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Development of a Mobile Application for Social Media Duration Tracking

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Abstract

Self-report methods are known to inadequately represent actual social media use, limiting the accuracy of duration-comparison research among adolescents. This second-year study addressed this limitation by developing SociaLog, an Android mobile application that automatically logs students' social media duration and frequency of use. Using a Research and Development approach combined with the Prototyping software development model, the application was designed through five phases: requirements gathering, quick design, prototype building, user evaluation, and refinement. A preliminary needs analysis (n = 10) established four functional requirements, prioritizing automatic logging and graph-based reporting. The prototype was trial-tested on 100 vocational high school students from two schools in Makassar, Indonesia, over a one-week period. Logged data showed an average daily social media use of 7.46-8.63 hours, dominated by WhatsApp and TikTok. A 27-item usability questionnaire demonstrated strong item validity (r = 0.65-0.88) and excellent reliability (Cronbach's alpha = 0.980). Non-parametric tests indicated consistently high user acceptance across schools (Mann-Whitney U, p = 0.304) and evaluation dimensions (Kruskal-Wallis, p = 0.846). These findings indicate that SociaLog offers a valid, reliable, and well-accepted alternative to self-reported social media duration measurement among adolescents.

Keywords*—social media; mobile application; Prototyping model; usability testing; vocational school.*

1. Introduction

Adolescents' social media use has risen substantially in recent years, and problematic patterns of use are now recognized as a public health concern associated with poorer sleep, mental well-being, and academic engagement. Accurately measuring how long adolescents actually spend on social media is therefore a necessary first step before any intervention, policy, or parental guidance can be designed. However, most duration data reported in prior studies, including school-based studies in Indonesia, rely on self-report instruments in which respondents estimate their own usage from memory.

Self-report measures are known to be a weak proxy for actual digital behavior. Ellis et al. (2019) found that self-report scales of smartphone use do not reliably predict objectively logged behavior, a discrepancy further confirmed by Zhao et al. (2025) in a large cohort study that identified systematic measurement gaps between adolescents' self-reported and objectively logged screen media activity. A systematic review and meta-analysis by Parry et al. (2021) similarly confirmed that the correlation between logged and self-reported digital media use

across 106 effect sizes is only moderate (r = 0.38). This discrepancy motivated the first year of this research program, which compared self-reported social media duration among vocational high school (Sekolah Menengah Kejuruan/SMK) students in Parepare, Indonesia, and found daily use of approximately 6-7 hours per day, but was constrained by the same self-report limitation.

To address this methodological gap, the second year of this research program focused on developing SociaLog, a mobile application capable of automatically recording social media duration and frequency, thereby removing reliance on memory-based estimation. Beyond automatic logging, the application also needed to be genuinely usable by adolescent users; an application that is accurate but difficult to understand or operate would still fail to produce reliable long-term data. Consequently, this study pursued two objectives: (1) to develop a mobile application prototype that supports the exploration and analysis of social media usage data, and (2) to evaluate, through a limited field trial, the extent to which the prototype is understandable, easy to use, and appropriate for logging students' social media duration.

Beyond its primary logging function, preliminary needs analysis in this study also surfaced an unanticipated use case: several respondents indicated that such an application would be valuable not only for students' self-monitoring but also to help parents supervise and limit excessive social media use in children. This finding is discussed further as a direction for future development.

The remainder of this article is organized as follows. Section 2 describes the Research and Development approach, the Prototyping model used to design and build the application, the participants, instruments, and statistical procedures. Section 3 presents the results of the needs analysis, the prototype design, the descriptive duration data collected during the field trial, and the validity, reliability, and acceptance testing of the application, followed by a discussion of these findings in relation to prior literature. Section 4 concludes the article.

2. Method

This study employed a Research and Development (R&D) approach at its preliminary stage, combined with a quantitative descriptive approach, consistent with the overall multi-year roadmap of this research program. R&D is well suited to studies that aim to produce and validate a practical product rather than merely test a hypothesis (Rahayu, 2025; Okpatrioka, 2023), and has been argued to serve as a viable primary alternative to conventional research design frameworks in applied, product-oriented studies such as this one (Umar et al., 2023).

2.1 Research Design: The Prototyping Model

The application was designed and built using the Prototyping model of the System Development Life Cycle (SDLC), an iterative, user-centered model that is well suited to problems in which functional requirements are informed by direct user feedback rather than being fully specified in advance (Szabó & Hercegfi, 2023). The Prototyping model comprises five phases: (1) requirements gathering, (2) quick design, (3) prototype building, (4) user evaluation, and (5) refinement, and was chosen because it aligns with the exploratory, feedback-driven nature of the R&D approach adopted for this research program.

2.2 Participants

Two participant groups were involved at different stages. For the preliminary needs analysis, 10 respondents (students and teachers) were purposively involved to identify functional requirements prior to development. For the limited field trial, 100 students (approximately 50 per school) from SMKN 9 Makassar and SMKN 10 Makassar, Indonesia, were selected using random sampling, consistent with the sampling approach used in the first year of this research program. Data logging took place over a one-week period (11-17 July 2026).

2.3 Instruments

Three instruments were used. First, following a user needs identification approach for requirements elicitation (Khalil et al., 2024), a needs-analysis questionnaire consisting of 24 Likert-scale (1-5) items across four dimensions (social media usage condition, problems encountered, application needs, and display/visualization needs) was administered to the preliminary respondents, supplemented by a semi-structured interview guide of 10 core questions developed following recommended practice for questionnaire construction in requirements elicitation via interviews (Wahbeh et al., 2020). Second, the mobile application itself served as an automatic logging instrument, recording the duration (minutes/seconds) and open frequency of each social media application used per day. Third, a 27-item usability questionnaire, using a 1-5 Likert scale across four dimensions, comprehension of features, ease of use, appropriateness for logging social media duration, and perceived advantage over self-report, was administered to all 100 trial participants, consistent with usability evaluation practices recommended for mobile applications (Johnson et al., 2020).

2.4 Development Procedure

Requirements identified in the needs analysis (automatic logging, graph-based daily/weekly reporting, a minimalist interface, and a browsable usage history) were translated into a quick design comprising the application's navigation structure and a low-fidelity wireframe. The prototype, named SociaLog, was then built using Android Studio with the Kotlin programming language, implementing five main menus accessible through a navigation drawer: Status, Daily Comparison, Usage Graph, Screenshot Gallery, and Social Media Ethics. The prototype was subsequently evaluated by the 100 field-trial participants, and findings from this evaluation, most notably the parental-monitoring use case, were identified as input for the refinement phase of a subsequent development cycle.

2.5 Data Analysis

Descriptive statistics (means, percentages) were computed for both the needs-analysis scores and the logged duration data. Prior to inferential testing, the Shapiro-Wilk test was used to assess normality (Gosselin, 2024; Midway & White, 2025) and Levene's test was used to assess homogeneity of variance (Zhou et al., 2023) for both the duration data and the usability data. Item-total Pearson correlation was used to assess the validity of the usability instrument, and Cronbach's alpha (Cronbach, 1951) was used to assess its reliability. Because the usability scores were not normally distributed, between-group comparisons were conducted using the non-parametric Mann-Whitney U test (between schools) and Kruskal-Wallis test (between the four usability dimensions), following the guidance of Chicco et al. (2025) and Clark et al. (2023) for selecting non-parametric alternatives when normality assumptions are violated. During data screening, respondents who gave an identical response to all 27 usability items (a straight-lining response pattern) were flagged following the detection criteria described by Curran (2016).

2.6 Software Architecture and Algorithm Design

Beyond the functional description provided above, this subsection documents the software architecture and core algorithm implemented in SociaLog at the source-code level, addressing the technical depth expected of a systems and computer engineering contribution.

1) Architectural Pattern

SociaLog follows the Model-View-ViewModel (MVVM) architectural pattern (Szabó & Hercegfi, 2023), illustrated in Figure A. The View layer consists of Android Fragments (e.g., UsageStatsFragment), which are responsible solely for rendering UI state and forwarding user interaction events. The ViewModel layer (e.g., UsageStatsViewModel, extending AndroidViewModel) exposes UI state through LiveData and performs asynchronous work via Kotlin Coroutines (viewModelScope, Dispatchers.IO) to keep the UI thread unblocked during data computation. Rather than a conventional repository backed by a persistent local database, the data-access role is fulfilled by SocialMediaTrackerService, an Android bound Service that wraps the system UsageStatsManager and exposes the aggregation algorithm described below through a LocalBinder interface; ViewModels bind to this service via a ServiceConnection and invoke its suspend function calculateUsageForDate() to retrieve on-demand statistics.

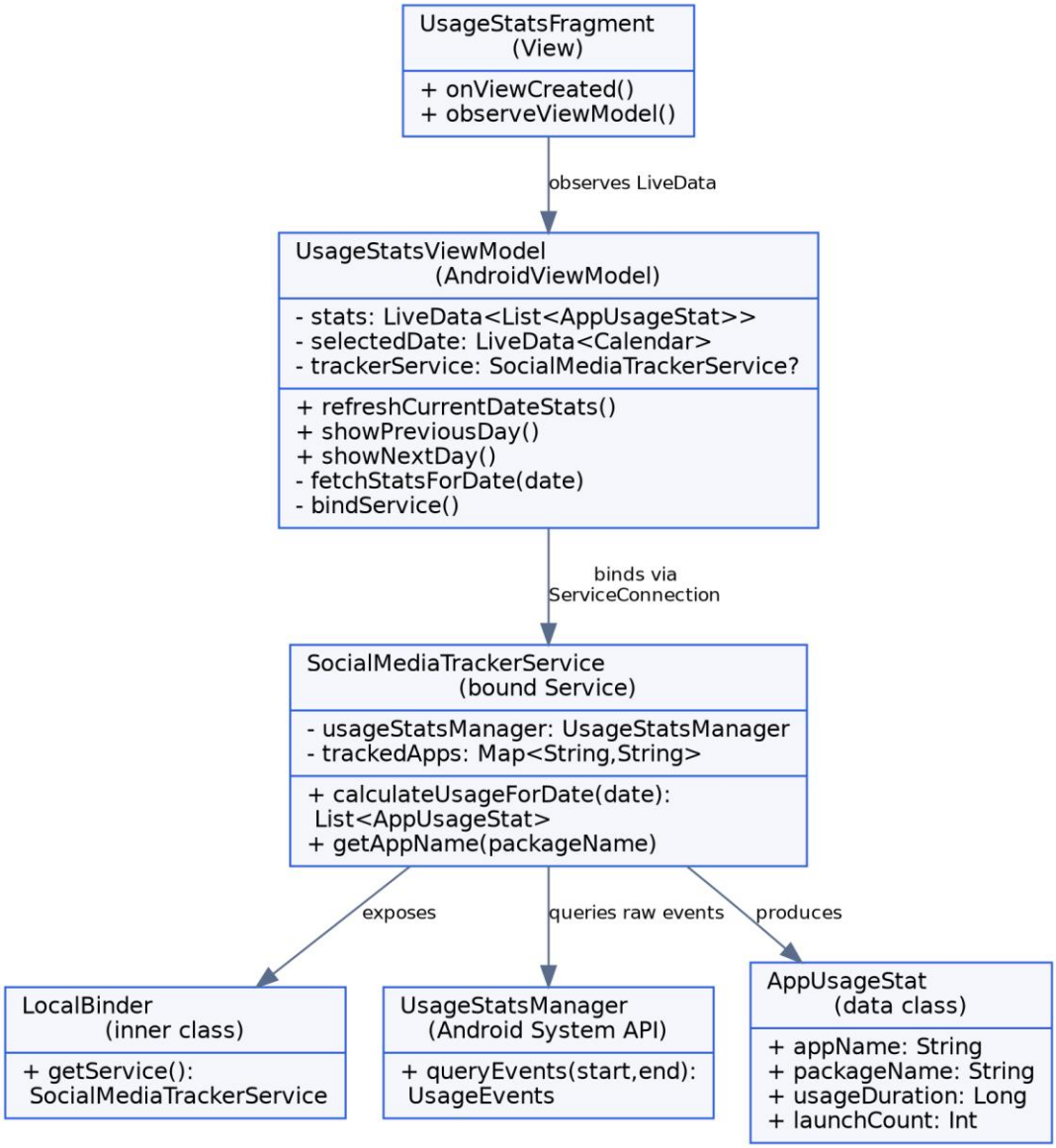


Figure 1. Class-level architecture diagram of the MVVM pattern implemented in SociaLog.

This is a deliberate architectural trade-off rather than an omission: SociaLog intentionally does not maintain its own persistent local database, recomputing usage statistics on demand directly from the Android system's authoritative usage-event log each time a screen is

opened or a date is navigated to. This avoids data-duplication and synchronization issues between an app-local store and the system's own record, at the cost of recomputation overhead on each query, an overhead that is quantified in Section 3.G.

2) Event-to-Duration Aggregation Algorithm

The core technical contribution of SociaLog lies in how it derives per-platform duration and open-frequency statistics. Rather than calling Android's coarse aggregate API (UsageStatsManager.queryUsageStats()), which is known to produce imprecise figures on several Android versions, SociaLog implements a custom event-stream reconstruction algorithm operating on raw UsageEvents:

(1) Raw foreground/background transition events are retrieved for the target date range via queryEvents(startOfDay, endOfDay). (2) Events are processed sequentially in a single pass; whenever the previously tracked foreground application differs from the arriving event and a MOVE_TO_FOREGROUND transition is observed, the elapsed time since the last recorded event timestamp is computed as a duration delta and accumulated into a thread-safe ConcurrentHashMap keyed by package name, while foreground-entry events are separately tallied to derive open-frequency counts. (3) Because several social media platforms are distributed under multiple Android package name variants (e.g., TikTok as com.zhiliaoapp.musically and com.ss.android.ugc.trill; Instagram as com.instagram.android and com.instagram.lite), a package-to-platform normalization step aggregates all variant packages into a single unified per-platform duration and launch-count figure before results are returned, sorted by descending duration. This single-pass, O(n) event reconstruction with cross-variant normalization is what enables SociaLog to produce the precise, platform-level figures reported in Section 3.C, and is illustrated end-to-end in the sequence diagram in Figure B.

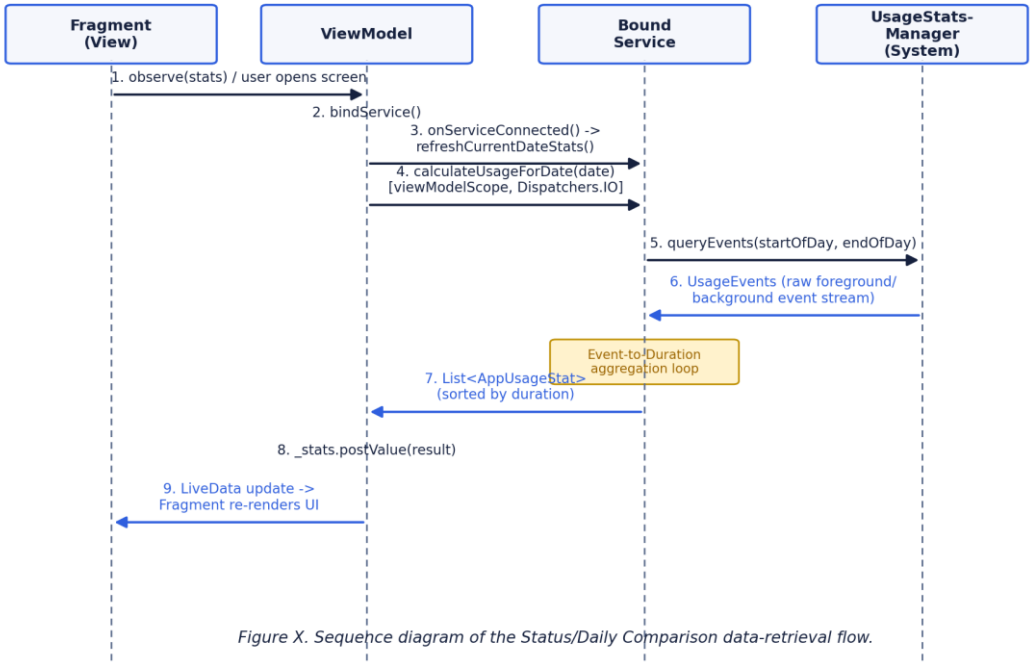


Figure 2. Sequence diagram of the data-retrieval flow, from user interaction through the event-aggregation algorithm to UI update.

3) High-Level System Data Flow

In response to reviewer feedback requesting a clearer, higher-level explanation of the end-to-end data pipeline, Figure C presents the system's data flow at the level of Collection, Processing, Storage, and Visualization stages, complementing the class- and sequence-level diagrams above. Raw usage events are collected from the Android system log, processed by the event-to-duration aggregation algorithm described above, held only in an in-memory, session-scoped cache (LiveData) rather than a persistent local database, consistent with the stateless-by-design architecture explained earlier, and finally rendered as charts and lists in the visualization layer. Any subsequent screen refresh or date navigation triggers a fresh collection-processing cycle rather than a read from stored history.

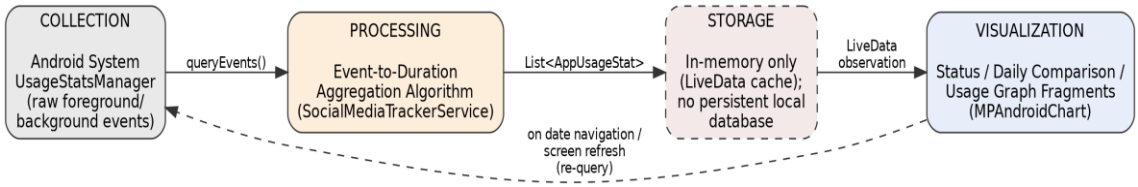


Figure 3.. High-level system data flow: Collection → Processing → Storage → Visualization.

3. Results And Discussion

This section presents the findings of this study following the sequence of the Prototyping development cycle, beginning with the results of the preliminary needs analysis that informed the application's functional requirements, followed by the resulting prototype design, the descriptive duration data obtained from the field trial, and the statistical testing of normality, validity, reliability, and user acceptance of the SociaLog application. Each subsection is discussed in relation to relevant prior literature to situate the findings within the broader context of automated social media monitoring and mobile application usability research.

3.1 Needs Analysis

The preliminary needs analysis (n = 10) produced an overall mean score of 4.33 out of 5, indicating a high perceived need for an automated social media duration logging application. As shown in Table 1, the highest-scoring dimension was application needs (mean = 4.61), while the lowest was social media usage condition (mean = 4.00), suggesting that respondents were more focused on concrete application features than on acknowledging their own usage patterns.

Table 1. Mean Needs-Analysis Score per Dimension (n = 10).

Dimension	Mean Score (1-5)
Social media usage condition	4.00
Problems encountered	4.12
Application needs	4.61
Display and visualization needs	4.36

The complementary semi-structured interviews reinforced this quantitative pattern. One respondent explicitly noted that such an application would be needed "to control students' social media use and make it easier for parents to minimize excessive social media use among their children." This insight was not anticipated in the original research proposal but is discussed further as a direction for future development.

3.2 Prototype Design

Based on the identified requirements, SociaLog was designed with five main menus: Status (per-application daily duration and open frequency, with date navigation), Daily Comparison (a bar chart of combined daily duration across all platforms), Usage Graph (a line chart of five-day usage trends per platform), Screenshot Gallery (automatically archived daily usage charts), and Social Media Ethics (educational content on privacy, critical thinking before sharing, and self-regulating usage time). Following a user-centered interaction design approach (Caschera & Guzzo, 2026), the interface adopted a consistent blue color scheme, recognizable icons, and minimalist layout, in line with the display preferences identified in the needs analysis (dimension mean = 4.36). Figure 1 shows the low-fidelity wireframe used during the quick-design phase, and Figure 2 shows screenshots of the implemented prototype.

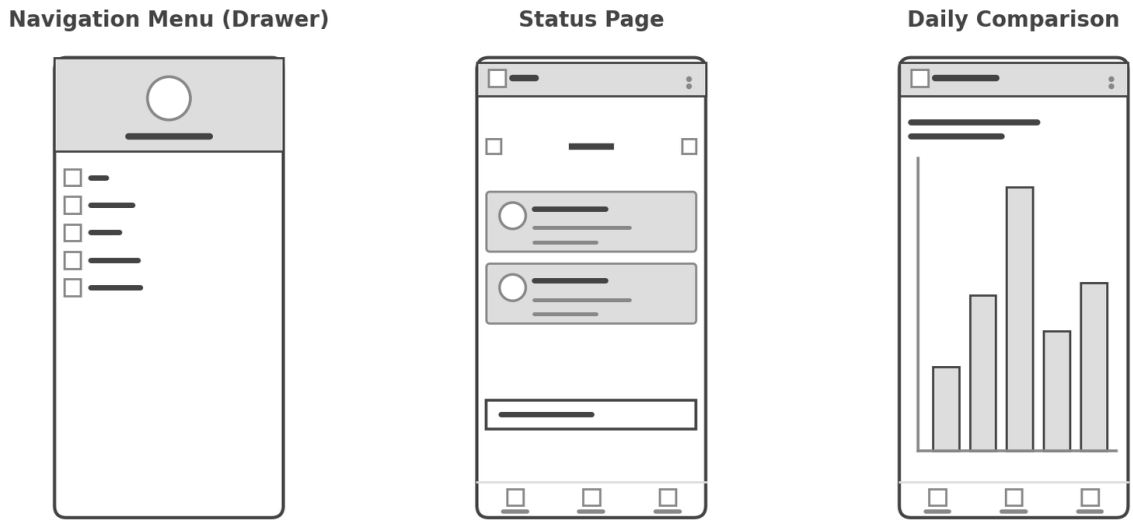


Figure 4. Low-fidelity wireframe of the navigation menu, Status page, and Daily Comparison page.

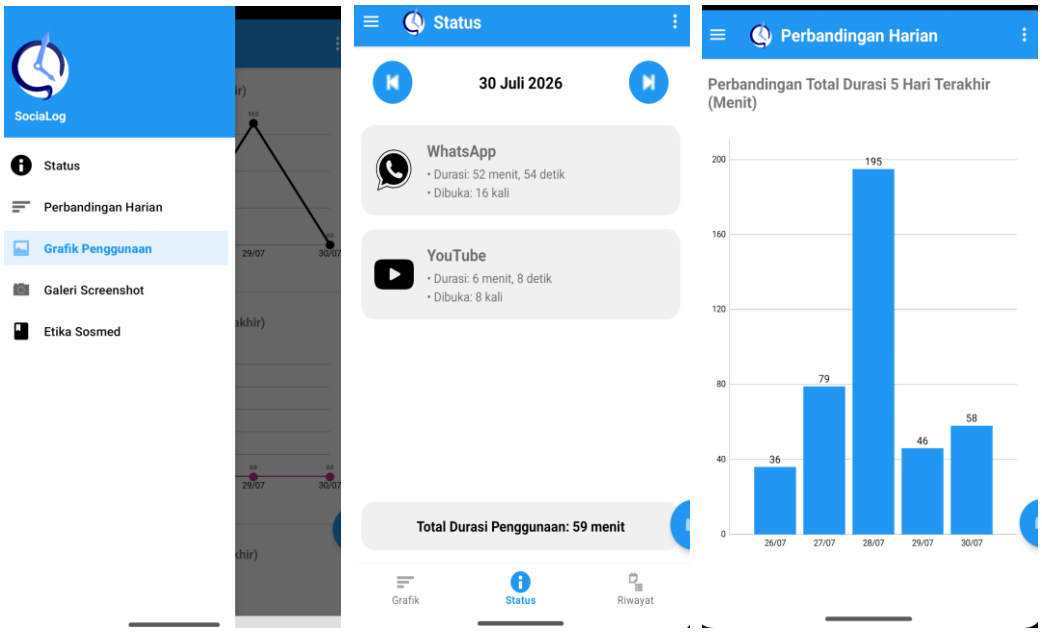


Figure 5. Screenshots of the SociaLog prototype: (left) navigation menu, (center) Status page, (right) Daily Comparison page.

Note on Figure 5: the screenshots above show the deployed application's original Indonesian-language user interface, as used by the student participants, and are presented unaltered to preserve their

authenticity as research artifacts. For consistency with the language of this manuscript, the Indonesian interface terms are translated here: "Perbandingan Harian" = Daily Comparison; "Grafik Penggunaan" = Usage Graph; "Galeri Screenshot" = Screenshot Gallery; "Etika Sosmed" = Social Media Ethics; "Durasi" = Duration; "Dibuka" = Opened (i.e., open count); "Total Durasi Penggunaan" = Total Usage Duration.

3.3 Social Media Duration Data

Automatic logging over the one-week trial period yielded a final analytic sample of 100 students (50 from each school) after data-cleaning procedures excluded records with insufficient coverage. As shown in Table 2, students at SMKN 9 spent an average of 447.4 minutes (7.46 hours) per day on social media, while students at SMKN 10 spent 517.6 minutes (8.63 hours) per day, both figures consistent with the 6-7 hours per day previously reported using self-report in the first year of this research program, and both figures substantially higher than typical adolescent screen-time benchmarks reported in comparable cohort research (Zhao et al., 2025).

Table 2. Descriptive Summary of Logged Social Media Duration (n = 100).

Indicator	SMKN 9	SMKN 10
Mean daily duration (all platforms)	447.4 min (7.46 h)	517.6 min (8.63 h)
Mean daily open frequency	98.9 times	108.5 times
Dominant platform(s)	TikTok (26.4%), WhatsApp (25.2%)	WhatsApp (30.5%), TikTok (28.4%)
Lowest-usage platform	YouTube (~9%)	YouTube (~9%)

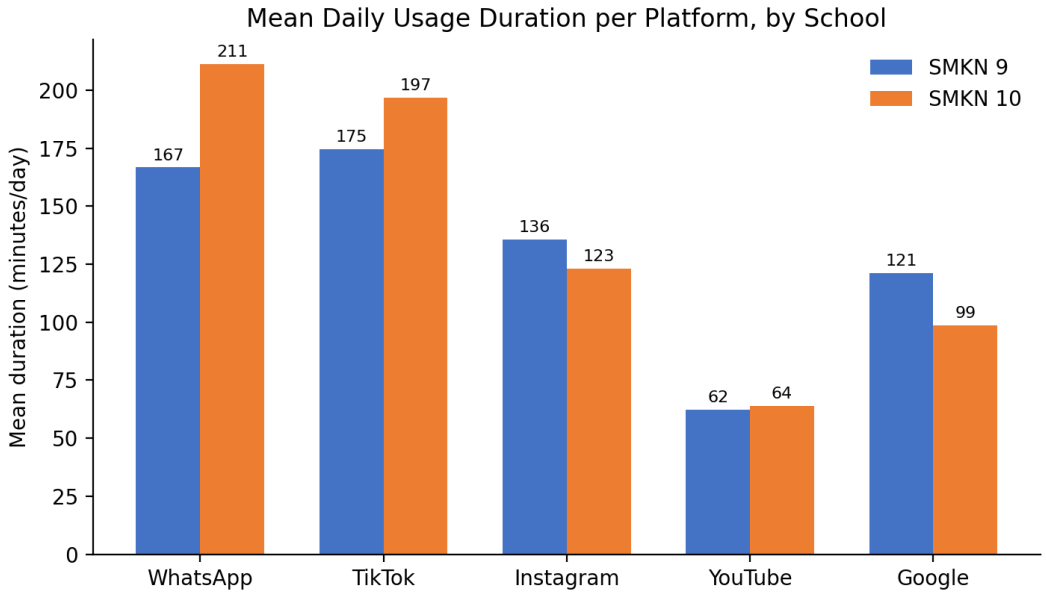


Figure 6. Mean daily duration per social media platform, by school.

WhatsApp and TikTok consistently emerged as the two dominant platforms at both schools, while YouTube was consistently the least-used platform, a pattern that plausibly reflects the dual role of WhatsApp as both a social and a functional communication tool, alongside the short-form, highly engaging content format of TikTok. That the automated logging succeeded in producing consistent, platform-level daily data across all 100 participants over a full week is

itself evidence supporting the first research objective: that the SociaLog prototype functions as intended in a real deployment setting.

3.4 Normality and Homogeneity

As shown in Table 3, the logged duration data were normally distributed at both schools, with homogeneous variance between schools (Levene's test: $F = 1.796$, $p = 0.183$). The combined usability score, however, was not normally distributed. Further inspection identified that 10 of the 50 SMKN 9 respondents (20%) had provided an identical response to all 27 usability items, a straight-lining pattern commonly associated with careless responding (Curran, 2016). Excluding these respondents did not restore normality ($n = 40$; $W = 0.922$; $p = 0.009$), indicating that the non-normal shape reflects a genuine feature of the usability score distribution rather than being solely an artifact of careless responses. Accordingly, subsequent between-group comparisons of usability scores were conducted using non-parametric tests.

Table 3. Shapiro-Wilk Normality Test Results.

Variable	n	Statistic	p-value	Conclusion
Daily duration - SMKN 9	50	W = 0.980	0.534	Normal
Daily duration - SMKN 10	50	W = 0.973	0.299	Normal
Usability score - SMKN 9	50	W = 0.928	0.0045	Not normal
Usability score - SMKN 10	50	W = 0.958	0.0715	Normal
Usability score - Combined	100	W = 0.939	0.0002	Not normal

3.5 Validity and Reliability

Item-total Pearson correlation for the 27-item usability questionnaire ($n = 100$) ranged from $r = 0.652$ to $r = 0.881$, exceeding the commonly used minimum threshold of $r > 0.3$ applied in comparable Indonesian ICT-based instrument validation studies (Yokhebed et al., 2024; Negoro et al., 2024); all items were therefore retained as valid. Cronbach's alpha reliability was 0.980, categorized as excellent (Cronbach, 1951). These results indicate that the usability instrument developed for this study is methodologically sound for assessing feature comprehension, ease of use, and appropriateness of the SociaLog application, consistent with recommendations that mobile health and education applications be evaluated through purpose-built usability development and evaluation studies rather than generic scales alone (Chin et al., 2021; Johnson et al., 2020).

3.6 User Acceptance Across Schools and Dimensions

Figure 4 illustrates the distribution shape underlying the non-normality reported above, showing a left-skewed distribution at SMKN 9 relative to a more symmetric distribution at SMKN 10.

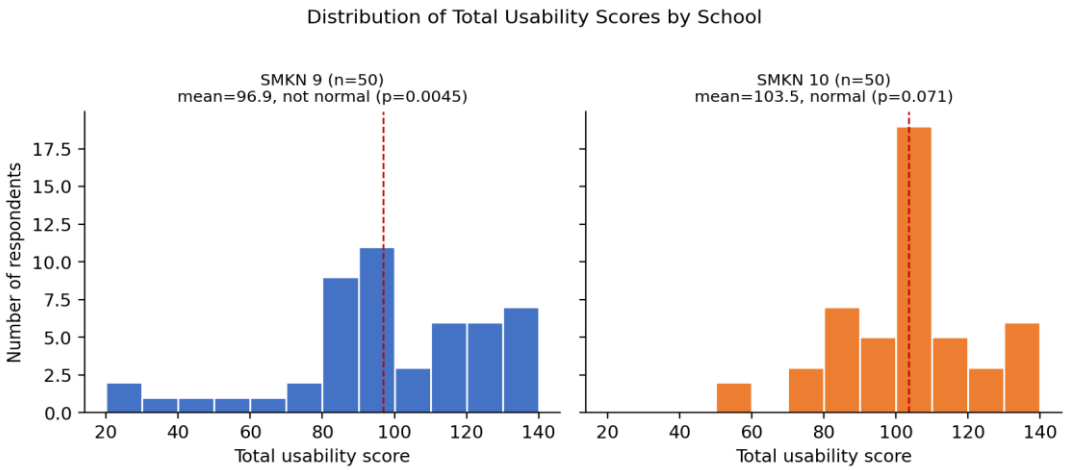


Figure 7. Distribution of total usability scores by school.

The Mann-Whitney U test indicated no statistically significant difference in usability scores between SMKN 9 (median = 93.5) and SMKN 10 (median = 105.5), U = 1100.5, p = 0.304, despite the numerically higher median observed at SMKN 10. Similarly, the Kruskal-Wallis test across the four usability dimensions, comprehension of features (mean = 3.72), ease of use (3.67), appropriateness for logging duration (3.73), and perceived advantage over self-report (3.73), showed no statistically significant difference, H = 0.816, p = 0.846, further supported by non-significant Bonferroni-corrected pairwise comparisons between all dimension pairs. Taken together, these results indicate that user acceptance of SociaLog is consistently high and evenly distributed, both across schools and across the specific aspects being evaluated, rather than being driven disproportionately by any single school or feature.

3.7 System Performance Evaluation

To address the reviewer's request for quantitative engineering evaluation, on-device performance profiling was conducted on a mid-range test device (Xiaomi Redmi Note 12, Android 13) using the Android Debug Bridge (adb) system diagnostic tools dumpsys meminfo and dumpsys cpuinfo, and the device's native battery usage statistics.

Table 4. On-device performance measurements (Xiaomi Redmi Note 12, Android 13).

Metric	Measured value	Measurement source
Memory footprint (Total PSS)	122,505 KB (≈ 119.6 MB)	adb shell dumpsys meminfo
CPU utilization (active use)	22% (18% user + 4.3% kernel)	adb shell dumpsys cpuinfo
CPU – rendering thread	11% (8.2% user + 2.8% kernel)	adb shell dumpsys cpuinfo
CPU – main application thread	9.1% (8.4% user + 0.6% kernel)	adb shell dumpsys cpuinfo
Battery consumption	0.33% over the measurement period	Device battery usage settings

The measured memory footprint (≈120 MB total PSS, of which graphics/EGL buffers account for the largest single share at 48.7 MB) and CPU utilization (22% during active foreground use, dominated by UI rendering rather than the event-aggregation computation itself) indicate that the event-stream reconstruction algorithm described in Section 2.F does not impose a disproportionate computational burden relative to standard UI rendering costs, despite performing a full single-pass reconstruction of the raw usage-event log on every query rather than reading from a pre-aggregated cache. Battery consumption of 0.33% over the observed

usage period is consistent with an application that performs computation only on demand (when a screen is actively opened) rather than through continuous background polling.

These measurements were obtained through a single-session, single-device profiling procedure and are reported as an initial engineering characterization rather than an exhaustive performance study; they are not yet averaged across multiple sessions, device tiers, or Android versions. Systematic multi-device, multi-session benchmarking, including query latency under larger historical date ranges, is identified as a direction for future work.

3.8 Discussion

These findings jointly address the two objectives of this study. First, the successful, uninterrupted automatic logging of duration and frequency data across 100 participants over a full week demonstrates that the SociaLog prototype is functionally capable of supporting the exploration and analysis of social media usage data, directly addressing the self-report limitation identified by Ellis et al. (2019) and Parry et al. (2021). Second, the combination of strong item validity, excellent reliability, and statistically indistinguishable acceptance across schools and evaluation dimensions indicates that the application is understandable, easy to use, and appropriate for its intended logging purpose, addressing the second objective of this study.

The detection of straight-lining responses in one-fifth of the SMKN 9 usability sample is a methodologically important finding in its own right. Rather than treating this as a limitation to be hidden, this study followed established detection procedures (Curran, 2016) to identify and transparently report affected responses, and demonstrated through a sensitivity analysis that excluding them did not materially change the substantive conclusion regarding usability. This practice is recommended for similar school-based technology-evaluation studies in which questionnaire fatigue among adolescent respondents is a plausible threat to data quality.

A related data-quality concern is whether the high reliability coefficient (Cronbach's alpha = 0.980) reflects genuine internal consistency or item redundancy, that is, whether some of the 27 usability items are so similarly worded that they contribute little independent information. To examine this on the same sample that produced the reported alpha, inter-item correlations across the full n = 100 sample were inspected: correlations between items ranged from r = 0.373 to r = 0.864, with a mean inter-item correlation of r = 0.642, and only 2 of 351 item pairs (0.6%) exceeding r = 0.85, the conventional threshold above which two items are considered near-duplicates rather than distinct indicators; neither pair approached the near-perfect correlation (r > 0.95) that would indicate true redundancy. This indicates that the observed reliability is not attributable to a small number of redundant item pairs dominating the scale, and is instead consistent with a well-known psychometric property of Cronbach's alpha: with k = 27 items and a moderate mean inter-item correlation, the Spearman-Brown relationship alpha = (k*r_bar) / (1+(k-1)*r_bar) predicts alpha = 0.980, exactly matching the empirically observed value. Separately, as part of the same data-screening effort, straight-lining detection (Curran, 2016) was applied systematically to both schools rather than SMKN 9 alone: 8 of 50 SMKN 10 respondents (16%) were also found to have given an identical response across all 27 items, in addition to the 10 SMKN 9 respondents (20%) reported above. A full exploratory factor analysis to confirm the intended four-dimension structure is nonetheless recommended as a direction for future refinement of the instrument.

Finally, the unanticipated finding that respondents value SociaLog's potential to support parental monitoring suggests a concrete direction for the refinement phase of this Prototyping cycle: extending the application with a parental-facing view of logged usage data, which was outside the scope of the original functional requirements but emerged directly from user evaluation, illustrating the value of an iterative, feedback-driven development model over a purely linear one for this type of application.

Comparison. Platform-level figures from the first-year study conducted at SMKN 2 and SMKN 3 Parepare (Yunendar et al., 2026) provide a direct point of comparison: TikTok was the dominant platform (436.4 minutes over three days, approximately 145.5 min/day), followed by WhatsApp (345.4 min/3-day, approximately 115.1 min/day), Instagram (264.0 min/3-day, approximately 88.0 min/day), and YouTube (185.0 min/3-day, approximately 61.7 min/day), with an overall mean of approximately 410 minutes (6.84 hours) per day. The platform ranking observed in the present study, TikTok and WhatsApp as the two leading platforms and YouTube consistently the lowest, closely mirrors this earlier finding, and the total daily duration in the current study (7.46-8.63 hours) is consistent with, though somewhat higher than, the 6.84-hour figure reported in the first-year study, a difference plausibly attributable to the automatic, event-based logging method used here compared to the three-day screen-time-record method used previously.

Explanation. The observed dominance of WhatsApp and TikTok, and the overall daily duration of 7.46-8.63 hours, can be explained by the dual functional-social role of WhatsApp (used for both peer socializing and practical communication such as coordinating school or family matters) and the short-form, algorithmically curated content format of TikTok, which is designed to encourage frequent re-engagement rather than single long sessions. The high overall duration likely reflects unsupervised access to personal devices outside school hours, consistent with broader adolescent screen-time trends reported in prior cohort research (Zhao et al., 2025), rather than a pattern unique to the two schools studied.

Implication. These findings carry three practical implications. First, for schools, the platform-level duration data produced by SociaLog could be incorporated into digital-literacy or homeroom guidance sessions, giving students concrete, personalized figures rather than general awareness messages. Second, for application design, the results validate the decision to prioritize automatic, platform-disaggregated logging over self-report, and support the earlier-identified direction of adding a parental-facing view, given that usage occurs predominantly outside adult supervision. Third, for future research, the consistently high usability scores across two schools suggest that the automatic-logging approach used here is a feasible instrument for similar studies in other SMK contexts, where structured digital-wellbeing monitoring is not yet common practice.

Limitations. This study has two main limitations. First, the trial involved only two vocational high schools in a single city (Makassar), which limits the generalizability of both the duration figures and the usability findings to other regions or school types. Second, data collection covered a one-week monitoring period, which captures typical weekday usage but may not reflect longer-term or seasonal variation (e.g., school holidays or examination periods). Addressing these limitations through multi-school and longer-duration follow-up studies is recommended as a direction for future work.

4. Conclusions

This study developed and evaluated SociaLog, a mobile application for automatically logging adolescents' social media duration and frequency of use, as an alternative to self-report measurement. Using a Prototyping-based development process, the application was built and trial-tested on 100 vocational high school students across two schools in Makassar, Indonesia, successfully logging an average of 7.46-8.63 hours of daily social media use dominated by WhatsApp and TikTok, figures consistent with, and more precisely measured than, self-reported estimates obtained in earlier research using the same population. The usability instrument used to evaluate the application demonstrated strong item validity and excellent reliability, and non-parametric testing showed that user acceptance was consistently high across both schools and all four evaluated usability dimensions, with no statistically significant gaps. A notable limitation identified during data screening was a subset of careless responses to the usability questionnaire,

which was detected, reported, and shown not to affect the overall conclusions through sensitivity analysis. Beyond confirming the functional and perceptual success of the prototype, this study surfaced an unanticipated need for parental-facing monitoring features, identified through user evaluation rather than initial requirements gathering, illustrating a genuine strength of the Prototyping model for this type of application. Future work should extend SociaLog with this parental-monitoring capability, validate its logged data against device-level screen-time records, and expand the trial to a larger and more geographically diverse sample of vocational high school students.

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