Motivational Factors exert a stronger effect on usage among first- and second-year undergraduate students than among senior students.

P9 and P10 are advanced as deliberately counter-intuitive boundary-condition conjectures, and their epistemic status must be stated precisely. They are not findings-in-waiting, and no existing study demonstrates them. They are derivations from the model's internal logic, and their value lies in their falsifiability: if either survives a well-powered test, the model gains strong corroboration; if either fails, the relevant mechanism, the LCAF threshold in P9 and the information-value account of promotion in P10, requires revision. Indicative, though not demonstrative, support exists in fragments of the empirical record: **Pandey (2024)** documents the institutional heterogeneity that P9's premise assumes, and **Bhatt and Rana (2011)** report promotion effects consistent with P10's mechanism. Neither fragment tests the conjecture itself.

P9. Boundary-condition conjecture. In institutions with the highest infrastructural quality serving predominantly Hindi-medium student populations, the relationship between infrastructure investment and digital resource usage is statistically weaker than in moderately equipped institutions serving English-medium populations, because LCAF dominates above the friction threshold. P9 is falsified if, in such institutions, the infrastructure–usage relationship proves equal or stronger.

P10. Boundary-condition conjecture. Faculty promotion (a sub-dimension of A) exerts a stronger marginal effect on usage in resource-poor institutions than in resource-rich institutions, because the absolute information value of faculty endorsement is greater under conditions of low autonomous discoverability. P10 is falsified if the marginal effect of faculty promotion proves equal or stronger in resource-rich institutions.

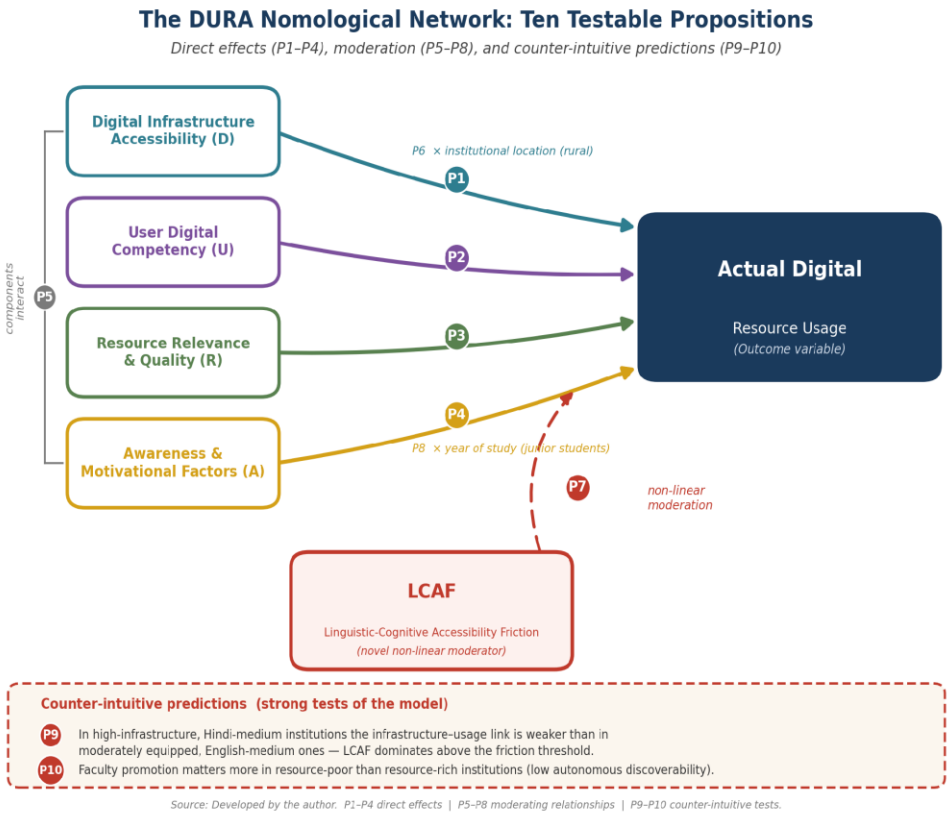

Figure 3. *The DURA nomological network. Four predictors (D, U, R, A) act on usage through direct effects (P1–P4); LCAF moderates these paths non-linearly (P7); institutional location (P6) and year of study (P8) act as contextual moderators; P5 specifies their interaction, and P9–P10 are boundary-condition conjectures.*

8. Discussion and Comparison with Existing Frameworks

DURA, with the LCAF construct, extends the existing literature in five respects. It elevates Digital Infrastructure Accessibility from facilitating condition to primary determinant. It integrates User Digital Competency as a co-equal construct, in recognition of the heterogeneity of Indian higher education. It incorporates Resource Relevance and Quality as a distinct dimension. It promotes Awareness and Motivational Factors to a separate component rather than folding them into a single social influence variable. And it introduces LCAF as a novel non-linear moderator, formalising a variable that has been empirically recurrent but theoretically unformulated.

Table 3 summarises the principal differences between DURA and four established frameworks. The classification criteria are stated explicitly so the exercise can be checked and challenged. *Central* means the feature appears as a named core construct in the original model specification. *Primary* means it is modelled as a first-order determinant of use. *Partial* means it is subsumed within a broader construct rather than modelled in its own right. *Implicit* means it is acknowledged in the source literature but not formally modelled. *Absent* means it is not specified. Classifications were coded against the original specification papers **(Davis, 1989; Venkatesh et al., 2012; DeLone & McLean, 2003; van Dijk, 2006)** rather than against later applications. The exercise remains interpretive: it is a structured reading of the specification texts by the authors, not a formal content analysis with independent coders and reliability statistics, and Table 3 should accordingly be read as an argument map rather than as measurement.

Table 3. *Comparative features of DURA and established frameworks, coded against the original specification papers using the criteria stated above.*

Feature	TAM (1989)	UTAUT2 (2012)	IS Success (2003)	Digital Divide (2006)	DURA (present)

Cognitive acceptance	Central	Central	Partial	Absent	Partial
Infrastructure as primary	Absent	Partial	Absent	Central	Primary
Digital competency (explicit)	Implicit	Implicit	Absent	Partial	Central
Resource relevance/quality	Absent	Absent	Central	Absent	Central
Institutional promotion	Absent	Partial	Absent	Absent	Central
Linguistic-cognitive friction	Absent	Absent	Absent	Absent	LCAF (novel)
Non-linear moderation	Absent	Absent	Absent	Absent	Central
Calibration to Indian/resource-constrained HE	No	No	No	Partial	Yes (India)

9. Implications

9.1 Theoretical implications

DURA contributes to LIS theory in three respects. It demonstrates the analytical gains from integrating structural-access theory, cognitive-acceptance theory, and information-quality theory in a single framework. It introduces LCAF as a novel theoretical primitive that addresses a long-standing empirical pattern in developing-nation research. And it specifies LCAF as a non-linear moderator, which has a methodological implication: future empirical validation should employ techniques sensitive to threshold and interaction effects, such as moderated structural equation modelling (Section 6.7).

9.2 Practical implications for academic libraries

DURA suggests four parallel intervention workstreams: investment in infrastructure, particularly connectivity and device access; structured user-education programmes targeting digital and information literacy; curation and evaluation of resources for curricular fit and linguistic accessibility; and active institutional promotion through faculty engagement and peer advocacy. The LCAF construct adds a more specific implication. Targeted investments in regional-language abstracting, layered scholarly summaries, and assisted-comprehension tools, including AI-mediated translation and summarisation where appropriate, can be expected to produce disproportionate returns in non-English-medium learner populations. These practitioner implications should be read as conditional on the model's empirical validation.

For a library director asking what to do first, the workstreams can be sequenced by cost and dependency. The lowest-cost, earliest actions are curation-side: plain-language and, where feasible, regional-language abstracts for high-use curricular resources; explicit labelling of language and reading level in discovery records; and information-literacy modules that teach strategies for reading English-medium scholarly text, not merely for finding it. A second tranche requires modest investment: interface-language options and vernacular help documentation for the OPAC and discovery layer, and structured faculty-promotion programmes in which reading lists link directly to subscribed resources. The most resource-intensive actions — commissioning regional-language scholarly summaries and deploying AI-mediated translation or summarisation assistance — should be piloted on a small set of high-enrolment courses and evaluated against independently observed usage before scaling, since their expected value is conditional on the LCAF mechanism the model proposes. At every stage the model implies the same measurement discipline stated in Section 1: judge interventions against observed usage, not provision statistics.

9.3 Policy implications

The model also provides a structured framework for evaluating national initiatives such as NDLI, e-ShodhSindhu, and the digital provisions of NEP 2020 **(Government of India, 2020)**, provided that evaluation rests on independently observed usage rather than on provider-reported provision statistics (Section 1). The interface-language strategy adopted by NDLI is a necessary but insufficient response to LCAF. Addressing content-level friction will require sustained investment in regional-language scholarly content production. For Uttar Pradesh in particular, the disparities documented by **Pandey (2024)** suggest that interventions targeting LCAF and infrastructure jointly will yield greater returns than interventions targeting either dimension on its own.

10. Limitations and Directions for Future Research

10.1 Limitations

Six limitations warrant acknowledgement, stated at the level of specificity a reviewer would demand rather than generically.

First, DURA is a conceptual framework awaiting empirical validation. No primary data are reported in this paper, and the ten propositions remain untested. Operationalisation of each component will require careful scale development, for which Section 6.7 provides a starting point but not a substitute.

Second, there is construct-validity risk. The distinctiveness of LCAF from User Digital Competency is defended conceptually in Section 6.8, but it is not yet demonstrated, and failure of discriminant validity in confirmatory testing would falsify the paper's central contribution.

Third, the evidence base is narrow and geographically concentrated. The corpus is dominated by Indian studies, supplemented by a small number of Tanzanian studies and regional syntheses, and roughly thirty-five references is modest for an integrative framework. The model's claims are therefore scoped to Indian higher education; applicability to other developing-nation contexts is a hypothesis for comparative research, not a property of the model.

Fourth, the reviewed corpus carries the same linguistic selection bias the paper critiques. It consists of published, English-language, peer-reviewed studies; regional-language scholarship on library use is largely invisible to the databases searched, so the evidence base for a theory of linguistic disadvantage is itself linguistically skewed (Section 2.5).

Fifth, there is a risk of researcher bias in inductive construct emergence. LCAF was derived from a comparatively small set of repeatedly cited studies by authors with first-hand experience of the phenomenon it describes. Familiarity aids recognition but invites confirmation bias, and independent re-derivation of the construct from other corpora and other linguistic contexts would be a meaningful robustness check.

Sixth, the model covers students only. Extensions to faculty, research scholars, and administrative staff will require theoretical adaptation. In addition, as noted in Section 1, the provider statistics used to motivate the provision–use paradox are unaudited self-reports and must not be treated as usage evidence in any test of the model.

10.2 A staged validation roadmap

The sequence set out below follows standard construct-validation practice in survey and information-systems research **(Hinkin, 1998; MacKenzie et al., 2011)**, so that each stage produces the evidence the next stage presupposes.

Validation should proceed in four stages. *Stage 1, content validation:* an expert panel of LIS and educational-psychology scholars evaluates the DURA component specifications and the LCAF item pool, using Lawshe's **(1975)** content validity ratio or a structured Delphi procedure. *Stage 2, pilot development:* cognitive interviews with regional-medium undergraduates, followed by pilot administration and exploratory factor analysis. *Stage 3, confirmatory testing:* large-sample confirmatory factor analysis with formal discriminant-validity assessment **(Fornell & Larcker, 1981; Henseler et al., 2015)**, followed by moderated structural equation modelling with non-linear terms to test P7. *Stage 4, comparative extension:* replication across other Indian states, South Asia, and sub-Saharan Africa to test the comparative hypothesis that DURA and LCAF generalise beyond the Indian setting in which they were derived.

10.3 Future research and the question of independence

Several lines of future work follow. Cross-sectional studies across Indian state universities would permit initial estimation of the DURA structural parameters. Longitudinal studies could examine the evolution of usage patterns as infrastructural conditions improve. Mixed-methods designs in the tradition reviewed by **Roy (2025)** could illuminate the lived experience of LCAF in Hindi-medium learner populations, and Section 3.7 flags two theoretical refinements:

the possible decomposition of Awareness and Motivation into separate constructs, and the formalisation of AI-mediated translation as an intervention acting on the moderator.

The first author's doctoral research, which examines digital resource usage in selected colleges of Uttar Pradesh, is positioned to provide an initial test of P1, P2, P4, and P9. One point should be stated candidly: that test is not independent, since it would be conducted by the construct's originator, and its evidential weight should be discounted accordingly. Corroboration of DURA and LCAF will be persuasive only when it comes from research teams with no stake in the model. The propositions, falsification conditions, and measurement strategy have been stated in this paper with enough precision to make such independent testing straightforward, and that, rather than self-validation, is the intended function of the specification.

11. Conclusion

The expansion of digital resources in Indian higher education has outpaced the theoretical frameworks available to explain their utilisation. Dominant acceptance models, although empirically robust in the settings that produced them, under-specify the structural, resource-side, institutional, and linguistic variables that shape usage in Indian state universities and affiliated colleges. This paper has proposed the DURA Model, integrating insights from TAM, UTAUT2, digital divide theory, the IS Success Model, and Cognitive Load Theory. Its central theoretical contribution is the LCAF construct, a non-linear moderator that formalises a long-observed but previously unformulated determinant of digital resource usage among non-English-medium learners, together with a concrete strategy for its measurement and explicit conditions under which the construct would fail. Ten falsifiable propositions, two of them boundary-condition conjectures, and a staged validation roadmap provide a clear agenda for empirical work, in which independent testing is invited and self-validation is explicitly discounted. The model's claims are scoped to Indian higher education; whether they travel to the wider Global South is a comparative hypothesis this paper hands to future research. By foregrounding the infrastructural, contextual, and linguistic realities of the setting in which it was derived, DURA aims to support more accurate diagnosis of underutilisation, more targeted interventions by librarians and policymakers, and a more productive theoretical conversation about technology acceptance beyond the environments in which the dominant models were built.

REFERENCES

1. Ahmed, S. M. Z. (2013). Use of electronic resources by the faculty members in diverse public universities in Bangladesh. The Electronic Library, 31(3), 290–312. https://doi.org/10.1108/EL-05-2011-0081
2. Ali, I., & Warraich, N. F. (2024). Use and acceptance of technology with academic and digital libraries context: A meta-analysis of UTAUT model and future direction. Journal of Librarianship and Information Science, 56(4), 965–977. https://doi.org/10.1177/09610006231179716
3. Amano, T., Ramírez-Castañeda, V., Berdejo-Espinola, V., Borokini, I., Chowdhury, S., Golivets, M., et al. (2023). The manifold costs of being a non-native English speaker in science. PLoS Biology, 21(7), e3002184. https://doi.org/10.1371/journal.pbio.3002184
4. Arora, P. (2019). The next billion users: Digital life beyond the West. Cambridge, MA: Harvard University Press.
5. Bhatt, R. K., & Rana, H. K. (2011). Use of ICT based resources and services of Dr. Zakir Husain Library at Jamia Millia Islamia: A survey. DESIDOC Journal of Library & Information Technology, 31(6), 443–449.
6. Chu, P., Komlodi, A., & Rózsa, G. (2015). Online search in English as a non-native language. Proceedings of the Association for Information Science and Technology, 52(1), 1–9. https://doi.org/10.1002/pra2.2015.145052010040
7. Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly, 13(3), 319–340.
8. DeLone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success: A ten-year update. Journal of Management Information Systems, 19(4), 9–30.
9. Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. Journal of Marketing Research, 18(1), 39–50.
10. Goodhue, D. L., & Thompson, R. L. (1995). Task-technology fit and individual performance. MIS Quarterly, 19(2), 213–236.
11. Government of India. (2020). National Education Policy 2020. New Delhi: Ministry of Education. Retrieved from https://www.education.gov.in
12. Hart, S. G., & Staveland, L. E. (1988). Development of NASA-TLX (Task Load Index): Results of empirical and theoretical research. In P. A. Hancock & N. Meshkati (Eds.), Human mental workload (Advances in Psychology, Vol. 52, pp. 139–183). Amsterdam: North-Holland.
13. Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. Journal of the Academy of Marketing Science, 43(1), 115–135. https://doi.org/10.1007/s11747-014-0403-8

14. Hinkin, T. R. (1998). A brief tutorial on the development of measures for use in survey questionnaires. Organizational Research Methods, 1(1), 104–121. https://doi.org/10.1177/109442819800100106
15. INFLIBNET Centre. (2023). Shodhganga@INFLIBNET: A reservoir of Indian theses. Gandhinagar: INFLIBNET Centre. Retrieved from https://shodhganga.inflibnet.ac.in
16. INFLIBNET Centre. (2024). e-ShodhSindhu: Consortium for higher education electronic resources. Gandhinagar: INFLIBNET Centre. Retrieved from https://www.inflibnet.ac.in
17. Jaakkola, E. (2020). Designing conceptual articles: Four approaches. AMS Review, 10(1–2), 18–26. https://doi.org/10.1007/s13162-020-00161-0
18. Kaur, B., & Verma, R. (2009). Use and impact of electronic journals in the Indian Institute of Technology, Delhi, India. The Electronic Library, 27(4), 611–622. https://doi.org/10.1108/02640470910979570
19. Khan, A., & Qutab, S. (2016). Understanding research students' behavioural intention in the adoption of digital libraries: A Pakistani perspective. Library Review, 65(4/5), 295–319. https://doi.org/10.1108/LR-06-2015-0070
20. Kumar, M., Tyagi, R., Gaumat, A., & Rani, J. (2025). Students' perceptions and readiness for AI-enhanced learning: A UTAUT-based study in Indian higher education institutions. Journal of Marketing & Social Research, 2(3), 495–500.
21. Lawshe, C. H. (1975). A quantitative approach to content validity. Personnel Psychology, 28(4), 563–575.
22. Leppink, J., Paas, F., van der Vleuten, C. P. M., van Gog, T., & van Merriënboer, J. J. G. (2013). Development of an instrument for measuring different types of cognitive load. Behavior Research Methods, 45(4), 1058–1072. https://doi.org/10.3758/s13428-013-0334-1
23. Lwoga, E. T. (2014). Critical success factors for adoption of web-based learning management systems in Tanzania. International Journal of Education and Development using Information and Communication Technology (IJEDICT), 10(1), 4–21.
24. Lwoga, E. T., & Komba, M. (2015). Antecedents of continued usage intentions of web-based learning management system in Tanzania. Education + Training, 57(7), 738–756. https://doi.org/10.1108/ET-02-2014-0014
25. MacInnis, D. J. (2011). A framework for conceptual contributions in marketing. Journal of Marketing, 75(4), 136–154. https://doi.org/10.1509/jmkg.75.4.136
26. MacKenzie, S. B., Podsakoff, P. M., & Podsakoff, N. P. (2011). Construct measurement and validation procedures in MIS and behavioral research: Integrating new and existing techniques. MIS Quarterly, 35(2), 293–334. https://doi.org/10.2307/23044045
27. Mubeen, I., Soroya, S. H., & Mahmood, K. (2021). Identifying the factors influencing digital library use among research students: A case of National Digital Library of Pakistan. Digital Library Perspectives, 37(3), 192–208. https://doi.org/10.1108/DLP-07-2020-0075
28. National Digital Library of India (NDLI). (2024). About NDLI: Growth, services, and institutional outreach. Kharagpur: Indian Institute of Technology Kharagpur. Retrieved from https://www.ndl.gov.in
29. Ng, W. (2012). Can we teach digital natives digital literacy? Computers & Education, 59(3), 1065–1078. https://doi.org/10.1016/j.compedu.2012.04.016
30. Paas, F. (1992). Training strategies for attaining transfer of problem-solving skill in statistics: A cognitive-load approach. Journal of Educational Psychology, 84(4), 429–434.
31. Paas, F., Tuovinen, J. E., Tabbers, H., & Van Gerven, P. W. M. (2003). Cognitive load measurement as a means to advance cognitive load theory. Educational Psychologist, 38(1), 63–71. https://doi.org/10.1207/S15326985EP3801_8
32. Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., et al. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. BMJ, 372, n71. https://doi.org/10.1136/bmj.n71
33. Pandey, G. J. (2024). A study of the socio-economic perspective of the digital divide among university students. ShodhKosh: Journal of Visual and Performing Arts, 5(5). https://doi.org/10.29121/shodhkosh.v5.i5.2024.1573
34. Park, N., Roman, R., Lee, S., & Chung, J. E. (2009). User acceptance of a digital library system in developing countries: An application of the Technology Acceptance Model. International Journal of Information Management, 29(3), 196–209. https://doi.org/10.1016/j.ijinfomgt.2008.07.001
35. Patil, H., & Undale, S. (2023). Willingness of university students to continue using e-Learning platforms after compelled adoption of technology: Test of an extended UTAUT model. Education and Information Technologies, 28, 14943–14965. https://doi.org/10.1007/s10639-023-11778-6
36. Roy, P. (2025). Applying UTAUT2 in qualitative research: A systematic review. International Journal of Qualitative Methods, 24. https://doi.org/10.1177/16094069251397344
37. Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. American Psychologist, 55(1), 68–78. https://doi.org/10.1037/0003-066X.55.1.68
38. Sergeeva, O. V., Zheltukhina, M. R., Shoustikova, T., Tukhvatullina, L. R., Dobrokhotov, D. A., & Kondrashev, S. V. (2025). Understanding higher education students' adoption of generative AI technologies: An empirical investigation using UTAUT2. Contemporary Educational Technology, 17(2), ep571. https://doi.org/10.30935/cedtech/16039
39. Siwach, A. K., & Malik, S. (2019). Differences between faculty members and research scholars in use of e-resources in five universities of North India. Library Philosophy and Practice (e-journal), 2775.
40. Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. Journal of Business Research, 104, 333–339. https://doi.org/10.1016/j.jbusres.2019.07.039
41. Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. Cognitive Science, 12(2), 257–285. https://doi.org/10.1207/s15516709cog1202_4

42. Sweller, J. (2011). Cognitive load theory. In J. P. Mestre & B. H. Ross (Eds.), The psychology of learning and motivation (Vol. 55, pp. 37–76). San Diego, CA: Academic Press.
43. van Deursen, A. J. A. M., & van Dijk, J. A. G. M. (2011). Internet skills and the digital divide. New Media & Society, 13(6), 893–911. https://doi.org/10.1177/1461444810386774
44. van Dijk, J. A. G. M. (2006). Digital divide research, achievements and shortcomings. Poetics, 34(4–5), 221–235. https://doi.org/10.1016/j.poetic.2006.05.004
45. Venkatesh, V., & Bala, H. (2008). Technology Acceptance Model 3 and a research agenda on interventions. Decision Sciences, 39(2), 273–315. https://doi.org/10.1111/j.1540-5915.2008.00192.x
46. Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. MIS Quarterly, 27(3), 425–478.
47. Venkatesh, V., Thong, J. Y. L., & Xu, X. (2012). Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. MIS Quarterly, 36(1), 157–178.
48. Verma, N. K., Deori, M., & Verma, M. K. (2022). Library services during COVID-19: A usability analysis of websites of the central university libraries in India. DESIDOC Journal of Library and Information Technology, 42(6), 341–353.
49. Wang, R. Y., & Strong, D. M. (1996). Beyond accuracy: What data quality means to data consumers. Journal of Management Information Systems, 12(4), 5–33.
50. Warschauer, M. (2003). Technology and social inclusion: Rethinking the digital divide. Cambridge, MA: MIT Press.
51. Whittemore, R., & Knafl, K. (2005). The integrative review: Updated methodology. Journal of Advanced Nursing, 52(5), 546–553. https://doi.org/10.1111/j.1365-2648.2005.03621.x
52. Xue, L., Mat Rashid, A., & Ouyang, S. (2024). The Unified Theory of Acceptance and Use of Technology (UTAUT) in higher education: A systematic review. SAGE Open, 14(1). https://doi.org/10.1177/21582440241229570
53. Zheng, H., Han, F., Huang, Y., Wu, Y., & Wu, X. (2025). Factors influencing behavioral intention to use e-learning in higher education during the COVID-19 pandemic: A meta-analytic review based on the UTAUT2 model. Education and Information Technologies, 30(9), 12015–12053. https://doi.org/10.1007/s10639-024-13299-2