

Usage of Online Learning Platforms among Computer Science Students in Mogadishu, Somalia: A Cross-Sectional Survey of Adoption, Access, and Transactional Distance

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Abstract

The global diffusion of online learning platforms has transformed higher education, yet evidence on how computer science (CS) students use these tools in post-conflict, low-resource settings such as Somalia remains scarce. This study examined the usage, accessibility, and perceived effectiveness of online learning platforms among CS and related students in Mogadishu, Somalia, interpreting the findings through an integrated lens combining Moore's Theory of Transactional Distance, the Community of Inquiry framework, and technology-acceptance theory (TAM/UTAUT). A quantitative, cross-sectional survey was administered electronically to 314 students through a structured, bilingual (English–Somali) questionnaire. Of the 314 respondents, 276 (87.9%) currently used online learning platforms, and analyses of platform experience were based on these active users. Descriptive statistics were computed, and Pearson's chi-square tests examined associations between usage and demographic characteristics. Coursera, YouTube, and Udemy were the most widely used platforms; most students accessed the internet

from home, and roughly one-third reported slow or very slow connectivity. Attitudes were favourable (68.1% positive or very positive), but three weaknesses were consistent with the international literature: limited clarity of lecturer communication, low peer interaction (55.4% interacting rarely or never), and difficulty of platform use (44.6%). Interpreted through the integrated framework, the results indicate that strong perceived usefulness has driven adoption ahead of the quality of the online experience: weak facilitating conditions, high transactional distance, and low effort expectancy persist. The study recommends targeted investment in connectivity, instructor capacity-building, interactive and mobile-friendly design, and digital-skills training aligned with regional digital agendas.

Keywords: online learning platforms; transactional distance; technology acceptance; digital divide; computer science education; Somalia

Introduction

Online learning platforms that are web-based systems that deliver, manage, and support instruction beyond the physical classroom, have moved from a supplementary convenience to a core pillar of higher education. The urgency of this shift became unmistakable on 11 March 2020, when the World Health Organization declared the COVID-19 pandemic, triggering institutional closures in approximately 193 countries and forcing a rapid, global pivot to “anytime, anywhere” learning (UNESCO, 2020). Massive open online course (MOOC) providers absorbed much of this demand, and MOOC enrolments surged dramatically during this period (Zhu & Doo, 2021).

For students of computer science (CS) and allied disciplines, online platforms are especially consequential. CS learning depends on continuous, hands-on practice and on access to current instructional content that formal curricula in resource-constrained settings cannot always provide. Global platforms such as Coursera, Udemy, edX, freeCodeCamp, and YouTube therefore function as important supplements to, and sometimes substitutes for, classroom instruction. Their value, however, depends not only on whether students can reach them but on whether the resulting experience is pedagogically effective: whether learners perceive the tools as useful and easy to use, whether infrastructure supports sustained engagement, and whether the platforms sustain

the dialogue and social presence that learning requires.

Within the East African Community (EAC), which Somalia joined in 2024, the development of digital skills is a strategic priority under the EAC Vision 2050 and the regional digital-transformation agenda; comparable commitments appear in the frameworks of the Intergovernmental Authority on Development (IGAD), the Arab League, and the digital-education guidance of UNESCO and the International Telecommunication Union (ITU). Yet the realities of online learning in Mogadishu, where electricity, connectivity, and device access are uneven, remain poorly documented, and Somalia rarely features in the empirical literature (Hassan, 2023; Omer, 2015). This absence is consequential: policy for online and blended learning is being formulated regionally and nationally with almost no student-level evidence from Somali institutions, and none, to the authors’ knowledge, specific to CS students, who are simultaneously the heaviest users of these platforms and the future builders of the country’s digital economy.

To move beyond a purely descriptive account, this study interprets its findings through an integrated theoretical framework that couples two established online-learning theories, Moore’s (1993) Theory of Transactional Distance and the Community of Inquiry framework (Garrison, Anderson, & Archer, 2000), with a technology-adoption lens drawn from the Technology

Acceptance Model (Davis, 1989) and the Unified Theory of Acceptance and Use of Technology (Venkatesh, Morris, Davis, & Davis, 2003; Venkatesh, Thong, & Xu, 2012). The first two theories explain the quality of the online experience; the adoption lens explains why students take up and persist with these tools even where infrastructure and pedagogy are weak. Together they frame the study's central empirical puzzle: how adoption and experience quality can diverge in a low-resource setting.

Accordingly, this study aimed to: (i) determine the prevalence of online-learning-platform use among CS students in Mogadishu; (ii) identify the platforms most frequently used; (iii) examine students' internet access and connectivity for learning; (iv) assess attitudes toward online learning and perceptions of lecturer communication, peer interaction, and platform usability; (v) examine associations between platform usage and demographic characteristics; and (vi) derive recommendations for strengthening online learning in Somali higher education. In doing so, the study contributes what is, to the authors' knowledge, the first student-level empirical evidence on online-learning-platform use among Somali computer science students.

Theoretical Framework

This study is guided by an integrated framework that combines two complementary perspectives: theories of the online-learning experience, which explain the quality of mediated instruction, and

theories of technology adoption, which explain why learners take up and continue to use a technology. The integration is deliberate. Experience theories alone can describe pedagogical shortcomings but cannot account for why adoption proceeds despite them; adoption theories alone can predict uptake but are largely silent on instructional quality. Coupling the two allows the study to interpret a setting in which adoption is high while experience quality is not.

Transactional distance and the Community of Inquiry

Moore's (1993) Theory of Transactional Distance conceptualises the "distance" in online education not as physical separation but as a pedagogical and psychological gap shaped by three elements: dialogue (the purposeful, two-way communication between teacher and learner), structure (the rigidity or flexibility of the course design), and learner autonomy (the degree to which learners direct their own learning). Transactional distance increases as dialogue falls and structure rises, and it is moderated by autonomy. Moore further distinguishes three interaction modes, student-teacher, student-student, and student-content, that jointly determine how "close" a distant learning experience feels. Recent empirical work confirms that transactional distance strongly predicts learning engagement and that all three interaction types, together with social presence and autonomous motivation, positively shape engagement (Chen, 2023).

The Community of Inquiry (CoI) framework (Garrison et al., 2000) offers a complementary account, holding that a meaningful online educational experience arises from the interplay of three “presences”: teaching presence (design, facilitation, and direct instruction), social presence (the ability of learners to project themselves socially and emotionally), and cognitive presence (the extent to which learners construct meaning through sustained reflection and discourse). Weak teaching presence maps closely onto the low dialogue of transactional-distance theory, and weak social presence onto impoverished student–student interaction. In this study, students’ ratings of lecturer communication index teaching presence and student–teacher dialogue, their reports of peer interaction index social presence and student–student dialogue, and their preference for independent versus collaborative learning indexes learner autonomy.

An adoption lens: TAM and UTAUT

Whereas transactional-distance and CoI theory explain the quality of the experience, they do not explain why students adopt a platform in the first place or continue using it when the experience is imperfect. For this, the study draws on the Technology Acceptance Model (TAM; Davis, 1989), which holds that behavioural intention to use a technology is driven by two beliefs, perceived usefulness (the degree to which the technology improves performance) and perceived ease of use (the degree to which using

it is effort-free), mediated by attitude toward use. The Unified Theory of Acceptance and Use of Technology (UTAUT; Venkatesh et al., 2003) generalises and extends TAM, identifying four determinants of intention and use: performance expectancy (usefulness), effort expectancy (ease of use), social influence (the perceived expectations of peers and referents), and facilitating conditions (the technical and organisational resources that support use). Its consumer extension, UTAUT2 (Venkatesh et al., 2012), adds hedonic motivation, price value, and habit, and is particularly apt for the voluntary, self-initiated use of free or low-cost MOOC platforms that characterises the present sample.

These constructs map directly onto the study’s measures. Platform-use prevalence indexes use behaviour; perceived ease of use corresponds to TAM’s perceived ease of use and UTAUT’s effort expectancy; favourable attitudes index attitude toward use and behavioural intention; and, crucially, connectivity, device, and institutional access index UTAUT’s facilitating conditions, while peer interaction doubles as an indicator of social influence. The adoption lens generates a specific, testable expectation for a low-resource setting: where perceived usefulness (performance expectancy) is high enough, adoption can proceed even when effort expectancy is unfavourable and facilitating conditions are weak, producing a characteristic “adoption-ahead-of-quality” pattern.

Integrated framework and expectations

Integrating the two perspectives yields the interpretive model that structures the Discussion. High performance expectancy, the recognised, career-relevant value of platforms such as Coursera and YouTube for CS learning, is expected to sustain widespread adoption and favourable attitudes. At the same time, weak facilitating conditions (slow, home- and mobile-dependent connectivity), low effort expectancy (difficulty of use), and high transactional distance (limited lecturer dialogue and sparse peer interaction, indexing weak teaching and social presence) are expected to constrain the quality of the experience. The framework thus predicts a divergence between adoption and experience quality, and it is against this prediction that the empirical results are interpreted.

Literature Review

This review synthesises peer-reviewed evidence across five themes: the global shift to online learning; MOOCs and self-directed learning; interaction, social presence, and transactional distance; technology acceptance in education; and e-learning in Sub-Saharan Africa and Somalia. It concludes by identifying the research gap this study addresses.

The global shift to online learning

The pandemic accelerated a long-running transition toward digital, learner-centred provision (UNESCO, 2020). Learning Management Systems (LMS) such as Moodle and Blackboard organise content delivery, assessment, and tracking, but are frequently

criticised for limited interactivity; a limitation that transactional-distance theory would attribute to high structure combined with low dialogue. Bibliometric analysis confirms a sharp post-2020 growth in online-learning research and a persistent concentration of evidence in high- and middle-income systems; Masalimova et al. (2024), mapping the BRICS literature, show that even large emerging economies are only beginning to generate substantial scholarship, leaving lower-income and post-conflict contexts comparatively understudied. The implication for the present study is that the empirical base on which online-learning policy rests is geographically skewed away from settings like Somalia.

MOOCs and self-directed learning

Because open platforms offer minimal instructor contact, their effectiveness depends heavily on learners' self-directed learning (SDL). Zhu and Doo (2021), in a study of MOOC learners, find that SDL, operationalised as motivation, self-monitoring, and self-management, has a moderate positive relationship with learning strategies and outcomes, underscoring that in low-dialogue environments the learner must supply the regulation the platform does not. Altinpulluk et al. (2023) add that course design and structure strongly shape learners' commitment in self-paced settings, and that motivation to enrol is both intrinsic (curiosity, personal development) and extrinsic (supporting formal study and careers). These findings are

directly relevant to CS students, who rely on Coursera, Udemy, and YouTube for practice-oriented, self-paced learning, and they anticipate this study's finding that students favour independent over collaborative learning; a high-autonomy orientation in Moore's terms.

Interaction, social presence, and transactional distance

Moore's (1993) Theory of Transactional Distance frames the "distance" in online education as a function of dialogue, structure, and learner autonomy, and distinguishes three interaction modes: student-teacher, student-student, and student-content. Chen (2023), in a chain-mediation study of college students, shows that transactional distance strongly and negatively predicts learning engagement, and that this relationship is mediated by social presence and autonomous motivation; evidence that the mechanisms Moore proposed operate empirically. The CoI framework (Garrison et al., 2000) similarly emphasises social, cognitive, and teaching presence as jointly necessary for a meaningful educational experience. Taken together, these frameworks imply that the weak instructor communication and low peer interaction examined in the present study should undermine the quality of online learning even where access exists; a prediction the present results permit testing in a Somali sample.

Technology acceptance in education

A parallel literature explains not the quality of the experience but its uptake. TAM (Davis, 1989)

established perceived usefulness and perceived ease of use as the proximal drivers of technology use, and remains among the most widely validated models in educational technology. UTAUT (Venkatesh et al., 2003) integrated eight prior models into four determinants: performance expectancy, effort expectancy, social influence, and facilitating conditions. Its consumer extension UTAUT2 (Venkatesh et al., 2012) added hedonic motivation, price value, and habit for voluntary settings. In educational technology, these models consistently identify performance expectancy as the strongest predictor of intention, with effort expectancy and facilitating conditions gaining weight where infrastructure is constrained. This literature motivates the present study's attention to ease of use, attitudes, and access as measured correlates of adoption, and it supplies the vocabulary, facilitating conditions, effort expectancy, needed to interpret why adoption can outrun experience quality in a low-resource context.

E-learning in Sub-Saharan Africa and Somalia

Across Sub-Saharan Africa, the benefits of online learning are constrained by infrastructural deficits. Kafle et al. (2025), in a mixed-methods study of extended-curriculum students in South Africa, document a pronounced digital divide driven by unreliable connectivity, limited device access, high data costs, and uneven digital literacy, precisely the facilitating-condition failures that adoption theory predicts will depress use behaviour and satisfaction. Evidence

from Somalia is thinner but consistent: Hassan (2023) reports that Somali university students are broadly positive about e-learning while citing low internet penetration, very low computer ownership, affordability barriers, and rural-urban inequalities as the principal constraints; Omer (2015) documents the same tensions among novice e-learning users in a Somali university; and contemporaneous accounts of the country's COVID-19 shift to online learning reinforce the pattern (ReliefWeb, 2020). Domestic scholarship on the wider digitalisation of Somali institutions is likewise emerging: Hussein and Sharif (2025) assess digital skills and training in Somali government institutions, and Hirsi and Sharif (2026) examine the adoption of artificial intelligence in Mogadishu university curricula; both signalling growing but still nascent capacity.

Research gap

Although the international literature on online learning is substantial, empirical evidence from Somalia, and from Somali computer science students specifically, is almost absent, and existing Somali studies are largely secondary reviews or institution-level assessments rather than student-level surveys of platform usage. No study, to the authors' knowledge, jointly examines adoption and experience quality among Somali CS students, or interprets the Somali case through both online-learning and technology-adoption theory. This study addresses that gap by providing a quantitative, student-level

examination of online-learning-platform usage, accessibility, and perceived effectiveness among CS students in Mogadishu, Somalia.

Methodology

Research design

A quantitative, cross-sectional descriptive survey design was employed. This design is appropriate for collecting data at a single point in time and for systematically describing patterns in the behaviours, perceptions, and attitudes of a defined population (Creswell, 2014).

Setting and study period

The study was conducted in Mogadishu, Somalia, among students enrolled in computer science and related programmes. Data were collected in 2026.

Study population and sampling

The target population comprised computer science and related students in Mogadishu. A total of 314 students were recruited using a systematic sampling approach, based on availability and willingness to participate. Participation was voluntary and anonymous. The achieved sample size is adequate for the descriptive and chi-square analyses reported, providing narrow confidence intervals around the principal proportions.

Data collection instrument

Data were collected using a structured, self-administered questionnaire comprising twelve items distributed electronically via Google Forms. The questionnaire was bilingual (English and Somali) to maximise comprehension, and

covered: (i) sociodemographic characteristics (age, sex, programme); (ii) current use of online learning platforms; (iii) platforms used and points of internet access; (iv) connection speed; and (v) perceptions of attitudes, lecturer communication, peer interaction, and usability. Perceptual items used ordinal, Likert-type response scales. The instrument was reviewed for clarity and cultural appropriateness prior to deployment.

Data analysis

Data were analysed using Python (pandas, scipy). Descriptive statistics, frequencies and percentages, were computed for all variables. Items permitting multiple responses (platforms used; points of internet access) were disaggregated using binary indicator coding. Bivariate associations between categorical variables were assessed using Pearson's chi-square (χ^2) test of independence, with $p < 0.05$ as the threshold for statistical significance. Cross-tabulations examined platform usage by sex, age, and programme. Where expected cell counts fell below five, results were interpreted with appropriate caution.

Ethical considerations

The study was reviewed and approved by the Somalia Researchers Association (SRA). All participation was voluntary. Informed consent was obtained electronically prior to data collection, after participants were informed of the study's purpose and their right to withdraw at any point without penalty. No personally

identifying information was collected, and respondents were assured of the anonymity and confidentiality of their responses. Data were stored securely and used solely for research purposes.

Results

Table 1 presents the sociodemographic characteristics of the 314 respondents. The sample was majority female (161, 51.3%). Respondents were predominantly young: 137 (43.6%) were aged 18–20 and 103 (32.8%) aged 21–29. Computer Science (69, 22.0%) and Web Development (67, 21.3%) were the most common programmes.

Table 1. Sociodemographic characteristics

Characteristic	n (%)
Sex	
Female	161 (51.3%)
Male	153 (48.7%)
Age	
Under 18	58 (18.5%)
18–20	137 (43.6%)
21–29	103 (32.8%)
30+	16 (5.1%)
Programme of study	
Computer Science	69 (22.0%)
Web Development	67 (21.3%)
IT	50 (15.9%)
Data Science & Artificial Intelligence (AI)	49 (15.6%)
Programming & Software Development	42 (13.4%)
Cybersecurity & Networking	32 (10.2%)
Other	5 (1.6%)

Table 2 presents the prevalence of platform use. An overwhelming 276 (87.9%) of respondents currently used online learning platforms, against 38 (12.1%) who did not. Usage did not differ significantly by sex ($\chi^2 = 1.933$, $p = 0.164$), age (χ^2

= 1.873, $p = 0.599$), or programme ($\chi^2 = 3.038$, $p = 0.694$). All subsequent analyses are based on the 276 active users.

Table 2. Use of online learning platforms

Uses online learning platforms	n (%)
Yes	276 (87.9%)
No	38 (12.1%)

Table 3 and Figure 1 present the platforms used by the 276 active users (multiple responses permitted). The most widely used were Coursera (162, 58.7%), YouTube (158, 57.2%), and Udemy (158, 57.2%). Specialised coding resources (Codecademy, freeCodeCamp, Stack Overflow) were used by smaller but meaningful proportions, indicating that students supplement broad course platforms with practice-oriented tools — consistent with the self-directed-learning patterns reported for CS MOOC users (Zhu & Doo, 2021).

Table 3. Online learning platforms used

Platform	n (%)
Coursera	162 (58.7%)
YouTube	158 (57.2%)
Udemy	158 (57.2%)
Codecademy	53 (19.2%)
freeCodeCamp	52 (18.8%)
Stack Overflow	51 (18.5%)
EdX	30 (10.9%)

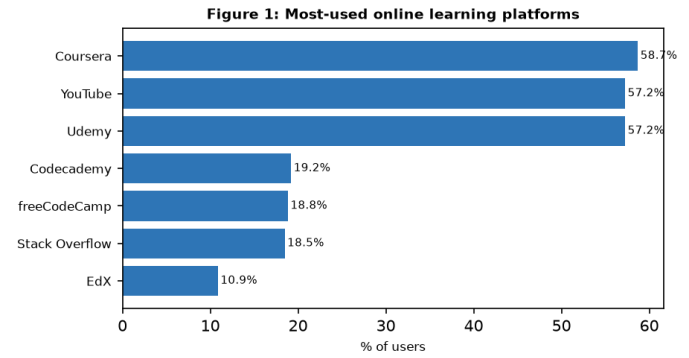


Figure 1. Most-used online learning platforms (% of the 276 active users).

Table 4 reports where students usually access the internet for learning. The home was the dominant access point, followed by mobile phones and the university campus, underscoring reliance on personal and domestic connectivity rather than institutional provision — a recognised driver of the African digital divide (Kafle et al., 2025).

Table 4. Point of internet access

Access point	n (%)
At home	216 (78.3%)
On your mobile phone	108 (39.1%)
At the university	61 (22.1%)

Table 5 and Figure 3 present connection speed. A plurality reported a normal connection (136, 49.3%), but 99 respondents (35.9%) reported slow or very slow connectivity — a structural constraint on sustained online learning.

Table 5. Internet connection speed

Connection speed	n (%)
Very fast	9 (3.3%)
Fast	32 (11.6%)
Normal	136 (49.3%)
Slow	66 (23.9%)
Very slow	33 (12.0%)

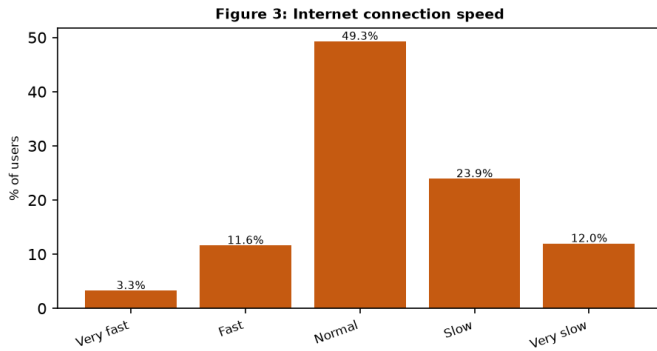


Figure 3. Self-reported internet connection speed (% of active users).

Table 6 and Figure 2 present attitudes toward online learning. Attitudes were predominantly favourable: 122 (44.2%) positive and 66 (23.9%) very positive, together 68.1%, against only 32 (11.6%) negative or very negative.

Table 6. Attitude toward online learning

Attitude	n (%)
Very positive	66 (23.9%)
Positive	122 (44.2%)
Neutral	56 (20.3%)
Negative	21 (7.6%)
Very negative	11 (4.0%)

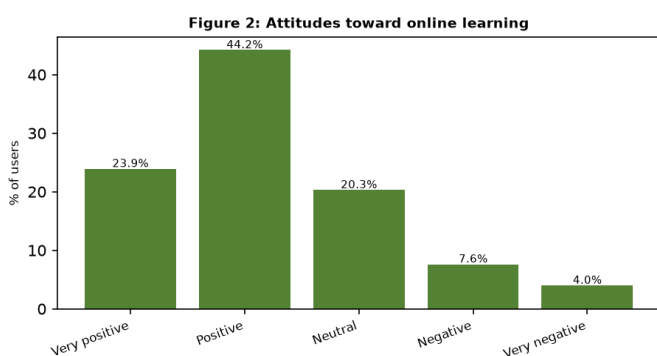


Figure 2. Attitudes toward online learning (% of active users).

Table 7 presents perceptions of lecturer communication. Only 47 respondents (17.0%) rated it clear or very clear, while 105 (38.0%)

rated it unclear or very unclear and the largest group was neutral (124, 44.9%). Weak teaching presence is a recognised contributor to transactional distance (Garrison et al., 2000; Moore, 1993).

Table 7. Clarity of lecturer communication

Lecturer communication	n (%)
Very clear and effective	14 (5.1%)
Clear	33 (12.0%)
Neutral	124 (44.9%)
Unclear	58 (21.0%)
Very unclear and ineffective	47 (17.0%)

Table 8 and Figure 4 present peer interaction. Interaction was low: 100 (36.2%) interacted rarely and 53 (19.2%) never, so that 153 (55.4%) interacted rarely or never; a critical weakness given the socially situated nature of CS learning and the role of student–student interaction in engagement (Chen, 2023).

Table 8. Frequency of peer interaction

Peer interaction	n (%)
Very often	13 (4.7%)
Often	37 (13.4%)
Sometimes	73 (26.4%)
Rarely	100 (36.2%)
Never	53 (19.2%)

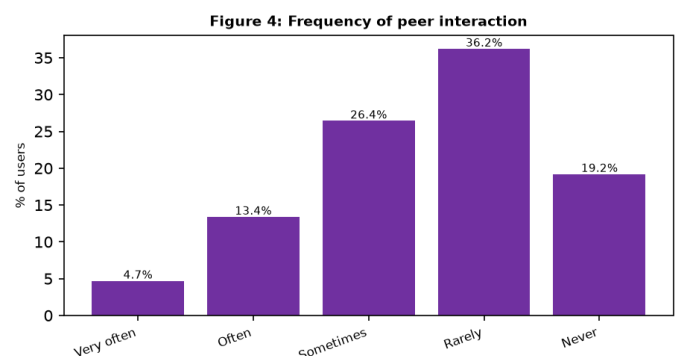


Figure 4. Frequency of peer interaction during online learning (% of active users).

Table 9 presents perceived ease of use. A combined 123 respondents (44.6%) found the platforms difficult or very difficult to use, exceeding the 74 (26.8%) who found them easy or very easy, indicating usability as a meaningful barrier.

Table 9. Ease of use

Ease of use	n (%)
Very easy	16 (5.8%)
Easy	58 (21.0%)
Neutral	79 (28.6%)
Difficult	87 (31.5%)
Very difficult	36 (13.0%)

Table 10 presents the preferred self-learning method. Independent (without-groups) learning led (129, 46.7%), exceeding collaborative learning (84, 30.4%), while 63 (22.8%) regarded the two as equivalent, echoing the self-directed orientation characteristic of MOOC learners (Zhu & Doo, 2021).

Table 10. Preferred self-learning method

Self-learning method	n (%)
Learning without groups (independent)	129 (46.7%)
Learning with groups (collaborative)	84 (30.4%)
Both are the same	63 (22.8%)

Discussion

Interpreted through the integrated framework set out in Section 2, the results tell a coherent story: strong perceived usefulness has driven near-universal adoption of online learning platforms, but weak facilitating conditions, low effort expectancy, and high transactional distance have kept the quality of the experience from keeping pace. Each element of this pattern is examined below.

Widespread adoption and the primacy of self-directed learning

The finding that 87.9% of respondents use online learning platforms confirms that these tools are now embedded in the study practices of CS students in Mogadishu, consistent with the global, pandemic-accelerated shift to digital learning (UNESCO, 2020). In technology-acceptance terms, this near-universal uptake signals very high performance expectancy: CS students evidently perceive platforms such as Coursera, Udemy, and YouTube as indispensable to acquiring current, practice-oriented, career-relevant skills that formal curricula supply only partly. That adoption did not differ significantly by sex, age, or programme indicates that this perceived usefulness is broadly shared rather than concentrated in a sub-group. The dominance of Coursera, Udemy, and YouTube, and the preference for independent over collaborative learning (46.7% versus 30.4%), mirror the self-directed patterns documented for MOOC users (Altinpulluk et al., 2023; Zhu & Doo, 2021). In Moore's (1993) terms, this is a high-autonomy learner population — an orientation that partly compensates for low dialogue but also places the entire regulatory burden on the student.

Connectivity and the digital divide: weak facilitating conditions

That roughly one-third of users (35.9%) reported slow or very slow connectivity, and that access depended on home (78.3%) and mobile (39.1%) rather than institutional networks (22.1%), situates the Somali case squarely within the Sub-

Saharan African digital divide (Kafila et al., 2025) and the broader constraints documented for Somali higher education — low internet penetration, low device ownership, and affordability barriers (Hassan, 2023; Omer, 2015). In UTAUT terms, these are failures of facilitating conditions: the technical and organisational resources that should support sustained use are largely absent from the institutional setting and displaced onto students' own homes and phones. The reliance on mobile access is doubly significant, because it interacts with the usability problems discussed below: platforms not optimised for small screens and intermittent connections impose a compounding penalty precisely where facilitating conditions are weakest.

Transactional distance: communication and interaction gaps

Despite favourable attitudes (68.1% positive or very positive), the study exposes high transactional distance. Lecturer communication was clear or very clear for only 17.0% of users, and peer interaction was low, with 55.4% interacting rarely or never. Interpreted through Moore's (1993) framework and the CoI model (Garrison et al., 2000), these results indicate simultaneously weak teaching presence (low student-teacher dialogue) and weak social presence (impoverished student-student interaction); the two conditions that Chen (2023) shows empirically to depress learning engagement through reduced social presence and autonomous motivation. The favourable overall

attitude therefore coexists with a structurally thin educational experience: students value the content they can reach (high performance expectancy) even as the dialogic and social scaffolding around that content remains sparse. This is the signature of an experience carried by student-content interaction while student-teacher and student-student interaction lag.

Usability and effort expectancy

That 44.6% of users found the platforms difficult or very difficult to use, against only 26.8% who found them easy, points to low effort expectancy in UTAUT terms, or low perceived ease of use in TAM terms. Acceptance theory predicts that low ease of use ordinarily suppresses adoption; the fact that adoption is nonetheless near-universal here is the clearest evidence that performance expectancy is doing the heavy lifting — students are absorbing a substantial usability cost because the perceived usefulness is high. This is an unstable equilibrium: sustained or increased ease of use (through mobile-optimised, lower-bandwidth, better-scaffolded design) would convert reluctant, effortful use into more durable, higher-quality engagement, whereas persistent difficulty risks attrition among exactly the students whose connectivity is weakest.

Overall interpretation and implications

Read together, the findings confirm the framework's central prediction: adoption has outpaced experience quality. High performance expectancy sustains near-universal, positively regarded use, while weak facilitating conditions

(connectivity, devices, institutional support), low effort expectancy (usability), and high transactional distance (thin teaching and social presence) limit what that use delivers pedagogically. The policy implication is that access-focused interventions alone will not realise the benefits of online learning for Somali CS education. Because the binding constraints are distributed across infrastructure, pedagogy, and design, remedies must be equally distributed: connectivity investment to repair facilitating conditions, instructor capacity-building to raise teaching presence, structured interaction to raise social presence, and usable, mobile-friendly design to raise effort expectancy. Targeting any one of these in isolation would leave the others as bottlenecks.

Limitations and Future Research

Several limitations should be borne in mind when interpreting these findings. First, the study was confined to a single city, Mogadishu; while Mogadishu is Somalia's largest concentration of higher-education institutions and CS students, connectivity, institutional resourcing, and platform access differ across Somali regions, so the results should not be generalised to the whole country or to rural settings without caution. Second, all measures are self-reported, and self-report is subject to recall and social-desirability bias; perceived connection speed, ease of use, and interaction frequency were not corroborated by objective or log data. Third, the design is cross-sectional, capturing a single point in time and

therefore precluding causal inference and any assessment of how usage or attitudes evolve; the associations reported (including the non-significant chi-square results) describe co-occurrence, not causation. Fourth, the questionnaire relied largely on single-item, ordinal indicators rather than validated multi-item scales, so the latent constructs of the theoretical framework; perceived usefulness, effort expectancy, teaching and social presence, were indexed rather than fully measured, and instrument reliability was not formally estimated. Finally, sampling was based on availability and willingness to participate, which may under-represent students with the weakest connectivity, who are hardest to reach through an online instrument — a bias that, if anything, would understate the access problems reported here.

Future research should employ larger, multi-institution and multi-region samples to establish generalisability across Somalia; combine self-report with objective measures (platform analytics, connectivity logs); adopt longitudinal designs to trace how adoption and experience quality change over time; deploy validated multi-item instruments so that the constructs of transactional distance, the Community of Inquiry, and technology acceptance can be modelled directly (for example, through structural equation modelling); and add qualitative methods (interviews, focus groups) to illuminate the lived experience behind the numbers, particularly the

mechanisms linking weak facilitating conditions to reduced engagement.

Conclusion

This study provides one of the first student-level empirical examinations of online-learning-platform usage among computer science students in Mogadishu, Somalia. Drawing on a cross-sectional survey of 314 students and interpreting the results through an integrated framework combining transactional-distance theory, the Community of Inquiry, and technology-acceptance theory, it demonstrates that online learning is now widespread (87.9%) and broadly valued, with Coursera, Udemy, and YouTube the most used platforms.

At the same time, it identifies consistent challenges: slow connectivity for a substantial minority (35.9%), frequently unclear lecturer communication, low peer interaction (55.4% rarely or never), and usability barriers (44.6%). Framed theoretically, these weaknesses reflect strong perceived usefulness coexisting with weak facilitating conditions, low effort expectancy, and high transactional distance — in short, adoption running ahead of experience quality. Addressing these gaps will require coordinated action by universities, the National Commission for Higher Education (NCHE), the Ministry of Education, and regional and international partners under the EAC, IGAD, and Arab League frameworks, so that the evident enthusiasm of Somali CS students for online learning translates into demonstrably effective learning outcomes.

Recommendations

For universities: invest in campus connectivity and learning infrastructure to strengthen facilitating conditions; train students and lecturers in effective platform use; and embed structured interaction (live sessions, forums, group activities) to raise teaching and social presence and thereby reduce transactional distance.

For the NCHE and the Ministry of Education: develop national standards and guidance for online and blended learning, and support the integration of recognised platforms into CS curricula.

For platform designers and providers: improve usability and mobile compatibility, given heavy reliance on mobile access and the high proportion reporting difficulty of use, so as to lower effort expectancy for low-bandwidth users.

For regional and international partners: support internet-infrastructure development and digital-skills programmes under the EAC, IGAD, and Arab League frameworks to widen equitable access.

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